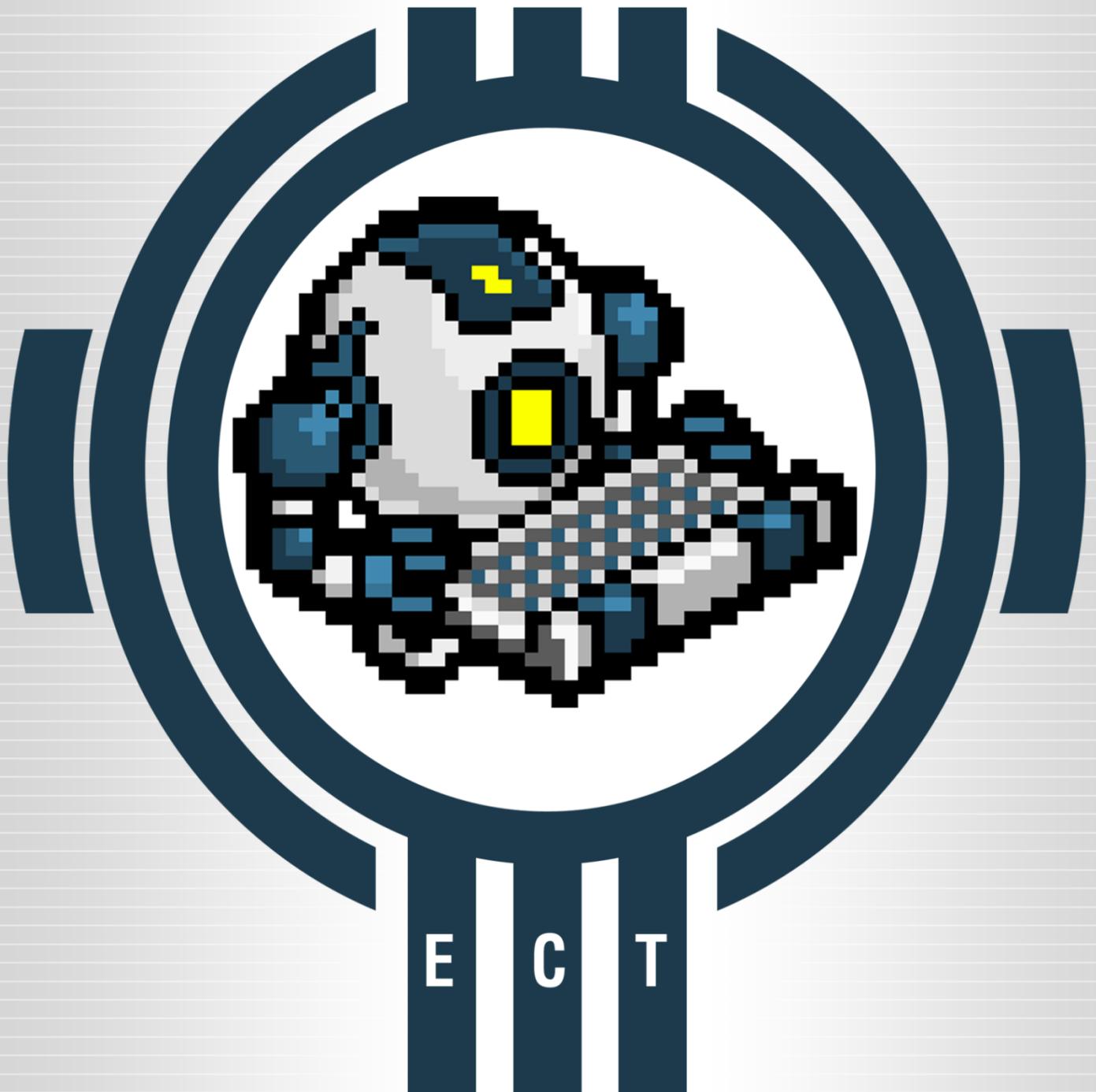


L A Z

**ECT** [www.EyeComTec.com](http://www.EyeComTec.com)  
**KEYBOARD**



E C T



# **ECTkeyboard Pro User's Manual**



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# About ECTkeyboard

**ECTkeyboard** is a program included in a set of assistive applications developed by the EyeComTec Company ([www.eyecomtec.com](http://www.eyecomtec.com)). **ECTkeyboard** is a virtual keyboard (symbol matrix) where the user can select letters, numbers or even commands by pressing a button or a pedal. This application can also be used in conjunction with eye-tracking devices, allowing users to select a symbol from a matrix by changing their sight direction.

The main idea of **ECTkeyboard** is to provide paralyzed patients and people with significant motor activity problems with a solution and a possibility to communicate.

The application is totally portable and doesn't require installation, allowing users to launch it from any external storage device. An unlimited amount of user profiles, as well as the possibility to switch them 'on the fly' allows the use of **ECTkeyboard** in various medical and rehabilitation centers. This application is incredibly convenient to use. Thus, a patient can freely use it in just a couple of minutes after the very first launch.

Users can change the interface layout of the program in order to create a convenient atmosphere. The user can change the number of rows and columns in the matrix of symbols, change the cell order, as well as change colors and various fonts of all the elements of the application. It's possible to select the size of the font and set a high contrast color scheme, which makes this application comfortable and easy for visually impaired patients. Users can also enable sound confirmation of all highlighted letters or symbols.

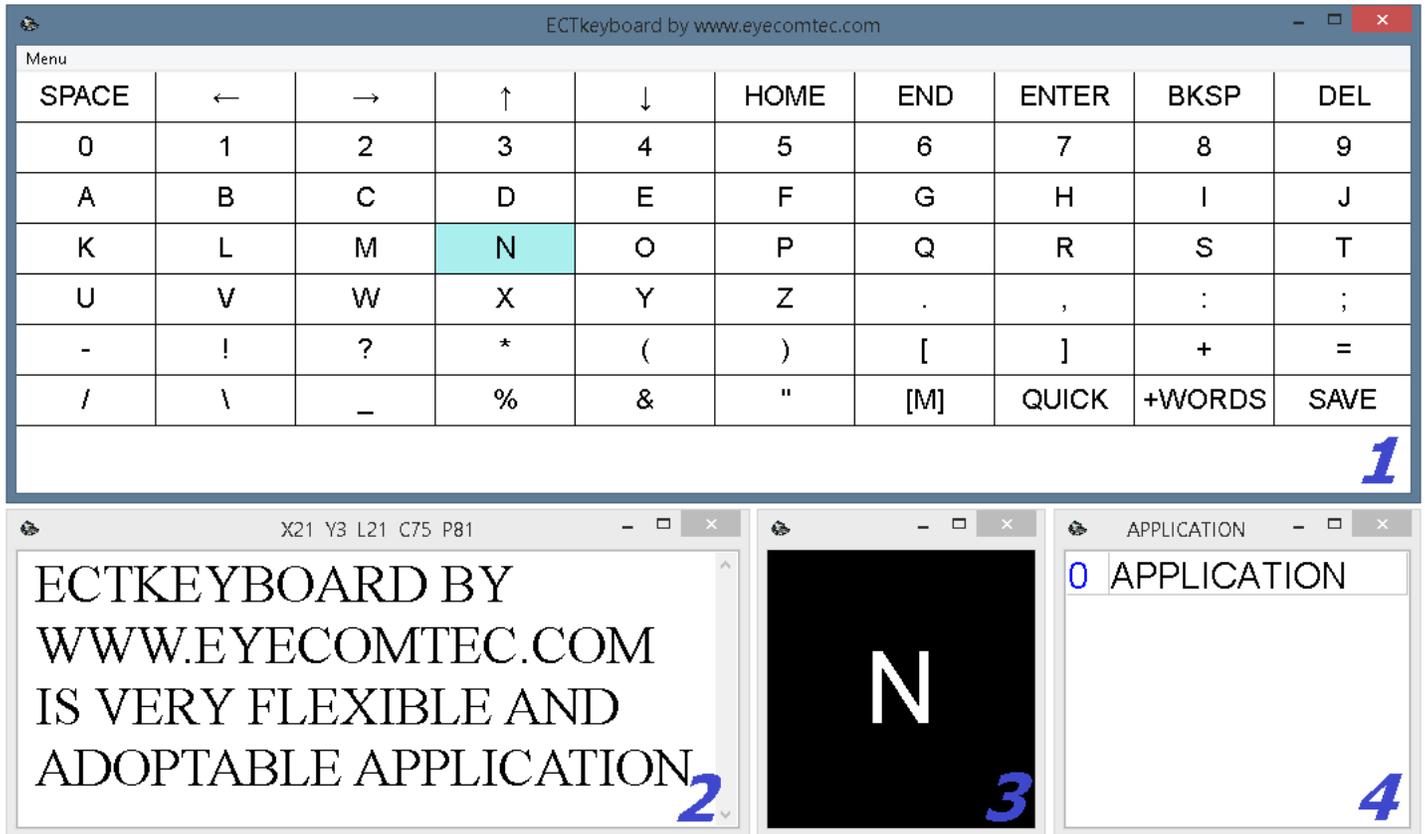
Another great and unique feature of **ECTkeyboard** is the variable speed of matrix symbol iteration. During the first period, when the user is just starting to get used to the application, a low speed of iteration allows them to understand the interface and remember all letter and symbol positions. A high speed can be useful for those who already know the application and can use it for fast text typing.

This application includes a frequently used word vocabulary, which allows users to increase the speed of typing. Words that contain a high number of symbols can be simply chosen from a list, instead of typing them letter by letter. The user can always add new words to the vocabulary, e.g. names, locations and so on.

**ECTkeyboard** can also be used by people without any physical problems. The application is a simple and convenient virtual keyboard, one which can easily send any text to a third party application or immediately save it as a text file.

The application is really flexible and has a lot of settings, i.e. users can change more than 140 parameters: colors and fonts of the interface, all form positions, the speed of selection and de-selection of symbols, progress bar size and position, and many others. All the mentioned features allow users to perform optimal **ECTkeyboard** setting procedures and create a perfect environment for each user.

The main interface of the program is shown in fig. 1.



(Fig. 1. Main interface of program)

The following elements are shown in the image:

1. The main window of the application – the virtual keyboard with letters, numbers, symbols, cursor movement arrows and some additional commands.
2. The text output window, which contains the typed text. **ECTkeyboard** allows users to type volumetric text at pretty fast speeds.
3. A window with a thumbnail of any currently selected symbol. You can select type, size, and color of fonts, as well as background colors in order to create a convenient user experience.

The quick entry window for fast word selection (predictive typing). When the user types several letters, this window will show all the words that start with those symbols.

# Main advantages of ECTtracker

**ECTkeyboard** – is a compact and convenient application that provides an incredibly flexible setup process. It has a lot of advantages in comparison with other applications in the same market field:

- unlimited user profiles supported by fast loading and switching speed. Such an approach allows various users on one personal computer to create unique interface settings and keyboard layouts.
- 10 various data input modes (two of the mentioned modes support external eye-tracking devices). This feature makes **ECTkeyboard** useful for patients with various physical conditions.
- a convenient interface, with the possibility to change symbol order, key size, and other visual parameters.
- special operation modes for visually impaired people or people with distortions of color perception. The application allows users to use its special high-contrast color scheme and huge fonts, as well as the window with a selected letter or symbol thumbnail. Furthermore, **ECTkeyboard** can be used by totally blind patients, due to a special feature that confirms all letters with a synthesized voice.
- **PRO** special graphical icons with letters or numbers (or instead of them) can be great for those patients who don't speak localization languages or just can't read.
- the fast entry mode with the vocabulary of frequently used words allows users to avoid long symbols by symbol typing, increasing the total speed of program operation and text typing.
- possibility to create a vocabulary for names, locations and special words that can't be found in standard vocabularies.
- users can implement special commands, allowing patients to change keyboard layouts, enable/disable sound confirmation, and use various additional options and tools right from the main window of the application without any need to call an assistant to perform the additional setting procedure.
- various localizations support, i.e. users can choose their native language for the interface. Fast entry vocabularies are also available for several languages.
- incredibly flexible setting procedure, i.e. users can change more than 130 parameters, which allow changes to the functionality and the interface of the application in order to create a comfortable atmosphere for each specific user.
- modularity of the application. Users can change colors and fonts for each window, hiding or showing them if necessary.
- possibility to transfer any typed text to any third party application, i.e. text editor, internet browser, chat window, etc.
- typed text can be automatically saved after a predefined period of time.
- small size and real portability of the application, which allows ECTkeyboard to run from any external storage device.
- low technical requirements of computing resources.

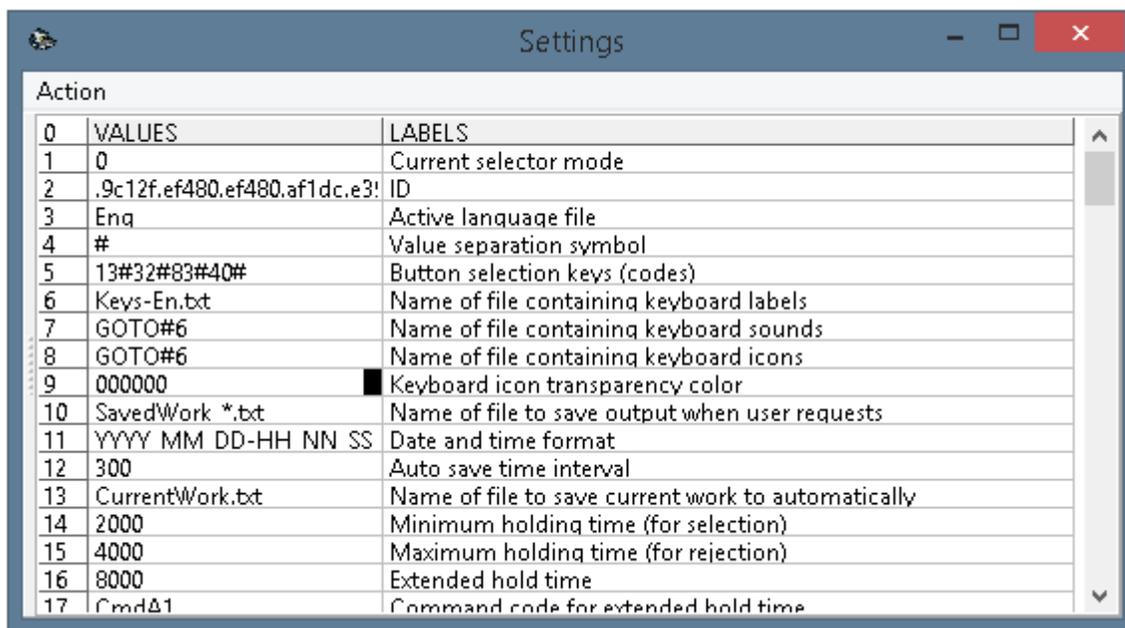
Thus, we can say that **ECTkeyboard** is now one of the most advanced and functional virtual keyboards in the field of assistive technologies.

# First start of ECTkeyboard. Getting started

**ECTkeyboard** is ready to operate immediately after downloading. There's no need to install the application. The user just has to run the executable file. Furthermore, the virtual keyboard can be launched from any portable storage device (a flash or SD card, an external hard drive, etc.).

The default settings allow the user to start operation of the application without performing any additional setting procedures. It's only necessary to choose the proper working mode of the selector. In cases where the user needs to change various parameters of the program, it's required to perform the following sequence of actions:

1. Launch the **ECTkeyboard** app.
2. Open the settings window of the program, by choosing **Settings - Show Settings Window** items of the main menu. The user can also press the corresponding hotkey - **F3** (see fig. 2).



| Action | VALUES                       | LABELS   |
|--------|------------------------------|--|
| 0      | 0                            | Current selector mode                              |
| 2      | .9c12f.ef480.ef480.af1dc.e3! | ID   |
| 3      | Eng                          | Active language file                               |
| 4      | #                            | Value separation symbol                            |
| 5      | 13#32#83#40#                 | Button selection keys (codes)                      |
| 6      | Keys-En.txt                  | Name of file containing keyboard labels            |
| 7      | GOTO#6                       | Name of file containing keyboard sounds            |
| 8      | GOTO#6                       | Name of file containing keyboard icons             |
| 9      | 000000                       | Keyboard icon transparency color                   |
| 10     | SavedWork *.bt               | Name of file to save output when user requests     |
| 11     | YYYY MM DD-HH NN SS          | Date and time format                               |
| 12     | 300                          | Auto save time interval                            |
| 13     | CurrentWork.txt              | Name of file to save current work to automatically |
| 14     | 2000                         | Minimum holding time (for selection)               |
| 15     | 4000                         | Maximum holding time (for rejection)               |
| 16     | 8000                         | Extended hold time                                 |
| 17     | Cmd&1                        | Command code for extended hold time                |

(Fig. 2. The settings window of **ECTkeyboard**)

3. Choose the file with keyboard labels - parameter 6.
4. Set the amount of key holding time required to select a symbol – parameter 14.
5. Set the amount of key holding time required to cancel the selection of a symbol – parameter 15.
6. Set required delay time for vertical and horizontal movements – parameters 18 and 19.
7. Select horizontal (parameter 46) and vertical (parameter 47) numbers of buttons.
8. Choose a font for symbols on the buttons and set its size and colors, as well as colors of surfaces and borders of buttons – parameters 57-80.
9. Choose a font and its size for the text output window – parameters 106 and 107.
10. If required, adjust the appearance of the progress bar (key selecting stripe) – parameters 131-149.
11. Enable the current key thumbnail (parameter 161); adjust the position and appearance of the window – parameters 162-173.
12. Enable the quick entry window (parameter 201) and adjust its appearance – parameters 202-217.

More detailed information about each parameter of the program can be found in the 'Settings and additional parameters of **ECTkeyboard**' chapter of this manual.

After making all required changes, the user has to save all the settings and apply them to all program windows. In order to do so, the user has to select **Settings - Set Current** menu items. After doing so, the user can proceed to the program operation.

In order to work with **ECTkeyboard**, it's required to select one of available selector operation modes. Such selection can be done through the **Start** submenu. The current version of the program supports the following modes:

1. Manual selection (modes 0, 0A, 0B);
2. Coordinate scanning (modes 1, 1B);
3. Symbol-by-symbol scanning (modes 2, 2B);
4. Half selection (mode 3);
5. Gaze control of the cursor buttons (mode 4);
6. Gaze control of the mouse cursor (mode 5).

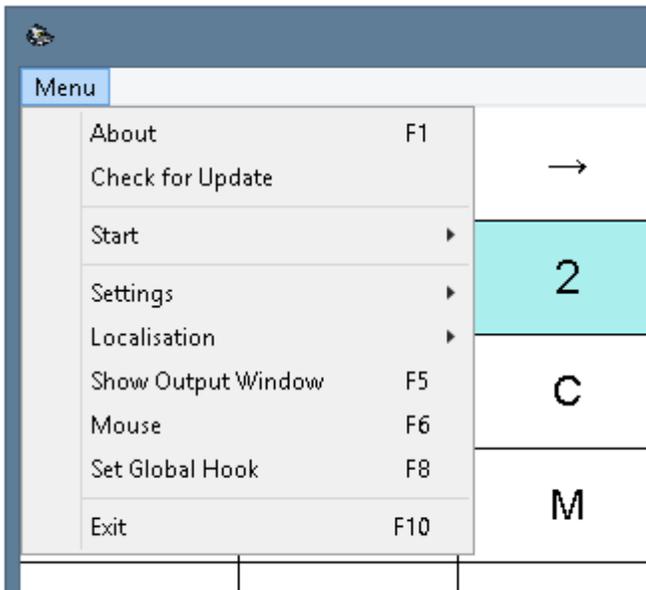
The 5th and 6th options are intended to work in conjunction with an external eye-tracking device, i.e. a device that tracks the eye movements of the user and identifies the direction of the user's sight. More information about the gaze control feature can be found in the 'Main menu and functionality of **ECTkeyboard**' chapter of this manual.

After choosing the required selector mode, the user can proceed to the text typing process. In case the text output window is not shown, it's necessary to press the **F5** hot key or select the **Show Output Window** item in the main menu of the program.

# Main menu and functionality of ECTkeyboard

The Menu of the program provides the user with fast access to all main controlling components of the **ECTkeyboard**. The user can choose a required selector working mode, save and load program settings, restore default settings, choose one of the available interface languages, or show the text output window through the menu. The menu of the program also allows the user to enable or disable virtual keyboard mouse control. All elements of the menu are conveniently grouped and have individual hotkeys, which allow the user to perform fast program setting.

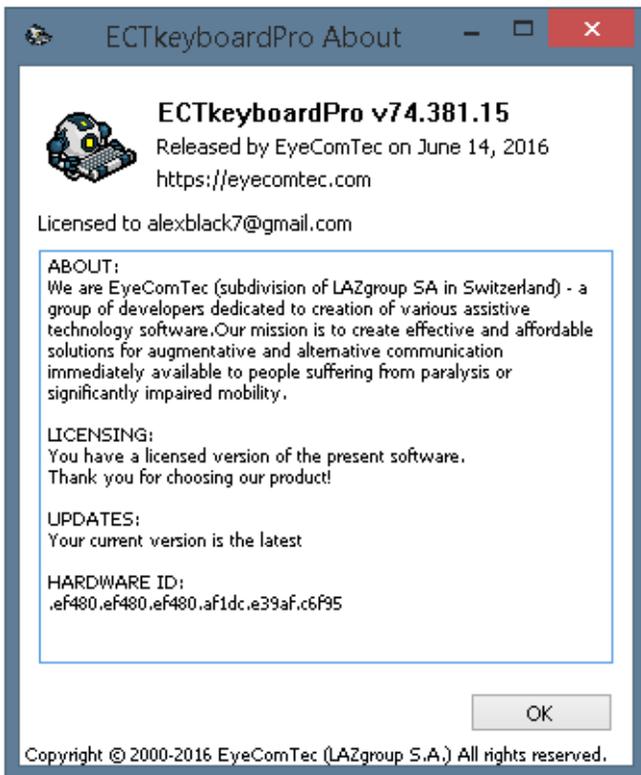
The main menu of the program is shown in fig. 3.



(Fig. 3. Main menu of **ECTkeyboard**)

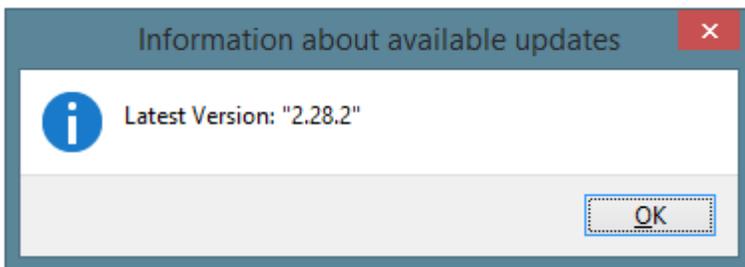
Let's look closer at the items on the menu.

**About**, the **F1** hotkey. By using this item, the user can open an informational window of the program, which contains some information about the developing company, contact details, and useful links, as well as information about the current version of **ECTkeyboard** (see fig. 4). More detailed information about the **About** window can be found in the '**New About window**' chapter of this manual.

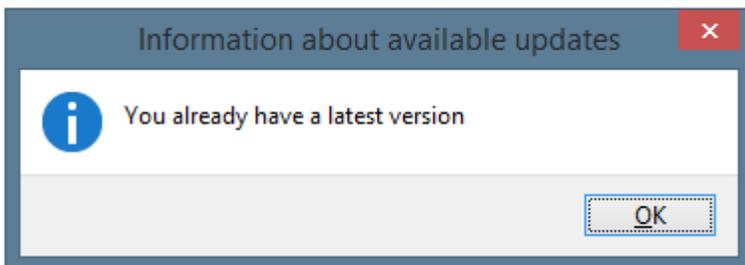


(Fig. 4. About window of the program)

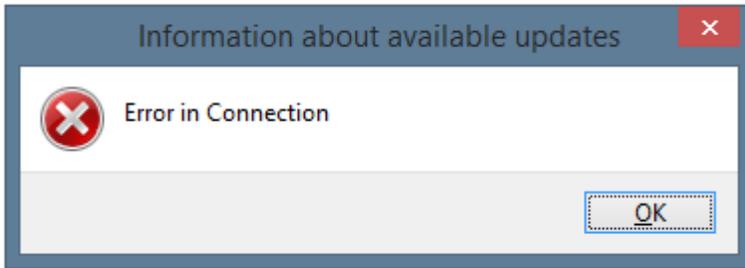
**Check for Update.** It allows the user to check for an updated version of the program on the developer's website. In case there's an update available, the program will open a window with information about the latest version (see fig. 5). If there's no update available, the user will see a corresponding notification (see fig. 6). In case the program can't establish a connection to the server (no internet connection, the server is not responding, or the connection is blocked by a firewall), the user will see the 'Error in Connection' message (see fig. 7).



(Fig. 5. Information about available updates)

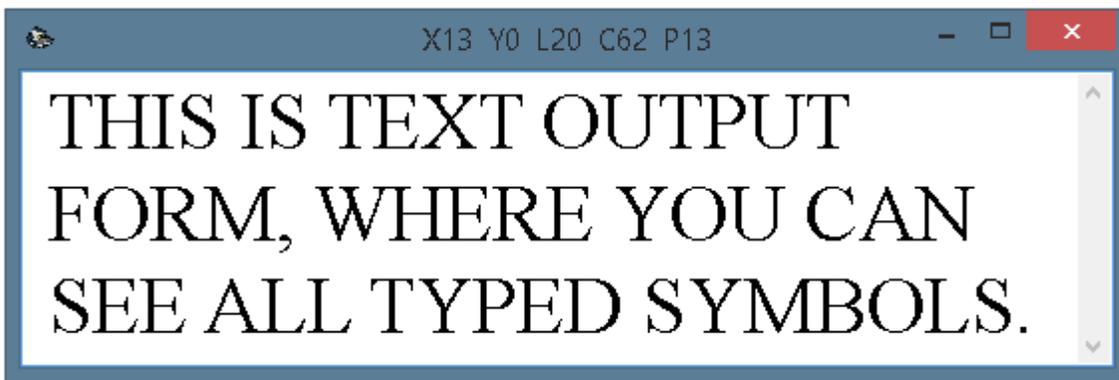


(Fig. 6. Informational window, which is shown when there are no updates)



(Fig. 7. Informational window, which is shown when it's impossible to check for updates)

**Show Output Window**, the **F5** hotkey. This item of the menu or the corresponding hotkey allows the user to show the text output window, which contains all the text typed with the virtual keyboard (see fig. 8). The output window can be closed by clicking the left mouse button on the red 'close' button in the upper right corner of the window.



(Fig. 8. Text output window)

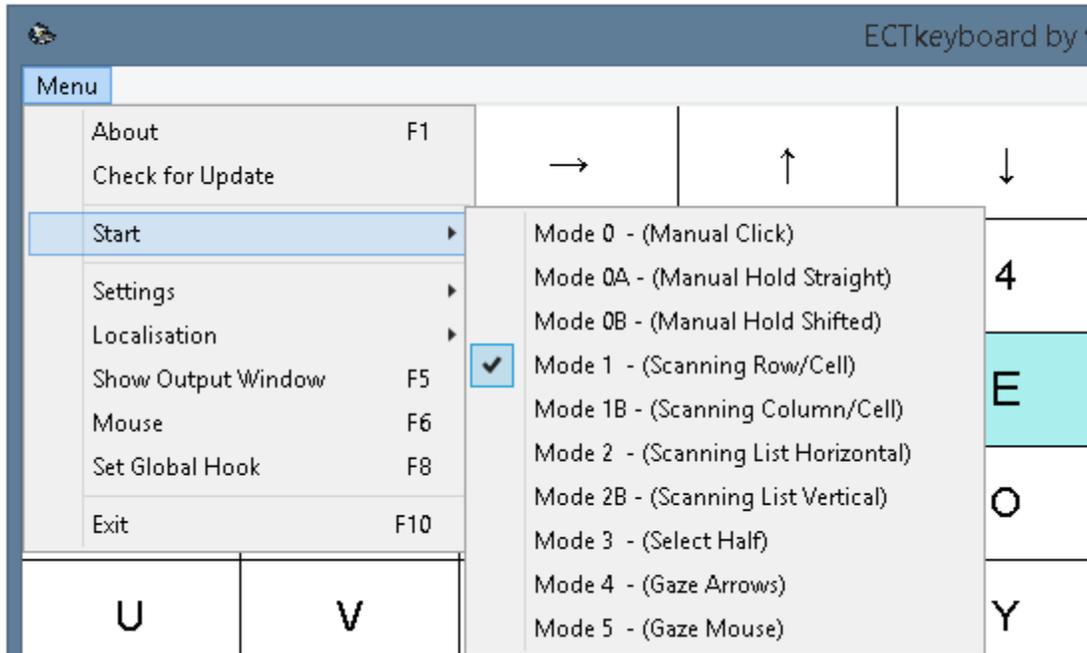
**Mouse**, the **F6** hotkey. This option enables or disables mouse control. Mouse control allows using the matrix of symbols as a virtual keyboard for fast text typing. When mouse control is enabled, the corresponding item of the main menu is marked with a checkmark and cells of the matrix of symbols are highlighted when the user moves the cursor above them. **ECTkeyboard** was mainly created to be controlled with keys. The mouse control mode was created mainly for debugging and testing purposes.

**Set Global Hook**, the **F8** hotkey. This item allows the user to enable the controlling actions global interception mode and can be used in order to emulate mouse buttons actions. This mode enables global interception of keystrokes in windows of any programs. Thus, the user can continue working with the virtual keyboard, even if the **ECTkeyboard** window is not active at the selected moment in time.

**Exit**, the **F10** hotkey. This item allows the user to exit the program, saving all settings changes.

## 'Start' submenu

This menu makes it possible to choose one of ten possible working modes of **ECTkeyboard** (see fig. 9).



(Fig. 9. 'Start' submenu)

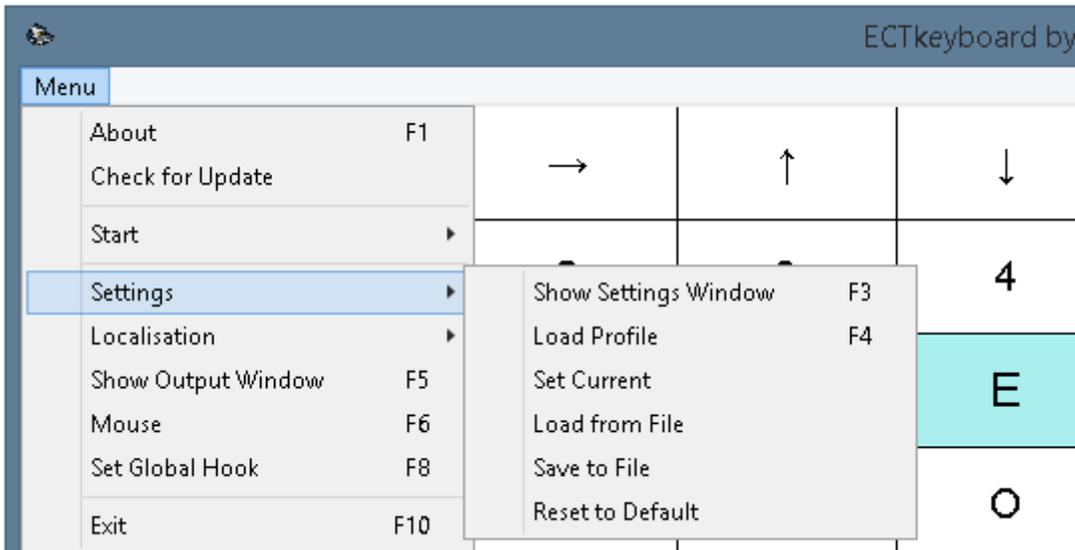
Each of the working modes is created for users with various levels of motor activity and allows for choosing the most convenient way of program operation:

- Modes 0, 0A and 0B allow for choosing the required symbol of the virtual keyboard by using cursor keys.
- Modes 1 and 1A iterate highlighted rows and columns in automatic mode, switching to the automatic symbols iteration on the second stage.
- Modes 2 and 2A automatically change highlighted symbols in vertical or horizontal order.
- Mode 3 divides the virtual keyboard into two separate halves. After selection of a half, it's divided into two new parts until the user selects one symbol.
- Modes 4 and 5 are intended to work with various eye-tracking devices.

More detailed information about the modes of data input can be found in the '**Program working modes**' chapter of this manual.

## 'Settings' submenu

The **Settings** submenu (see fig. 10) allows the user to open the settings window of the program, export and import settings as/from configuration files and restore default values for all the parameters of **ECTkeyboard**.



(Fig. 10. 'Settings' submenu)

**Show Settings Window**, the **F3** hotkey. By using this menu item, the user can open the settings window of the program that contains all the options that have changeable values.

**Load Profile**, the **F4** hotkey. This item of the main menu or the corresponding hotkey opens the standard dialog window of the operating system, which allows the loading of a previously saved configuration file with all **ECTkeyboard** settings and parameters.

**Set Current**. This menu item allows the user to apply settings that were manually selected or imported from a file with the **Load from File** item to the main window of the program.

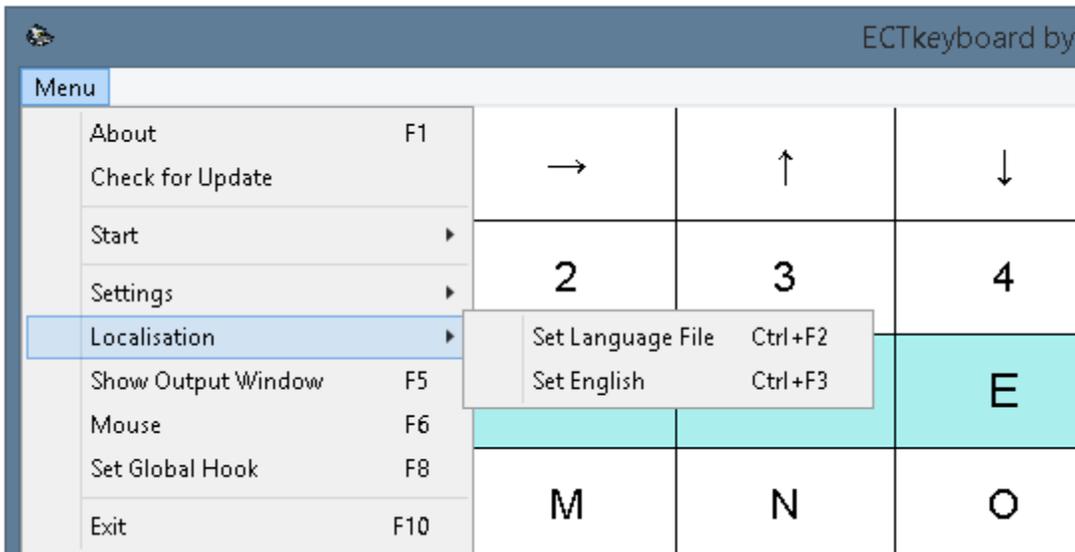
**Load from File**. This command involves the very same principle as the **Load Profile** item of the menu, but the main difference is that such settings are not applied to the main window by default, allowing the user to change necessary parameters in the settings window.

**Save to File**. By using this menu item, the user can export all the settings of **ECTkeyboard** into a separate configuration file in order to use it for fast loading in future. The application supports an unlimited amount of configuration files, which can be really handy when the program is launched from a portable storage device or in cases where several different users are working with the program on one computer. These configuration files allow the user to change the appearance and functionality of the virtual keyboard on-the-fly.

**Reset to Default**. This option can be used in cases where the user wants to restore to the initially selected settings of **ECTkeyboard**. This item of the menu revokes all the changes that were made in the settings of the program, restoring the settings profile from the executable file of the program.

## 'Localization' submenu

**ECTkeyboard** supports various localization languages and allows the user to switch between them on-the-fly, thus making it possible to work with the program in native languages of different users. The language choosing menu (see fig. 11) allows the user to select a required program interface language.



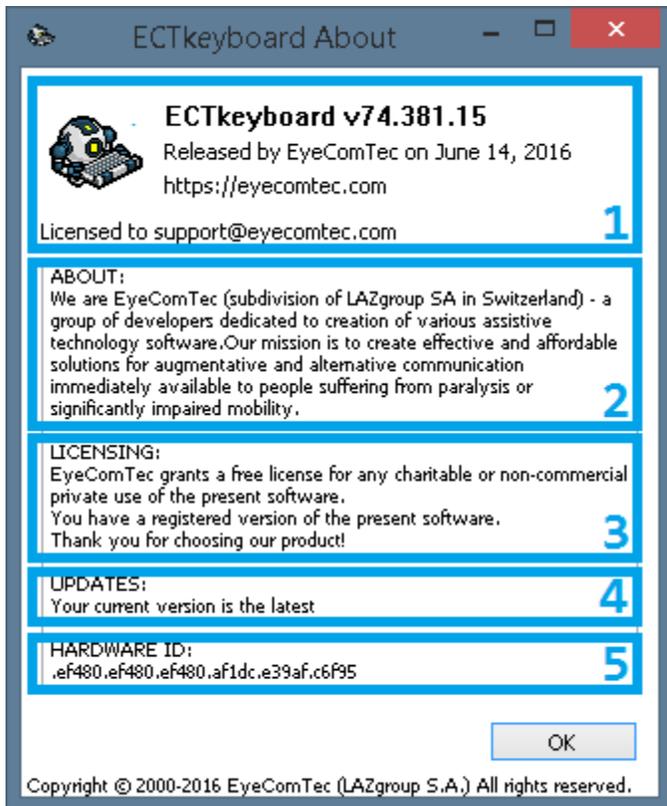
(Fig. 11. 'Localization' submenu)

**Set Language File**, the **Ctrl+F2** key combination. This item of the menu opens a standard dialog window for the operating system, allowing the user to choose one of the available localization files in the folder of the program. The program interface, all items of the menu and the parameters description of the settings panel of **ECTkeyboard** are going to be translated into a different language after confirmation of a new file selection.

**Set English**, the **Ctrl+F3** key combination. This item allows the user to select English as the interface language, without opening any additional windows.

# 'About' window

When launching a non-activated copy of EyeComTec programs (ECTcamera, ECTtracker, ECTkeyboard, ECTmouse, ECTlistener and ECTmorse), the user will see the **About** window, which contains additional blocks of information (see fig. 12).

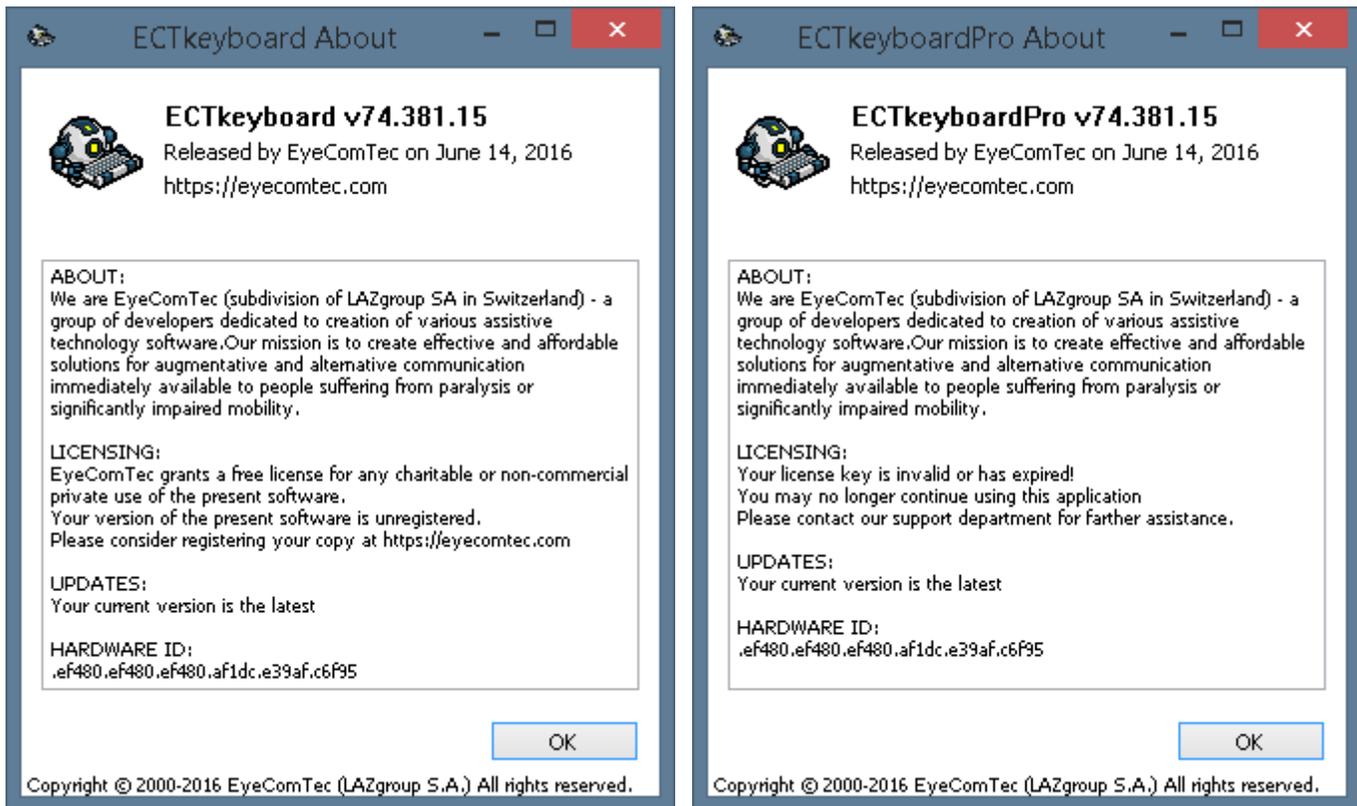


(Fig. 12. An updated About window of the **ECTkeyboard** program)

On the image above, various information blocks are marked with numbers:

1. The number and the date of the release, the company's website address. For activated versions, this block also includes an e-mail address of the user registered to this copy of the program.
2. The **About** section, which contains the information about the EyeComTec Company.
3. The **Licensing** section, which indicates the license type of the current copy of the program (paid commercial or free non-commercial license);
4. The **Updates** section, which shows if there's an updated version of the program on the developer's website);
5. The **Hardware ID** section, which indicates the hardware code of the computer used to launch the program.

The appearance of the **About** window is different for paid commercial programs (Pro version) and free versions for non-commercial use (see fig. 13).



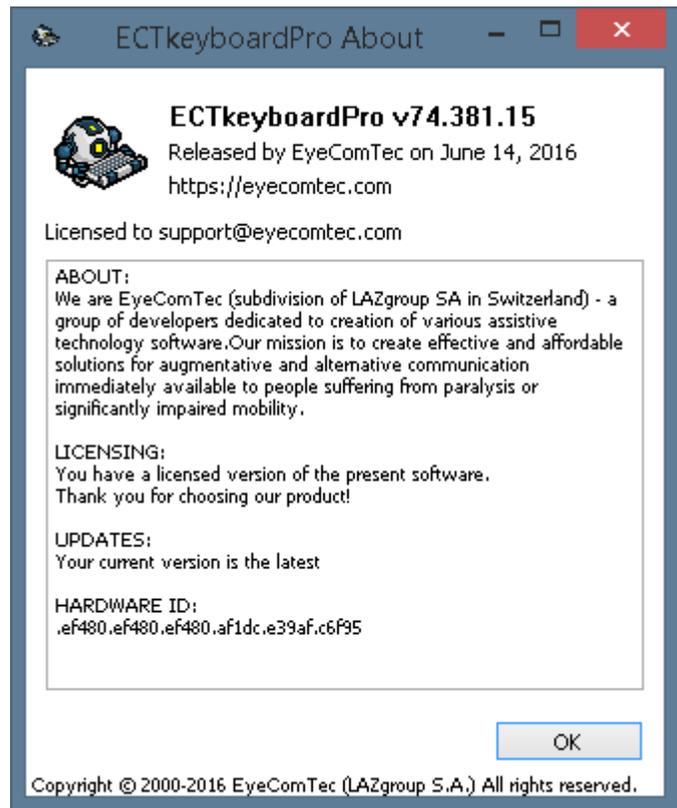
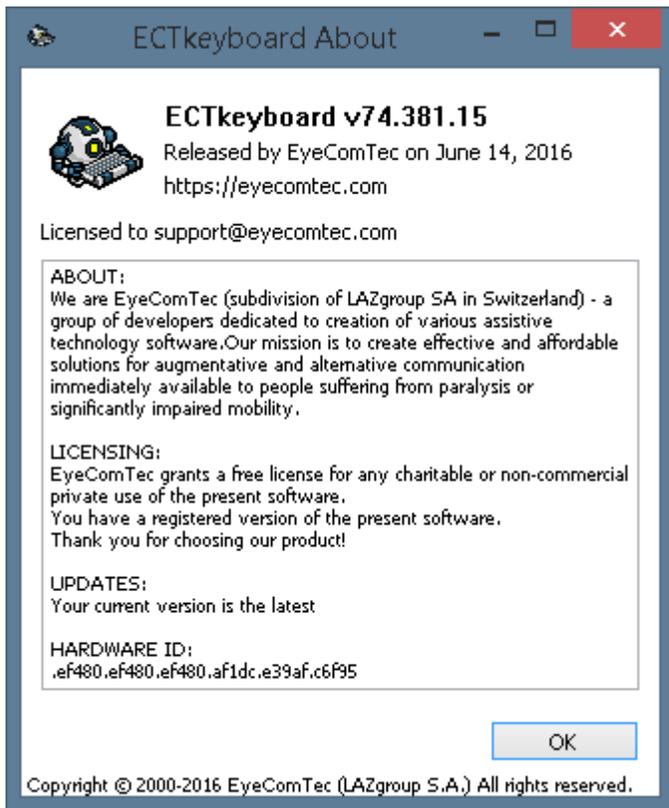
(Fig. 13. The About window for non-activated versions of the program. Left: free license for non-commercial use; Right: paid commercial license)

The user will see the main window of the program after pressing the **OK** button and closing the **About** window in a program with the free type of the license. The non-activated version of the program with a commercial license will not be launched until the user purchases (or prolongs if the license expired) a license and creates a new key file in the program's folder.

All the programs with free licenses are intended for people with a real physical need for assistive technologies from the EyeComTec Company. The registration process is not compulsory in such cases, but the company kindly recommends that our customers do register in order to gain the full benefits e.g. updates and customer support. Free versions of our software products can also be used by non-commercial and charitable organizations. These organizations must register for a licence.

Registration on the company's website and the following activation of the program are compulsory for Pro versions of software.

After completing the activation, the **About** window will not be shown during every launch of the program. The user can open it by using the **About** menu item, or by pressing the **F1** hot key (see fig. 14). There is sometimes a short delay when opening the **About** window, as every time it is opened, the program will check for updates on the EyeComTec website.



(Fig. 14. The About window for activated versions of the program. Left: free license for non-commercial use; Right: paid commercial license)

# Program working modes

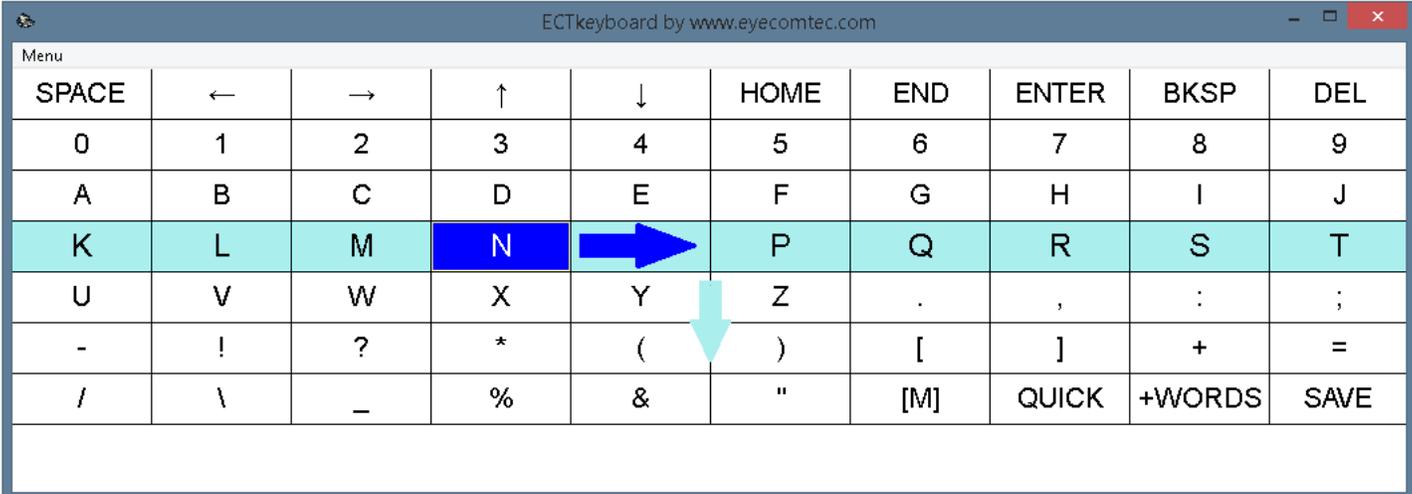
The user can choose one of 10 different working modes of **ECTkeyboard** in accordance with their own preferences and motor activity level. The working mode can be chosen in the **Start** drop-down menu. Let's look closer at the working modes of the program.

**Mode 0 – (Manual Click).** In this mode, the user can select a symbol from the virtual keyboard by using cursor keys. After choosing the desired symbol, the user has to press a button, which was previously selected as the symbol confirmation button. The selected symbol (character or letter) appears in the text output window, allowing the user to choose the following symbol.

**Mode 0A – (Manual Hold Straight).** This working mode is similar to the previous one, and the symbol selection can also be done with cursor keys. The main difference of this mode is that the user has to hold the confirmation button for a predefined period of time in order to type a symbol. In this working mode, the cursor will appear on the opposite side after reaching the border of the virtual keyboard (in the same row during the horizontal selection, or in the same column during the vertical selection).

**Mode 0B – (Manual Hold).** As in 0A working mode, the user has to hold the confirmation key for a predefined period of time. After reaching the border of the virtual keyboard during horizontal movement, the cursor will appear in the next or the previous row (it depends on the direction of symbols iteration). After reaching the border of the virtual keyboard during vertical movement, the cursor will appear on the opposite side in the next or the previous column.

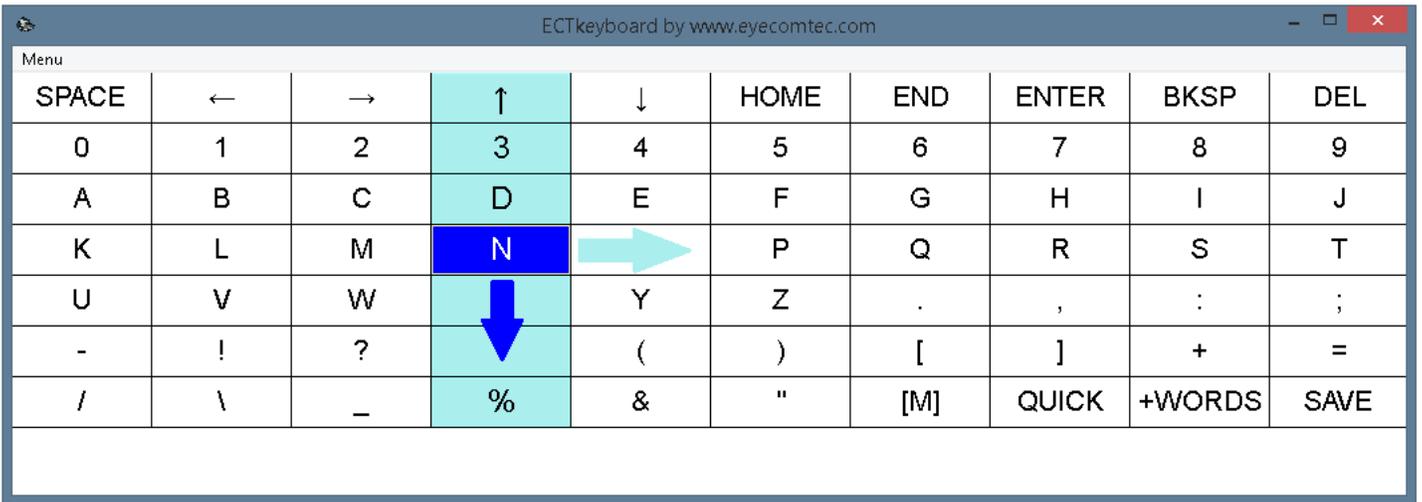
**Mode 1 – (Scanning Row/Cell).** A coordinate scanning mode. In this mode, the user has to select a highlighted row (iteration goes from top to bottom) and then a required symbol (from left to right) (see fig. 15).



| Menu  |   |   |   |   |      |     |       |        |      |
|-------|---|---|---|---|------|-----|-------|--------|------|
| SPACE | ← | → | ↑ | ↓ | HOME | END | ENTER | BKSP   | DEL  |
| 0     | 1 | 2 | 3 | 4 | 5    | 6   | 7     | 8      | 9    |
| A     | B | C | D | E | F    | G   | H     | I      | J    |
| K     | L | M | N | P | Q    | R   | S     | T      |      |
| U     | V | W | X | Y | Z    | .   | ,     | :      | ;    |
| -     | ! | ? | * | ( | )    | [   | ]     | +      | =    |
| /     | \ | _ | % | & | "    | [M] | QUICK | +WORDS | SAVE |

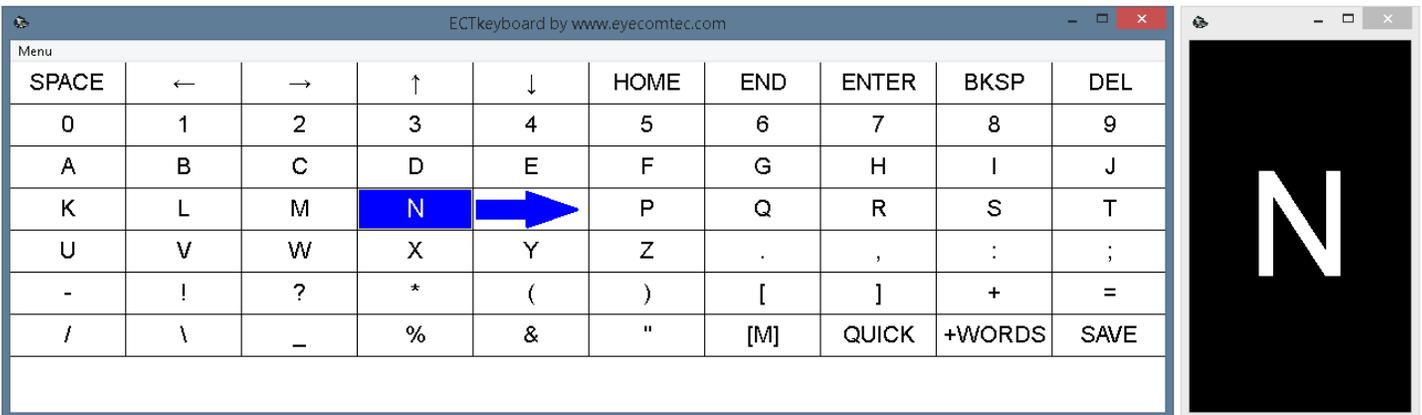
(Fig. 15. Selector mode 1 – Scanning Row/Cell)

**Mode 1B – (Scanning Column/Cell).** A coordinate scanning mode. In this mode, the user has to select a highlighted column (iteration goes from left to right) and then a required symbol (from top to bottom) (see fig. 16).



(Fig. 16. Selector mode 1B – Scanning Column/Cell)

**Mode 2 – (Scanning List Horizontal).** A step-by-step working mode. In this mode, the keys of the virtual keyboard are highlighted one by one from left to right, changing the row when the cursor reaches the border of the virtual keyboard (see fig. 17). This step-by-step mode is the slowest mode of the program.



(Fig. 17. Selector mode 2 – Scanning List Horizontal. The thumbnail window is shown)

**Mode 2B – (Scanning List Vertical).** A step-by-step working mode. In this mode, the keys of the virtual keyboard are highlighted one by one from top to bottom, changing the column when the cursor reaches the border of the virtual keyboard (see fig. 18).

| SPACE | ← | → | ↑ | ↓ | HOME | END | ENTER | BKSP   | DEL  |
|-------|---|---|---|---|------|-----|-------|--------|------|
| 0     | 1 | 2 | 3 | 4 | 5    | 6   | 7     | 8      | 9    |
| A     | B | C | D | E | F    | G   | H     | I      | J    |
| K     | L | M | N | O | P    | Q   | R     | S      | T    |
| U     | V | W |   | Y | Z    | .   | ,     | :      | ;    |
| -     | ! | ? |   | ( | )    | [   | ]     | +      | =    |
| /     | \ | _ | % | & | "    | [M] | QUICK | +WORDS | SAVE |

(Fig. 18. Selector mode 2B – Scanning List Vertical)

Letter-by-letter scanning modes (2 and 2B) are recommended for visually impaired people or patients with undue fatigability. It's also recommended to enable the current symbol thumbnail window for such modes (Set value 1 for parameter 161 in the settings window of the program) and choose a proper thumbnail size. Even though modes 2 and 2B are the slowest modes of the program, usage of each of them allows patients to reduce strain to their eyes, making it possible to prolong working time with the program without interruptions.

**Mode 3 – (Select Half).** The separating working mode. When this mode is enabled, the virtual keyboard is divided into two parts, and each of those parts is alternately highlighted (see fig. 19). When the user chooses a part that contains a required symbol or character, this part is also divided into two alternately highlighted fragments. This division happens one after another until the user selects only one required symbol.

| SPACE | ← | → | ↑ | ↓ | HOME | END | ENTER | BKSP   | DEL  |
|-------|---|---|---|---|------|-----|-------|--------|------|
| 0     | 1 | 2 | 3 | 4 | 5    | 6   | 7     | 8      | 9    |
| A     | B | C | D | E | F    | G   | H     | I      | J    |
| K     | L | M | N | O |      | Q   | R     | S      | T    |
| U     | V | W | X | Y | Z    | .   | ,     | :      | ;    |
| -     | ! | ? | * | ( | )    | [   | ]     | +      | =    |
| /     | \ | _ | % | & | "    | [M] | QUICK | +WORDS | SAVE |

| Menu  |   |   |   |   |      |     |       |        |      |
|-------|---|---|---|---|------|-----|-------|--------|------|
| SPACE | ← | → | ↑ | ↓ | HOME | END | ENTER | BKSP   | DEL  |
| 0     | 1 | 2 | 3 | 4 | 5    | 6   | 7     | 8      | 9    |
| A     | B | C | D | E | F    | G   | H     | I      | J    |
| K     | L | M | N | O | P    | Q   | R     | S      | T    |
| U     | V | W | X | Y | Z    | .   | ,     | :      | ;    |
| -     | ! | * | ( | ) | [    | ]   | +     | =      |      |
| /     | \ | _ | % | & | "    | [M] | QUICK | +WORDS | SAVE |

(Fig. 19. Selector mode 3 – Select half)

**Mode 4 – (Gaze Arrows).** This working mode requires an eye-tracking device. When the user is looking right, left, up, or down, a special pointer in the form of an aim moves correspondingly (see fig. 20). The progress bar becomes full, and when it reaches the right border, a selected symbol is added to the text output window. When the pointer is moving to another character, this timer starts to get full from the very beginning.

| Menu  |   |   |   |   |      |     |       |        |      |
|-------|---|---|---|---|------|-----|-------|--------|------|
| SPACE | ← | → | ↑ | ↓ | HOME | END | ENTER | BKSP   | DEL  |
| 0     | 1 | 2 | 3 | 4 | 5    | 6   | 7     | 8      | 9    |
| A     | B | C | D | E | F    | G   | H     | I      | J    |
| K     | L | M | N | O | P    | Q   | R     | S      | T    |
| U     | V | W | X | Y | Z    | .   | ,     | :      | ;    |
| -     | ! | ? | * | ( | )    | [   | ]     | +      | =    |
| /     | \ | _ | % | & | "    | [M] | QUICK | +WORDS | SAVE |

50,9%

(Fig. 20. Selector modes 4 and 5 for use in conjunction with eye-tracking devices)

**Mode 5 – (Gaze Mouse).** This working mode requires an eye-tracking device. The eye-tracking system identifies the current state of the user’s eyes, and the special algorithm of its software part makes it possible to identify the direction of the user’s gaze. Thus, the user has to look at the desired symbol of the virtual keyboard for a predefined period of time in order to type it.

Gaze Arrows and Gaze Mouse modes involve different algorithms, which allows **ECTkeyboard** to work with different models of eye-tracking devices.

# Additional features of the program

**ECTkeyboard** doesn't only allow symbol-by-symbol text typing, which can be saved into external files. The program can also be used for editing an existing text, mouse cursor movement, selection of different applications windows and text pasting into any third-party software. Furthermore, **ECTkeyboard** allows the user to pronounce typed messages.

The functionality of the program can be significantly expanded with special macro commands. These commands allow the user to save and load files, execute external commands, launch various applications and emulate different keystrokes and combination of keys. The patient can use macro commands to change several parameters of **ECTkeyboard** directly from the main window of the program!

## Text editing and work with vocabulary

There's a set of special buttons in **ECTkeyboard** that was created for text editing and work with the auxiliary vocabulary (see fig. 21).

| SPACE   | ←       | →       | ↑       | ↓       | HOME    | END      | ENTER   | BKSP    | DEL   |
|---------|---------|---------|---------|---------|---------|----------|---------|---------|-------|
| 0       | 1       | 2       | 3       | 4       | 5       | 6        | 7       | 8       | 9     |
| A       | B       | C       | D       | E       | F       | G        | H       | I       | J     |
| K       | L       | M       | N       | O       | P       | Q        | R       | S       | T     |
| U       | V       | W       | X       | Y       | Z       | .        | ,       | :       | ;     |
| -       | !       | ?       | *       | (       | )       | [        | ]       | +       | =     |
| /       | \       | _       | %       | "       | QUICK   | +WORDS   | SAVE    | [M]     | SPEAK |
| MOUSE ← | MOUSE → | MOUSE ↑ | MOUSE ↓ | MOUSE L | MOUSE R | MOUSE 2L | SCROLL↑ | SCROLL↓ | SEND  |

(Fig. 21. Buttons for text editing and work with the vocabulary)

Text editing buttons are located in the first row of the virtual keyboard. There are seven of them, and they are mostly copying the functionality of several keys of the traditional keyboard. The user can press these buttons in order to correct some mistakes or possible misspellings in the text relatively quickly.

**Cursor keys** (left, right, up and down). **Left** and **Right** keys allow the user to move the cursor by one symbol to the left or to the right correspondingly. **Up** and **Down** keys move the cursor by one row up or down. In the case of moving up or down, the cursor will appear before the first symbol in that row.

**HOME.** This button can be used to move the cursor to the beginning of the current row.

**END.** This key can be used to move the cursor to the end of the current row.

**ENTER.** This key allows the user to create a new row at the current location of the cursor. All text after the cursor will be moved to that newly created row.

**BKSP.** This key deletes one symbol located to the left from the cursor.

**DEL.** This key deletes one symbol located to the right from the cursor.

Keys for work with vocabulary are located in the right part of the seventh row of the virtual keyboard.

**QUICK.** This button allows the user to control the predictive typing function. When the user is typing a text symbol-by-symbol, the quick entry window shows all the words that start with the entered sequence of symbols. Each word is assigned a number or letter, which can then be used to select that word. Thus, the user can perform fewer actions and can work with the program faster and more efficiently.

**+WORDS.** Keeping in mind the fact that all main dictionaries contain only the most common words, the user may need to add new words to the vocabulary. Such words may include names, geographical names and terms that can't be found in traditional vocabularies. This button allows the user to add all new words, which were entered in the text output window, to a separate vocabulary (independent from the main vocabulary). The user has to be really careful with the **+WORDS** and avoid any mistakes or misspellings in typed words; otherwise, these wrong words will be added to the vocabulary and will appear in the quick entry window.

**SAVE.** This button can be used to save the typed text into an external file.

### **Mouse cursor control. How to copy and paste text**

The **ECTkeyboard** program can be used to copy any typed text and paste it into any third-party application window, i.e. text editors, web browsers, chats and so on. The program also allows the user to pronounce typed text messages. Furthermore, it allows the user to emulate all main mouse actions, i.e. cursor movement, single or double left-click and right-click. In order to grant access to the mentioned additional features, it's required to set 8 as the value of parameter 47 of the settings window of the program. After doing that, the user will see a new row in the virtual keyboard (see fig. 22). These buttons can be used to move the mouse cursor and interact with third-party application windows in order to paste text that was typed in **ECTkeyboard**.

| Menu    |         |         |         |         |         |          |         |         |       |
|---------|---------|---------|---------|---------|---------|----------|---------|---------|-------|
| SPACE   | ←       | →       | ↑       | ↓       | HOME    | END      | ENTER   | BKSP    | DEL   |
| 0       | 1       | 2       | 3       | 4       | 5       | 6        | 7       | 8       | 9     |
| A       | B       | C       | D       | E       | F       | G        | H       | I       | J     |
| K       | L       | M       | N       | O       | P       | Q        | R       | S       | T     |
| U       | V       | W       | X       | Y       | Z       | .        | ,       | :       | ;     |
| -       | !       | ?       | *       | (       | )       | [        | ]       | +       | =     |
| /       | \       | _       | %       | "       | QUICK   | +WORDS   | SAVE    | [M]     | SPEAK |
| MOUSE ← | MOUSE → | MOUSE ↑ | MOUSE ↓ | MOUSE L | MOUSE R | MOUSE 2L | SCROLL↑ | SCROLL↓ | SEND  |

(Fig. 22. Keys to control mouse cursor and pronounce typed text)

The first group of 4 buttons (**Mouse←**, **Mouse→**, **Mouse↑** and **Mouse↓**) can be used to move the mouse cursor by a short and predefined distance left, right, up or down. These buttons were made to make it possible to control the mouse cursor using **ECTkeyboard** by locating it above other applications where the user may need to pass typed texts, or above control elements that require a left or right mouse button click.

**MOUSE L**, **MOUSE R**, and **MOUSE 2L** buttons can be used to emulate a single left-click, single right click and double left-click correspondingly. Such clicks will be performed for the elements or windows located under the mouse cursor.

**Attention!** In order to provide the proper working of mouse action emulating buttons (single and double clicks), the user has to enable the actions interception mode. To do that, it's required to select the **Set Global Hook** item of the main menu or press the **F8** hotkey. This mode has to be manually enabled after every new start of **ECTkeyboard**.

When working in the interception mode, the program will inhibit all keystrokes in any third-party application that are used to control **ECTkeyboard**. For example, if the user controls the virtual keyboard with cursor buttons and uses **Enter** to confirm the selection, all mentioned buttons will not work in any other application.

Furthermore, controlling key emulation is also unavailable in this mode of **ECTkeyboard**. This feature was disabled in order to avoid cyclical keystrokes of one and only one button, when such an emulated action will be intercepted and performed again and again.

Furthermore, **ECTkeyboard** allows the user to control the mouse scrolling function in order to scroll through contents in an external application window. The **SCROLL↑** button will scroll such content upwards, while the **SCROLL↓** button scrolls downwards. The scrolling will be performed in the window under the current position of the mouse cursor. It's not required to perform a mouse button click or any other action. The user can just locate the cursor above any required window.

The main feature of **ECTkeyboard** during work with any external application is its ability to paste any typed text into such an application. After locating the cursor above any desired window, the user just needs to press the **SEND** button on the virtual keyboard. By doing so, the user will transfer all typed text from the output window of **ECTkeyboard** to the window under the mouse cursor.

Another very important and popular feature of **ECTkeyboard** is its ability to pronounce texts from the main window of the program. This can be done with the **SPEAK** button. By using this button, paralyzed patients can use synthesized speech in order to communicate with other people. This feature can be used in several other scenarios. For example, by using macro commands, the user can open any external text file in the main window of the program (a book or any other document) and press the **SPEAK** button in order to read it aloud.

The program involves an internal SAPI algorithm of Windows OS. After adding any external voice libraries, **ECTkeyboard** will be able to speak with different voices and even in various languages!

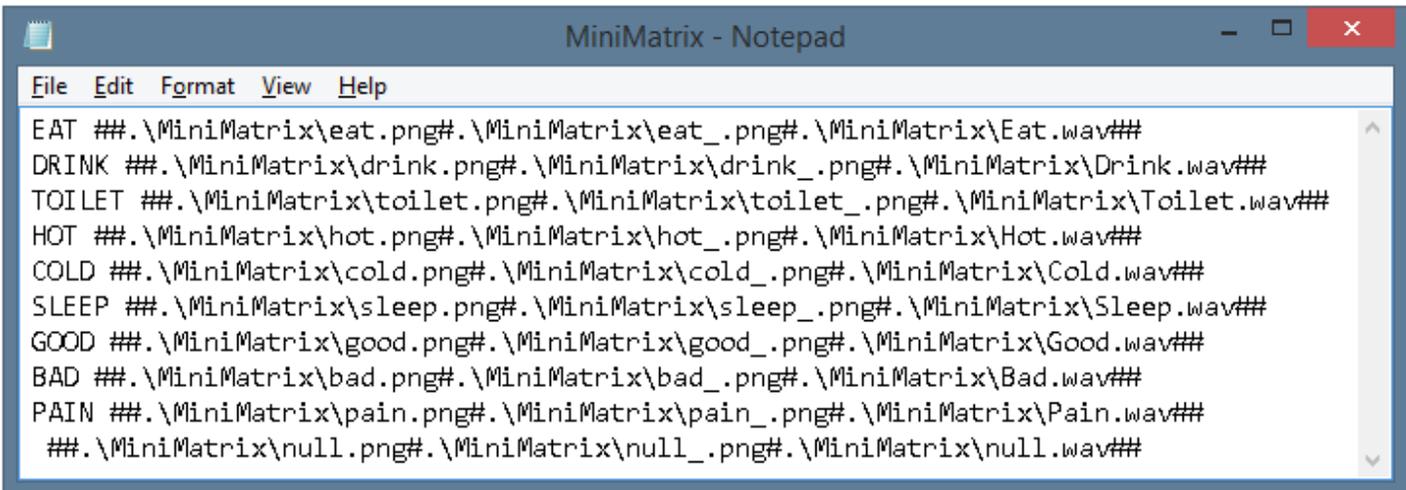
## PRO Creating a personalized virtual keyboard

**ECTkeyboard** provides incredibly flexible settings features. For example, the user can create their own virtual keyboard with any amount or position of buttons, including adding customized captions and an image or sound for each button. In order to do so, the user has to create a keyboard file with button captions and full paths to images or sounds. It's also required to set up the program to work with such a file.

### Keyboard files

Keyboard files are text files with parameters written using a special separating symbol (default value is #). Each string in the file corresponds to a button on the virtual keyboard, e.g. if a virtual keyboard has nine buttons, the file of the keyboard should have nine independent strings.

Let's look at an example of the virtual keyboard file (see fig. 23).



```
File Edit Format View Help
EAT ###.\MiniMatrix\eat.png#.\MiniMatrix\eat_.png#.\MiniMatrix\Eat.wav###
DRINK ###.\MiniMatrix\drink.png#.\MiniMatrix\drink_.png#.\MiniMatrix\Drink.wav###
TOILET ###.\MiniMatrix\toilet.png#.\MiniMatrix\toilet_.png#.\MiniMatrix\Toilet.wav###
HOT ###.\MiniMatrix\hot.png#.\MiniMatrix\hot_.png#.\MiniMatrix\Hot.wav###
COLD ###.\MiniMatrix\cold.png#.\MiniMatrix\cold_.png#.\MiniMatrix\Cold.wav###
SLEEP ###.\MiniMatrix\sleep.png#.\MiniMatrix\sleep_.png#.\MiniMatrix\Sleep.wav###
GOOD ###.\MiniMatrix\good.png#.\MiniMatrix\good_.png#.\MiniMatrix\Good.wav###
BAD ###.\MiniMatrix\bad.png#.\MiniMatrix\bad_.png#.\MiniMatrix\Bad.wav###
PAIN ###.\MiniMatrix\pain.png#.\MiniMatrix\pain_.png#.\MiniMatrix\Pain.wav###
###.\MiniMatrix\null.png#.\MiniMatrix\null_.png#.\MiniMatrix\null.wav###
```

(Fig. 23. Keyboard file example)

This keyboard was created especially for medical and rehabilitation centers, and its main task is to establish the very first initial contact with a patient that can't speak or write. The keyboard contains just nine buttons: 'Eat', 'Drink', 'Toilet', 'Hot', 'Cold', 'Sleep', 'Good', 'Bad', 'Pain'.

This example shows how each string of the file is used to set various parameters. In order to make it clearer, the file content can be divided into several columns.

|        | 0 | 1                        | 2                         | 3                        | 4 | 5 |
|--------|---|--------------------------|---------------------------|--------------------------|---|---|
| EAT    | # | #.\MiniMatrix\eat.png    | #.\MiniMatrix\eat_.png    | #.\MiniMatrix\Eat.wav    | # | # |
| DRINK  | # | #.\MiniMatrix\drink.png  | #.\MiniMatrix\drink_.png  | #.\MiniMatrix\Drink.wav  | # | # |
| TOILET | # | #.\MiniMatrix\toilet.png | #.\MiniMatrix\toilet_.png | #.\MiniMatrix\Toilet.wav | # | # |
| HOT    | # | #.\MiniMatrix\hot.png    | #.\MiniMatrix\hot_.png    | #.\MiniMatrix\Hot.wav    | # | # |
| COLD   | # | #.\MiniMatrix\cold.png   | #.\MiniMatrix\cold_.png   | #.\MiniMatrix\Cold.wav   | # | # |
| SLEEP  | # | #.\MiniMatrix\sleep.png  | #.\MiniMatrix\sleep_.png  | #.\MiniMatrix\Sleep.wav  | # | # |
| GOOD   | # | #.\MiniMatrix\good.png   | #.\MiniMatrix\good_.png   | #.\MiniMatrix\Good.wav   | # | # |
| BAD    | # | #.\MiniMatrix\bad.png    | #.\MiniMatrix\bad_.png    | #.\MiniMatrix\Bad.wav    | # | # |
| PAIN   | # | #.\MiniMatrix\pain.png   | #.\MiniMatrix\pain_.png   | #.\MiniMatrix\Pain.wav   | # | # |

(Fig. 24. Clear structure of the keyboard file)

The keyboard file structure can be compared with a table, where each row corresponds to a button on the virtual keyboard, while each column corresponds to a different parameter of the button.

Column numbers start at 0. In the mentioned example:

0. The zero column contains button captions.
1. The first column is empty (because there's no need to perform commands during its operation and it's only required to show text in the output window).
2. The second column contains full paths to the image files of the keyboard buttons.
3. The third column contains full paths to the additional image files of the keyboard buttons, which are used to highlight a selected button.
4. The fourth column contains full paths to the audio files of the keyboard buttons, which are used to announce the texts on each button.
5. The fifth and all following columns can be used to set additional parameters.

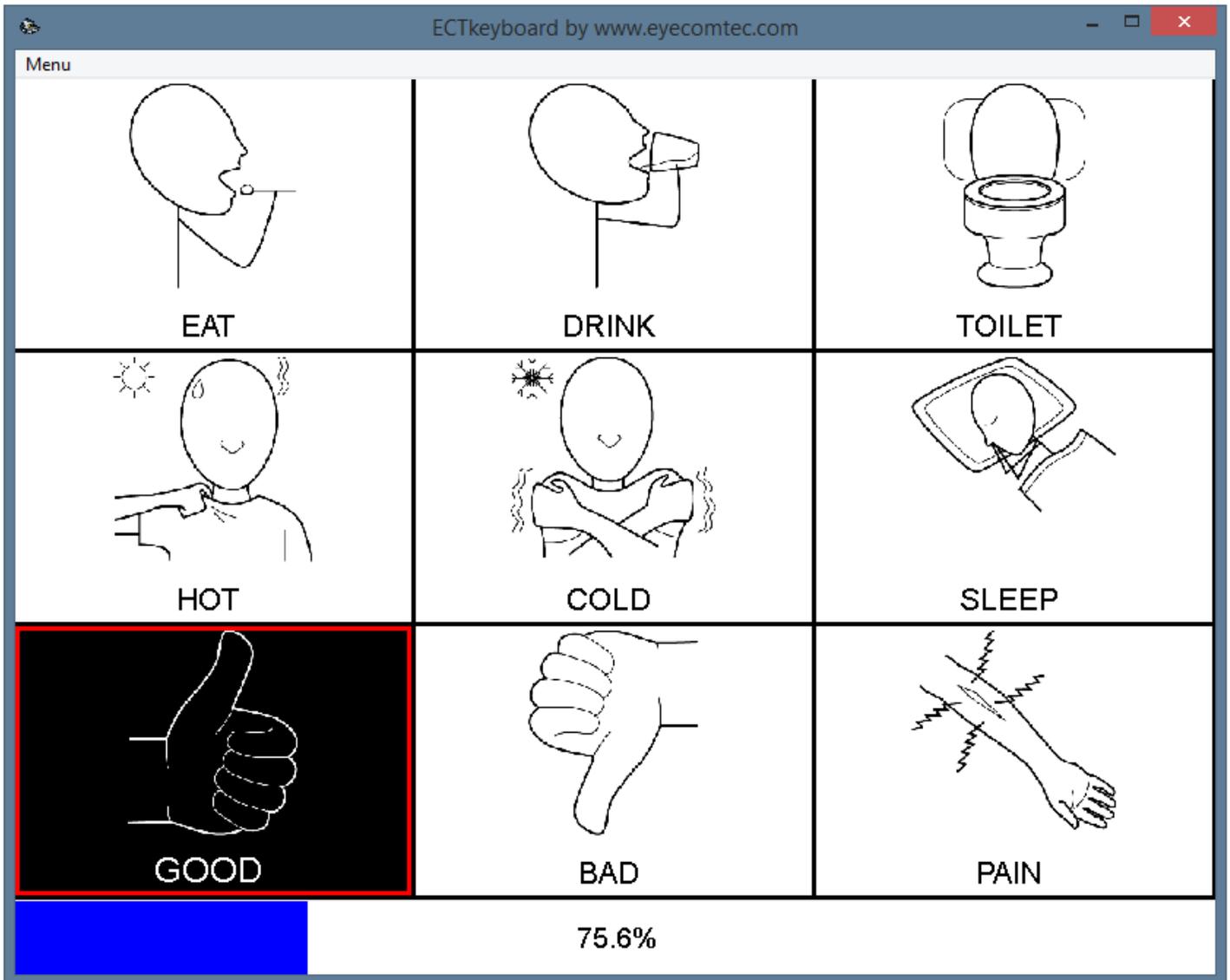
## Setting the program to work with a keyboard file

It's not enough to create a keyboard file to operate the program. The user has to set up **ECTkeyboard** in order to provide the proper functionality of the program. In order to do that, the user has to change the following parameters in the settings window of the program:

- Parameter 28. Defines columns that contain keyboard button captions and executed commands. In the file mentioned above, button captions are saved in column 0, while commands are saved in the first column. Thus, the user has to change the value of parameter 28 to **0#1**.
- Parameter 29. Defines columns that contain button sounds. In the file mentioned above, sounds were saved in column 4. Thus the user has to change the value of the parameter 29 to **4**.
- Parameter 30. Defines columns that contain images for various button states (an inactive button, a button under the cursor, a button row is selected, a selected button, a pressed button). The mentioned simple keyboard requires only two different states, i.e. active and inactive. Icons for the inactive buttons are stored in the second column, while icons for active are stored in the third. Thus, the user has to change the value of parameter 30 to **2#3#3#3#3**. This value defines that all other states will use images from the third column of the keyboard file.
- Parameter 172 allows the user to select a thumbnail for the currently selected symbol window. In the mentioned example, the program will also use value **3**.

- Parameters 46 and 47 allow the user to select the horizontal and vertical number of buttons on the keyboard. The most convenient layout for the keyboard with 9 buttons is 3x3. Thus the user has to select **3** for both parameters.

After saving all the changes in the program, the user has to choose a proper working mode of the selector. The program is ready to work (see fig. 25). The most convenient way of work for such a keyboard is the second method, i.e. the horizontal scanning mode.



(Fig. 25. Appearance of simplified keyboard with icons)

### **PRO** Additional information

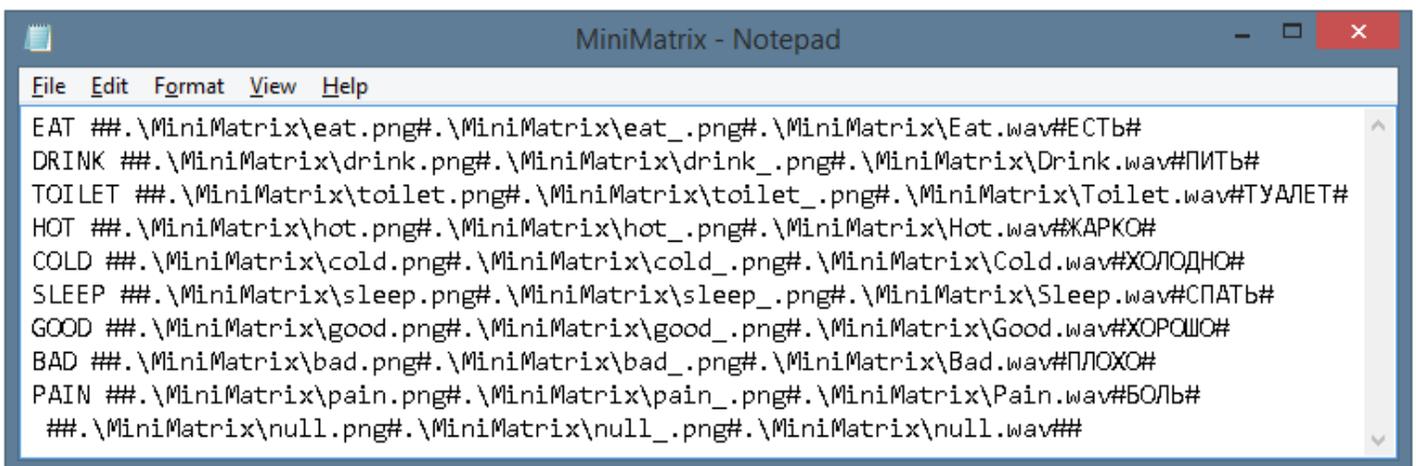
Initial versions of **ECTkeyboard** had the possibility to select separate files for virtual keyboard captions, images, and sounds (parameters 6, 7, 8 of the settings window of the program). But after the release of the latest version, all mentioned parameters were united into keyboard files. Thus parameters 7 and 8 are hidden from the settings window of the program.

Each button of the virtual keyboard can be assigned a caption, up to 5 different images (inactive state, a button under the cursor, button row selection, button selection, pressed button) and a sound file, which is played when the button is highlighted. All mentioned parameters are not obligatory, e.g. the user can select only sounds and icons for one group of buttons, and only captions for another group. Even if there's no parameter for a button, **ECTkeyboard** will still work properly, only that particular button won't create any action. Such an approach provides great flexibility in the program setting process.

All the images (icons) of the virtual keyboard are loaded into RAM and rendered in accordance with a selected scale of the buttons (Parameter 56) and the currently selected symbol window (Parameter 173). When a keyboard includes a high amount of buttons or heavy image files, this rendering process can take significant time. Full re-rendering happens after every change in the settings window of the program, new profile loading or changes of the **ECTkeyboard** main window size. This effect is more noticeable when each state of the keyboard buttons has its own image, or such images have high resolution. Thus, only the PRO version of the program supports keyboard icons, because the user must have a proper understanding of all the parameters and settings that are used in the program.

Unlike keyboard icons, sound files are loaded from the storage device at the moment of announcement. In order to improve the speed of the program, it's recommended to launch it from a hard drive or any fast external storage device (USB 2.0 or 3.0). When the user launches **ECTkeyboard** from a storage device connected via a USB 1.0 port or the reading speed of such a device is too low, sounds of the program may be played with delays, while the program won't provide maximum efficiency and operating speed.

The current keyboard file structure allows the user to add additional parameters, e.g. new localizations, very quickly (see fig. 26). In order to work with an additional localization, the user needs to just change the value of parameter 28 in the settings window of the program to **5#1**, because additional captions are added into the fifth column of the keyboard file. One keyboard file may contain several different localizations, saved in different columns with the **#** separator. If necessary, the user can also add specific sets of sounds or icons for the keyboard. The incredible ease of this process makes **ECTkeyboard** a really universal program.

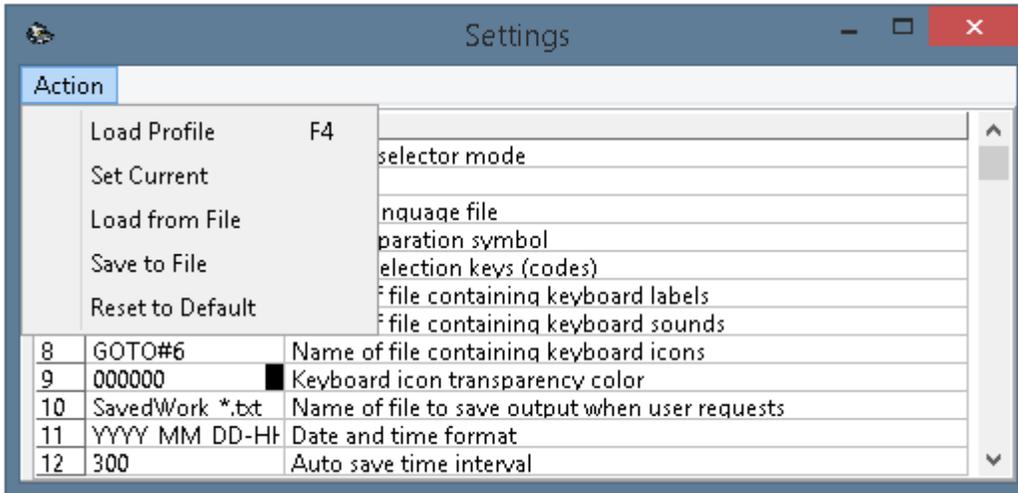


```
File Edit Format View Help
EAT ##.\MiniMatrix\eat.png#.\MiniMatrix\eat_.png#.\MiniMatrix\Eat.wav#ECTb#
DRINK ##.\MiniMatrix\drink.png#.\MiniMatrix\drink_.png#.\MiniMatrix\Drink.wav#ПИТЬ#
TOILET ##.\MiniMatrix\toilet.png#.\MiniMatrix\toilet_.png#.\MiniMatrix\Toilet.wav#ТУАЛЕТ#
HOT ##.\MiniMatrix\hot.png#.\MiniMatrix\hot_.png#.\MiniMatrix\Hot.wav#КАРКО#
COLD ##.\MiniMatrix\cold.png#.\MiniMatrix\cold_.png#.\MiniMatrix\Cold.wav#ХОЛОДНО#
SLEEP ##.\MiniMatrix\sleep.png#.\MiniMatrix\sleep_.png#.\MiniMatrix\Sleep.wav#СПАТЬ#
GOOD ##.\MiniMatrix\good.png#.\MiniMatrix\good_.png#.\MiniMatrix\Good.wav#ХОРОШО#
BAD ##.\MiniMatrix\bad.png#.\MiniMatrix\bad_.png#.\MiniMatrix\Bad.wav#ПЛОХО#
PAIN ##.\MiniMatrix\pain.png#.\MiniMatrix\pain_.png#.\MiniMatrix\Pain.wav#БОЛЬ#
##.\MiniMatrix\null.png#.\MiniMatrix\null_.png#.\MiniMatrix\null.wav###
```

(Fig. 26. Adding localization to the keyboard file)

# Settings and additional parameters of ECTkeyboard

**Attention!** After performing any changes to the settings of the program, the user has to click the **Settings - Set Current** items of the main menu. In order to provide a more convenient experience, the **ECTkeyboard** settings window contains its own **Action** menu, which has the same items as the **Settings** menu (see fig. 27).



(Fig. 27. Action menu of the settings window)

In order to make the setting process more convenient and easy, all the settings of the program are divided into several categories, which have different colors:

1. Main settings of **ECTkeyboard** (parameters 1-38). This group includes such parameters as time intervals for the symbol matrix scanning, symbol selection and cancellation of the previously selected symbol; names of files with keyboard tags, icons and sounds; key codes, which are used to select symbols; the name of the receiving software; the date and time format in the log; the frequency of automatic text saving; the volume and the speed of text announcing and several other parameters. This group also contains automatically obtained information about the identification number and coordinates of the external application window, which is used to transmit texts from the main window of **ECTkeyboard**.
2. Visual parameters of the virtual keyboard (parameters 41-85). This group of parameters includes width and height values of buttons, positions of symbols on the buttons, and the main window refresh interval. Furthermore, this group of parameters allows the user to change button surface and border colors, as well as the font color and size for the active, inactive and selected elements.
3. Visual parameters of the text output window (parameters 101-109). By using this group of parameters, the user can change the size and position of the output window, choose the type, size and color of the font, and adjust the background color of the window.
4. Visual parameters of the progress bar (parameters 131-149). By using this group of parameters, the user can change the size and position of the progress bar, its color and the direction of filling. The user can also change the type of the text information of the progress bar, and choose the type, color, and size of the font.
5. Visual parameters of the currently selected symbol window (parameters 161-173). By using these parameters, the user can change the position and size of the window, the size of text on it, colors of text and background and the font style.

- Settings of the quick entry window (parameters 201-217). This group of settings can be used to change the position and size of the word selection window, select a color for the background, words, and controlling buttons and choose the style and size of the font. Users can also select an auxiliary vocabulary file, set the list of controlling symbols and choose the name for the vocabulary, which can be used to save additional words (names, geographical names and terms that can't be found in the main vocabulary, etc.).

Let's look at each group of parameters closer.

## General settings of ECTkeyboard (1-40)

| Action | VALUES             | LABELS   |
|--------|--------------------|--|
| 0      | VALUES             | LABELS   |
| 1      | 1                  | Current selector mode  |
| 2      | .9c12f.ef480.ef480 | ID   |
| 3      | Eng                | Active language file   |
| 4      | #                  | Value separation symbol  |
| 5      | 13#32#83#40#       | Button selection keys (codes)  |
| 6      | Keys-En.txt        | Name of file containing keyboard labels                                      |
| 7      | GOTO#6             | Name of file containing keyboard sounds                                      |
| 8      | GOTO#6             | Name of file containing keyboard icons                                       |
| 9      | 000000             | Keyboard icon transparency color   |
| 10     | SavedWork *.txt    | Name of file to save output when user requests                               |
| 11     | YYYY MM DD-HH      | Date and time format   |
| 12     | 300                | Auto save time interval  |
| 13     | CurrentWork.txt    | Name of file to save current work to automatically                           |
| 14     | 2000               | Minimum holding time (for selection)   |
| 15     | 4000               | Maximum holding time (for rejection)   |
| 16     | 8000               | Extended hold time   |
| 17     | CmdA1              | Command code for extended hold time  |
| 18     | 800                | Column cycling delay time  |
| 19     | 800                | Row cycling delay time   |
| 20     | ECTkeyboard sele   | Progress bar select sound file   |
| 21     | ECTkeyboard reje   | Progress bar reject sound file   |
| 22     | 1                  | Display window borders (1-show all borders; 0-hide all borders)              |
| 23     | Untitled - Notepad | Title of window to receive key-codes (target)                                |
| 24     | Notepad            | Class of the object on window to receive key-codes (target)                  |
| 25     | 100                | Time delay at the beginning of every new scanning (in ms)                    |
| 26     | 30#39#40#37#       | Cursor key-codes (up#right#down#left#)                                       |
| 28     | 0#1                | Column with labels (label#action)  |
| 29     | 2                  | Column with sounds   |
| 30     | 3#4#5#6#7          | Column with icons (state1#state2#state3#state4#state5)                       |
| 31     | .                  | Separating symbol for parameters inside keyboard commands                    |
| 32     | 1609               | X coordinate of window to receive key-codes (target)                         |
| 33     | 317                | Y coordinate of window to receive key-codes (target)                         |
| 34     | 525858             | Handle of window to receive key-codes (target)                               |
| 35     | 2000               | Time delay before selecting the window to receive key-codes (target) (in ms) |
| 36     | ECTkeyboard sele   | Selection sound file for window to receive key-codes (target)                |
| 37     | 50                 | Voice volume for the SPEAK command   |
| 38     | 0                  | Voice speed for the SPEAK command  |

(Fig. 28. Program settings window, parameters 1-38)

- 1 – Current selector mode.** This parameter makes it possible to choose the working mode of the program, which is automatically launched after the start of the program. The default value for this parameter is 1 (Scanning row/cell), but the user is free to select any other working mode. It's recommended to change

this parameter in a situation where the program is constantly working in one mode. This feature can also be used to launch **ECTkeyboard** when the patient is not able to use the program menu.

**PRO 2 – ID.** This field contains a unique number that allows the program to recognize a computer that is used to run the program. This number is a serial number of a system disk (some versions of **ECTkeyboard** use a hash number of the disk that was used to launch the program). This parameter is obtained automatically during the launch of the program.

**3 – Active language file.** This field can be used to set a full path to the localization file of the program. The program folder of **ECTkeyboard** contains all the localizations in the Languages folder. After setting the full path, the program is able to work with localization files located in any folder on the hard disk or an external storage device of the computer.

**PRO 4 – Value separation symbol.** All configuration files of **ECTkeyboard** use the special separating marker in order to set a selection of connected parameters in one string, e.g. a file with commands and symbols for each button of a keyboard contains a symbol itself, a full path to the image and a full path to the sound file. In order to separate these values, the program uses this separating symbol. The default value for this parameter is #.

**5 – Button selection hotkeys (codes).** There are several ways to select a symbol from the symbol matrix. The patients who retained at least some kind of motor activity can use a direct closing of keyboard contacts, i.e. the patient can select a symbol by making a movement with a working muscle, fast inhaling, pressing a special button with the tongue, etc. In cases where contacts of such communicating devices are connected directly to the keyboard, it's recommended to choose the most rarely used button. This field of the settings window can be used to indicate all key codes required to activate the highlighted element of the symbol matrix. Key codes are written one by one, without spaces, separated with a special marker (the default value is #, but it can be changed to any other symbol by changing parameter 4 of the settings window). The default value for this parameter is 13#32## (the following keys are used to activate symbols: Enter and Space).

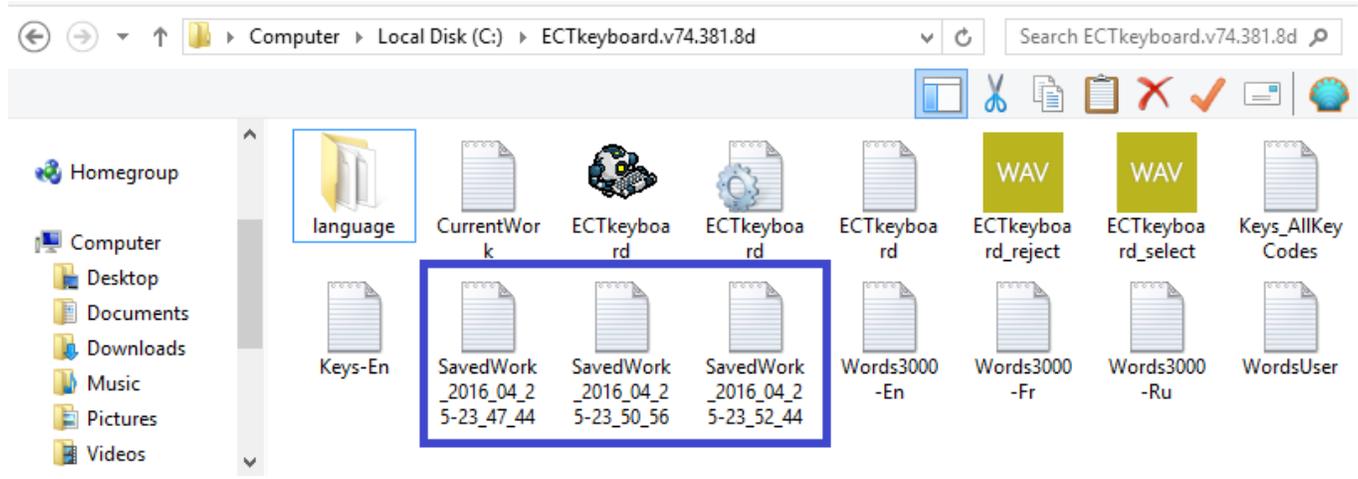
**6 – Name of file containing keyboard labels.** **ECTkeyboard** can be used with different sets of button captions, e.g. in different languages, to change uppercase or lowercase letters, for various commands or in order to enable the simplified entry mode. Each set of captions has to be saved as a separate file and located in the program directory together with the main file of the program. This item of the settings window allows the user to change various sets of buttons quickly and easily by entering a file name into the field. This feature is very convenient because each user of the program can have all elements located in preferred positions and use a specific set of macros.

**PRO 7 – Name of file containing keyboard sounds.** As in the previous parameter, this field contains a full path to the keyboard file. This file contains names of all sound files that are going to be played for highlighted symbols of the virtual keyboard. The default value for this field is GOTO#6, i.e. the same file name as in parameter 6. The internal structure of the **ECTkeyboard** settings files supports the special separating marker (default value #). Thus, one file may contain a set of captions, as well as sound file names. The announcement of the highlighted symbols of the virtual keyboard allows visually impaired patients to work with **ECTkeyboard**.

**PRO 8 – Name of file containing keyboard icons.** This field contains the name of the file that includes all the images (icons) that are used for the keys of the virtual keyboard. These icons allow the user to change the program interface, especially when working in the simplified mode that includes only several buttons for the patient ('eat', 'drink', 'relax', 'pain' etc.). Furthermore, these icons are great for patients who can't speak in the localization language or simply can't read. The default value for this field is GOTO#6, i.e. the same file name as in parameter 6.

**PRO 9 – Keyboard icon transparency color.** The transparency feature is used for icons that have any shape other than rectangular. The default value for this parameter is 000000, i.e. the black color. The user can select a color manually or by double left-clicking on the value field. In the second case, the user will see a standard dialog window of the OS, which can be used to choose a color.

**PRO 10 – Name of file to save output when the user requests.** Every time the user chooses to save a typed text, all the content from the output window is saved into a file. In order to provide more comfort during work with such saved files, the user can create a name template. The default value is SavedWork \*.txt. Furthermore, the name of the file contains the date and time, which can be changed in parameter 11. Examples of such files are shown in figure 29.



(Fig. 29. Files with texts typed in **ECTkeyboard**)

**PRO 11 – Date and time format.** This parameter helps the user to change the date and time format used in the names of text files. The default value for this parameter is YYYY\_MM\_DD-HH\_NN\_SS (year, month, day, hours, minutes and seconds). The user can change this value in accordance with personal needs and requirements, e.g. if the user selects the H\_NN\_SS value, the file name will only contain the time without the date of its creation.

**PRO 12 – Autosave time interval.** In addition to the manual text saving feature, **ECTkeyboard** supports an automatic data saving mode. This parameter allows the user to define a time interval in seconds that is required to create new text files in automatic mode. The default value for this parameter is 300 seconds (i.e. 5 minutes), but this field may contain any desired value. It's not recommended to use very short values because it will result in an increased amount of text files in the program field with a difference of just a couple of symbols.

**13 – Name of file to save current work to automatically.** Before closing the program, all typed text is also saved as a file. During the next start of the program, this text will appear in the text output window. This

parameter allows the user to set any desired file name, which will be used to store texts before exiting **ECTkeyboard**. The default value for this parameter is CurrentWork.txt.

**14 – Minimum holding time (for selection)**. The parameter for minimum holding time is required to provide a more convenient working environment for patients with various disorders, e.g. when a patient can make a selection only by closing their eyes and **ECTkeyboard** is working in conjunction with an eye-tracking device, the system needs to identify continuous closed eye state and ignore blinking and eyelash shaking. In situations where a muscle or a group of muscles is not damaged, movement of such muscles can be used to work with the program, ignoring any tremors, ticks, or other uncontrolled muscle contractions. In cases where the patient uses inhaling to type texts, the program needs to divide natural breathing and symbol selection.

This parameter allows the user to divide conscious data entry from rapid uncontrolled actions for all mentioned situations. The working value of this parameter is set in milliseconds. Here's an example. If a patient is working with the matrix of symbols by closing his eyes and the minimum holding time value is 1000, in order to select a letter the patient has to close an eye for a second. Any shorter actions will be ignored by the program. Thus, **ECTkeyboard** allows for ignoring the negative affection of blinking.

This parameter is used for all working modes that involve holding, i.e. 0A, 0B, 1, 1B, 2, 2B, 3. The default value for this parameter is 2000 (2 seconds).

**15 – Maximum holding time (for rejection)**. The maximum holding time parameter is also used to select a row, a column or a cell of the virtual keyboard. In order to select any element, the patient has to keep eyes closed longer than indicated in the parameter of minimum holding time, but shorter than in the maximum holding time parameter. If the user keeps their eyes closed longer than indicated in this parameter, the program will cancel any previously selected symbol.

This parameter is used for all working modes that involve holding – 0A, 0B, 1, 1B, 2, 2B, 3. The default value for this parameter is 4000 (4 seconds).

**PRO 16 – Extended hold time**. In cases where the holding time is longer than indicated in this field, the program can execute an additional command (e.g. automatic calibration or a sound alarm for medical personnel).

This parameter is used for all working modes that involve holding – 0A, 0B, 1, 1B, 2, 2B, 3. The default value for this parameter is 8000 (8 seconds).

**PRO 17 – Command code for extended hold time**. This field can be used to set a command that will be executed when the user is holding the selection key (or keeps eyes closed) longer than indicated in the parameter 16.

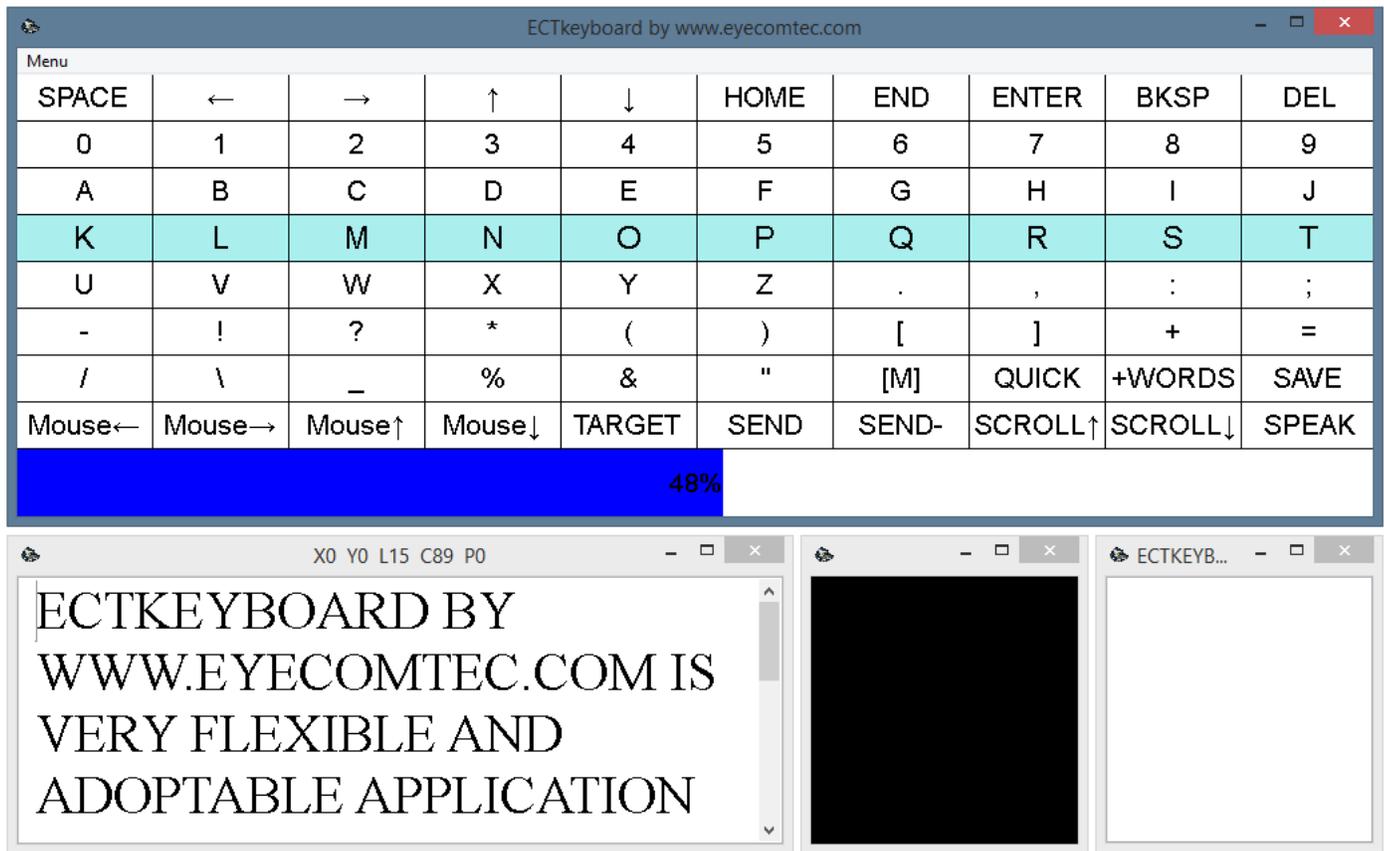
**18 – Column cycling delay time**. This parameter allows changing the delay time between rows changing (in the row/cell scanning mode) and one column cell changing (in the column/cell and list/vertical scanning modes). The longer the time interval, the slower the speed of symbol alternation. It's recommended to increase this interval when the user is just getting started working with the virtual keyboard, allowing the use to avoid possible mistakes and remember the positions of symbols. The default value for this parameter is 800 (0, 8 seconds).

19 – **Row cycling delay time.** This parameter allows changing the delay time between columns changing (in the column/cell mode) and cells of one column (in the row/cell and list/horizontal modes). The default value for this parameter is 800 (0, 8 seconds).

20 – **Progress bar selects sound file.** ECTkeyboard virtual keyboard uses sound notifications for element selection (rows, columns or a symbol) or cancellation of selection. This feature significantly improves program operation for visually impaired users and allows them to get used to actual symbol delay timings. By double clicking, the user can use the standard dialog window of the operating system to select any required sound file.

21 – **Progress bar rejects sound file.** Similar to the previous parameter, the user is able to select any sound file for the cancellation of element selection notifications.

22 – **Display window borders.** This parameter can be used to hide or show borders of the main window of the program and the text output window (see fig. 30). This parameter can be useful for running the program on computers with low display resolution or when a significant part of the screen is taken by other important applications. It can also be handy when the virtual keyboard and the text output window are open in the full-screen mode. The default value of this parameter is 1, i.e. window borders are shown.



| Menu   |        |        |        |        |      |       |         |         |       |
|--------|--------|--------|--------|--------|------|-------|---------|---------|-------|
| SPACE  | ←      | →      | ↑      | ↓      | HOME | END   | ENTER   | BKSP    | DEL   |
| 0      | 1      | 2      | 3      | 4      | 5    | 6     | 7       | 8       | 9     |
| A      | B      | C      | D      | E      | F    | G     | H       | I       | J     |
| K      | L      | M      | N      | O      | P    | Q     | R       | S       | T     |
| U      | V      | W      | X      | Y      | Z    | .     | ,       | :       | ;     |
| -      | !      | ?      | *      | (      | )    | [     | ]       | +       | =     |
| /      | \      | _      | %      | &      | "    | [M]   | QUICK   | +WORDS  | SAVE  |
| Mouse← | Mouse→ | Mouse↑ | Mouse↓ | TARGET | SEND | SEND- | SCROLL↑ | SCROLL↓ | SPEAK |

50.1%



(Fig. 30. Program windows with and without frames)

**PRO 23 – Title of the window to receive key codes (target).** During its operation, **ECTkeyboard** can not only show typed texts in the output window, but can also transmit keystrokes to any other application, e.g. text editors, web browsers, chats, etc. The program uses header names in order to identify such third-party applications or programs. For example, if the user wants the virtual keyboard to send texts to the Notepad application into a new file, it's required to set this parameter to Untitled - Notepad. The TARGET button of the virtual keyboard allows the user to set the parameter value automatically.

**PRO 24 – Class of the object to receive key codes (target).** In order to provide the proper transmission of keystrokes from **ECTkeyboard** to an external application, it's required to set the window class for that application. The TARGET button of the virtual keyboard allows the user to fill the parameter value automatically.

**25 – Time delay at the beginning of every new scanning (in ms).** When the user controls application by opening and closing their eyes, the selection of the first row or the first symbol usually requires some additional time. And in cases where there's no additional delay, the user may often face situations where it's impossible to make a selection of the first element immediately. Thus the user has to wait until the program alternates all rows\cells and returns to the first one. This parameter allows the user to select a comfortable delay time at the beginning of each new scanning process, which significantly increases the overall comfort and convenience level of the virtual keyboard. The default value of this parameter is 100 ms.

**PRO 26 – Cursor key-codes (up#right#down#left).** This parameter can be used to set cursor key codes for the program. The default value of this parameter is 38#39#49#37.

**PRO 28 – Column with labels (label#action).** Keyboard files of **ECTkeyboard** contain several columns, divided with a special marker (#). This parameter allows the user to select the order of these columns. The default value of this parameter is 0#1 (the first column is used for the button symbols, while the second – for actions for each of the buttons).

**PRO 29 – Column with sounds.** This parameter can be used to set the keyboard file column number that contains all sounds that are played during the key selection process. The default value of this parameter is 2 (sound file names are listed in the third column).

**PRO 30 – Column with icons (state 1#state 2#state 3#state 4#state 5).** This parameter allows the user to set column numbers for various button states (a symbol for an inactive button, a symbol for an active button, a symbol for a highlighted button, a symbol for a selected button). The default value of this parameter is 3#4#5#6#7 (images for different button states are listed in columns 4-8).

**PRO 31 – Separating symbol for parameters inside keyboard command.** **ECTkeyboard** allows the user to change program parameters directly on the virtual keyboard. Thus, the user is able to change keyboard layouts, enable or disable sound confirmation during scanning, etc. In order to provide this functionality, special commands are used in keyboard files. This parameter defines the symbol that is used to separate these commands in files. The default value of this parameter is ',' (comma).

**PRO 32 – X coordinate of the window to receive key codes (target).** In order to provide proper communication with receiving software, **ECTkeyboard** identifies horizontal and vertical coordinates of its window. The TARGET button of the virtual keyboard allows the user to fill the parameter value automatically.

**PRO 33 – Y coordinate of the window to receive key codes (target).** This parameter works similarly to the previous one. The TARGET button of the virtual keyboard allows the user to fill this parameter value in automatically.

**PRO 34 – Handle of the window to receive key codes (target).** A numeric window id number that was assigned by the operating system. By using this value, **ECTkeyboard** can interact with third party application windows (e.g. send texts, emulate keystrokes or mouse actions and so on). The TARGET button of the virtual keyboard allows the user to set the handle value automatically.

**35 – Time delay before selecting the window to receive key codes (target) (in ms).** Selection of a third party program window for **ECTkeyboard** is done with a short delay, but not instantly. This parameter allows the user to set any custom value of this delay. The default value of this parameter is 2000 ms (2 seconds).

**36 – Selection sound file for the window to receive key codes (target).** Before selecting the receiving program window, **ECTkeyboard** makes a sound signal to notify the user. This parameter allows the user to set the full path to a sound file that will be used every time during the target window selection. The default value of this parameter is ECTkeyboard\_select.wav (the standard sound notification during the selection process). But the user is able to select any other sound file.

**PRO 37 – Voice volume for the SPEAK command.** This parameter makes it possible to select a required sound level for the speech synthesis engine. The value of this parameter can be selected from a range between 0 (min. volume) and 100 (max. volume). The default value of this parameter is 50.

**PRO 38 – Voice speed for the SPEAK command.** This parameter is used to change the speed of the speech synthesis engine, thus allowing the user to select the most suitable computer voice speed. The default value of this parameter is 0.

**39 – Pronunciation of keys (0-disable; 1-sound files; 2-SAPI default; 3-SAPI custom)**

**40 – Synchronous or Asynchronous SPEAK command (0-synchronous; 1-asynchronous)**

## Virtual keyboard window settings (41-85)

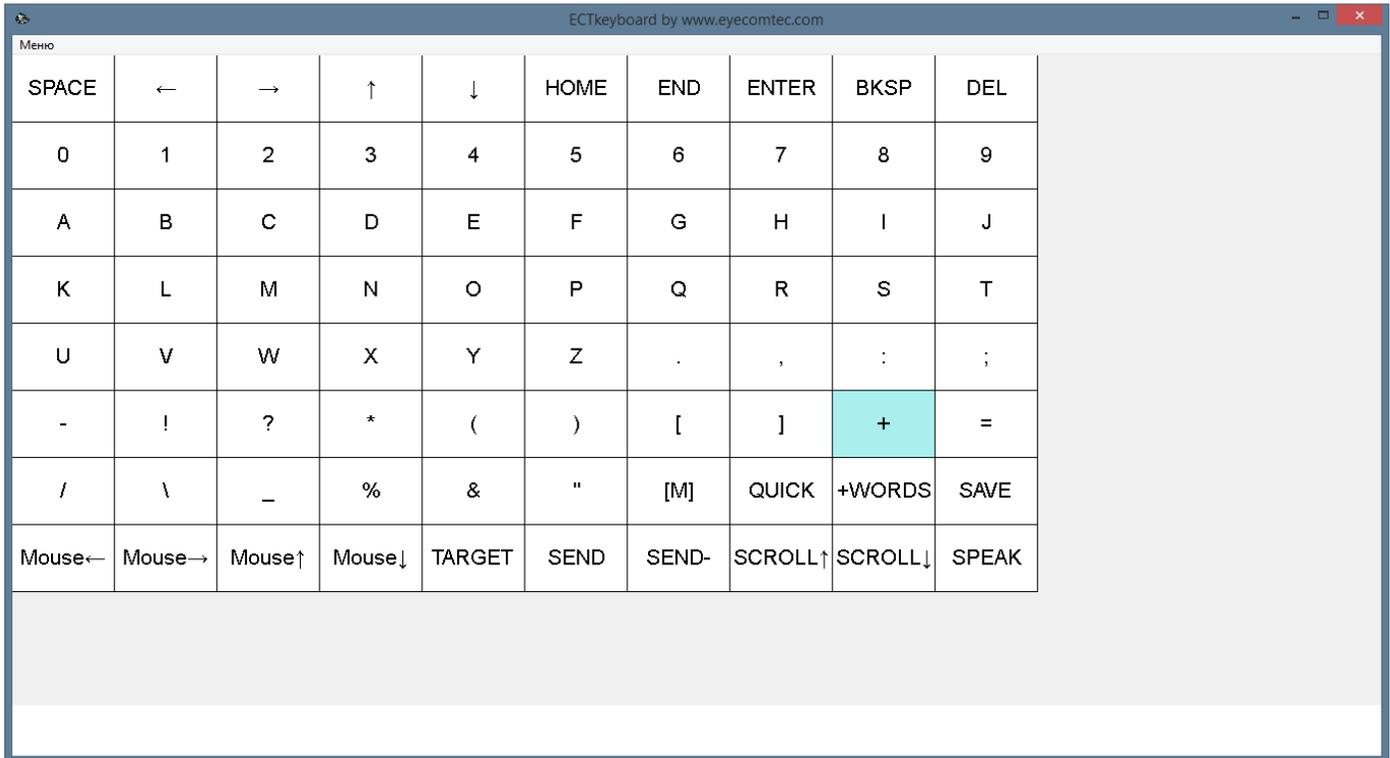
The screenshot shows a 'Settings' window with a table of parameters. The table has three columns: 'Action', 'VALUES', and 'LABELS'. The parameters are numbered 41 through 85. The 'VALUES' column contains various data types including integers, strings, and hex codes. The 'LABELS' column provides descriptions for each parameter, such as 'Adjust button size dimensions to fill the keyboard window' for parameter 41, and 'Key state 0 - button font name' for parameter 57. The window has a standard Windows title bar with minimize, maximize, and close buttons.

| Action | VALUES          | LABELS  |
|--------|-----------------|---|
| 41     | 1               | Adjust button size dimensions to fill the keyboard window |
| 42     | 74              | Main window (keyboard) - left margin positioning          |
| 43     | 100             | Main window (keyboard) - top margin positioning           |
| 44     | 1016            | Main window (keyboard) - width                            |
| 45     | 350             | Main window (keyboard) - height                           |
| 46     | 10              | Number of buttons per row                                 |
| 47     | 8               | Number of buttons per column                              |
| 48     | 100             | Width of buttons  |
| 49     | 65              | Height of buttons   |
| 50     | 1               | Space between rows  |
| 51     | 1               | Space between columns                                     |
| 52     | 1               | Size of button borders in pixels                          |
| 53     | 1               | Direction of button labels (0-vertical; 1-horizontal)     |
| 54     | 5               | Positioning of text (1-9)                                 |
| 55     | 5               | Positioning of icon (1-9)                                 |
| 56     | 100             | Scale keyboard icons (in percents)                        |
| 57     | Arial           | Key state 0 - button font name                            |
| 58     | 16              | Key state 0 - font size of button text                    |
| 59     | 000000          | Key state 0 - button text color                           |
| 60     | FFFFFF          | Key state 0 - button surface color                        |
| 61     | FFFFFF          | Key state 0 - button border color                         |
| 62     | 000000          | Key state 0 - key state background color                  |
| 63     | Arial           | Key state 1 - button font name                            |
| 64     | 18              | Key state 1 - font size of button text                    |
| 65     | 000000          | Key state 1 - button text color                           |
| 66     | AAEEEE          | Key state 1 - button surface color                        |
| 67     | AAFFFF          | Key state 1 - button border color                         |
| 68     | 110000          | Key state 1 - key state background color                  |
| 69     | Arial           | Key state 2 - button font name                            |
| 70     | 18              | Key state 2 - font size of button text                    |
| 71     | FFFFFF          | Key state 2 - button text color                           |
| 72     | 0000FF          | Key state 2 - button surface color                        |
| 73     | FFFAAA          | Key state 2 - button border color                         |
| 74     | 000011          | Key state 2 - key state background color                  |
| 75     | Arial           | Key state 3 - button border color                         |
| 76     | 18              | Key state 3 - font size of button text                    |
| 77     | FFFFFF          | Key state 3 - button text color                           |
| 78     | 0000DD          | Key state 3 - button Surface color                        |
| 79     | 000000          | Key state 3 - button border color                         |
| 80     | FFFFFF          | Key state 3 - key state background color                  |
| 81     | RenderedKeyboar | Rendered keyboard save file name                          |
| 82     | 5               | Size of row shift in pixels                               |
| 83     | 5               | Size of column shift in pixels                            |
| 84     | 0               | Disable the cursor at empty border cells                  |
| 85     | 100             | Repaint delay of the main window (keyboard) (in ms)       |

(Fig. 31. Program settings window, parameters 41-85)

**41 – Adjust button size dimensions to fill the keyboard window.** This variable parameter can have two different values: 0 and 1. If the value is equal to 1, the program performs an automatic scaling of all the virtual keyboard buttons in order to fit them in the virtual keyboard window. This feature is very useful for situations where the user has to change the window size instantly, without a long manual selection of the button width and height values. Automatic scaling of the buttons is enabled by default.

If the parameter value is 0, then button width and height, as well as the distance between buttons and the border thickness, strictly follow the selected values (see fig. 32).



(Fig. 32. Appearance of the virtual keyboard when automatic scaling is disabled)

**42 – Main window (keyboard) – left margin position.** This parameter allows the user to set the value of the margin of the main window of **ECTkeyboard** relative to the left border of the desktop. This value is used to select the most convenient window position (up to a pixel) for situations that require precise window positioning. The other convenient and easy way that can be used in all other situations is moving program windows with the mouse cursor.

**43 – Main window (keyboard) – top margin position.** Similar to the previous one, this parameter allows the user to set the value of the main window margin relative to the upper border of the desktop.

**44 – Main window (keyboard) – width.** This parameter defines the exact width of the virtual keyboard window.

**45 – Main window (keyboard) – height.** Allows the user to set the height of the virtual keyboard window (accurate to a pixel). Manual selection of parameters 44 and 45 allows the user to set any required values of the virtual keyboard size for situations when it's necessary to provide a precise location relative to other program windows and their size.

46 – **Number of buttons per row.** By changing this parameter, the user can change the amount of buttons in a row of the virtual keyboard. The default value is 10. The amount of buttons in the matrix depends on the total quantity of different symbols and commands in use, e.g. the Russian alphabet includes 33 letters. If the user adds main text editing commands to the matrix (moving left or right by one symbol, moving to the beginning or the end of the row, switching between rows, delete button, etc.), the matrix will consist of about 43-50 buttons. If the user wants to add lowercase buttons in addition to uppercase or include Latin characters, the matrix will contain 26-33 buttons more. The vertical amount of buttons is limited only by a proper level of comfort for a paralyzed person and the resolution of the computer display.

47 – **Number of buttons per column.** Allows the user to change the amount of buttons in each column of the virtual keyboard. The default value is 7. It's recommended to follow one rule – the more symbols the matrix includes, the higher the value's vertical and horizontal button amounts. By keeping relatively close values of row and column button amounts, the user can reach the most convenient and fast operation of the program in the coordinate modes (1 and 1B). Final appearance of the matrix has to be selected in accordance with the convenience and comfort levels for various users. Thus it can be totally different. (see fig. 33-34).

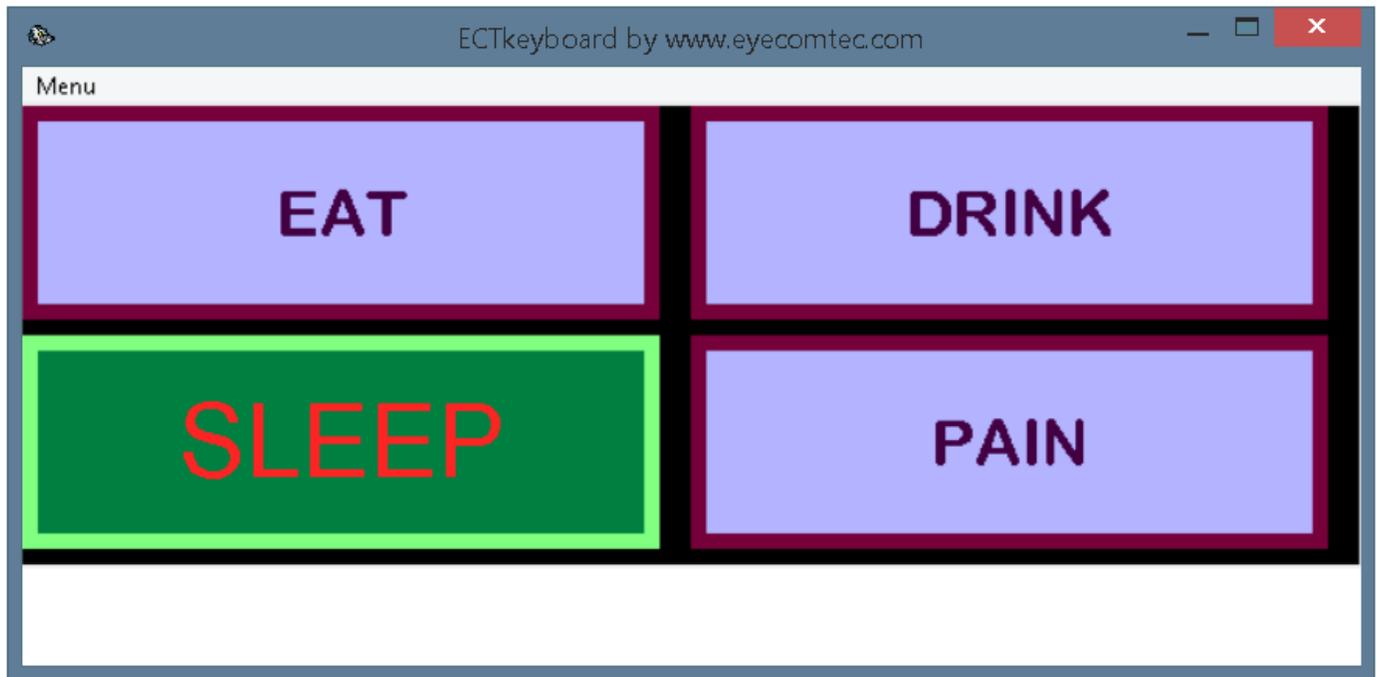
| Menu   |        |        |      |       |         |         |       |        |      |        |        |
|--------|--------|--------|------|-------|---------|---------|-------|--------|------|--------|--------|
| SPACE  | ←      | →      | ↑    | ↓     | HOME    | END     | ENTER | BKSP   | DEL  | 0      | 1      |
| 2      | 3      | 4      | 5    | 6     | 7       | 8       | 9     | A      | B    | C      | D      |
| E      | F      | G      | H    | I     | J       | K       | L     | M      | N    | O      | P      |
| Q      | R      | S      | T    | U     | V       | W       | X     | Y      | Z    | .      | ,      |
| :      | ;      | -      | !    | ?     | *       | (       | )     | [      | ]    | +      | =      |
| /      | \      | _      | %    | &     | "       | [M]     | QUICK | +WORDS | SAVE | Mouse← | Mouse→ |
| Mouse↑ | Mouse↓ | TARGET | SEND | SEND- | SCROLL↑ | SCROLL↓ | SPEAK |        |      |        |        |

(Fig. 33. The virtual keyboard with 7 rows and 12 columns)

| Меню   |        |         |         |        |
|--------|--------|---------|---------|--------|
| SPACE  | ←      | →       | ↑       | ↓      |
| HOME   | END    | ENTER   | BKSP    | DEL    |
| 0      | 1      | 2       | 3       | 4      |
| 5      | 6      | 7       | 8       | 9      |
| A      | B      | C       | D       | E      |
| F      | G      | H       | I       | J      |
| K      | L      | M       | N       | O      |
| P      | Q      | R       | S       | T      |
| U      | V      | W       | X       | Y      |
| Z      | .      | ,       | :       | ;      |
| -      | !      | ?       | *       | (      |
| )      | [      | ]       | +       | =      |
| /      | \      | _       | %       | &      |
| "      | [M]    | QUICK   | +WORDS  | SAVE   |
| Mouse← | Mouse→ | Mouse↑  | Mouse↓  | TARGET |
| SEND   | SEND-  | SCROLL↑ | SCROLL↓ | SPEAK  |

(Fig. 34. The virtual keyboard with 16 rows and 5 columns)

**48 – Width of buttons.** This parameter defines the horizontal button size in pixels. This value can be increased if the matrix contains fewer buttons (see fig. 35) or in situations where the paralyzed patient is visually impaired. An increased button size in conjunction with a carefully selected color scheme allows the user to reduce eye fatigue. Thus, the user is able to make fewer mistakes and reduce the overall stress level during program operation. However, the amount of visible buttons is limited by the resolution of the display and the defined size of the program window. It's not recommended to use high values for small windows and when the automatic scaling mode is enabled (if the parameter 41 is set to 1). The default value of the button width is 100 pixels.



(Fig. 35. The simplified mode of the virtual keyboard with a contrast color scheme)

49 – **Height of buttons.** This parameter defined the vertical button size in pixels. Keeping in mind that the height of buttons is usually lower than their width, it's not recommended to use higher values for the vertical size of buttons for situations where the user is working with commands or words in the matrix in order to provide convenient reading and fast selection of a required symbol. Height and width values are usually selected experimentally by the user during several program operation sessions. The default button height value is 65 pixels.

50 – **Space between rows.** The space between the buttons makes it possible to divide buttons from each other and makes the virtual keyboard clearer, thus providing additional comfort. The horizontal shift value defined the horizontal distance between matrix columns. The default value of this parameter is 1 pixel.

51 – **Space between columns.** This parameter allows the user to set the distance between matrix rows in pixels. Separate changing of horizontal and vertical distance between buttons allows the user to change the appearance of the virtual keyboard in accordance with the specific needs of the user (see fig. 36-39). The default value of this parameter is 1 pixel.

|   |   |   |   |   |
|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 |
| D | E | F | G | H |
| N | O | P | Q | R |

(Fig. 36. The horizontal and vertical distances are set to 1 pixel)

|   |   |   |   |   |
|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 |
| D | E | F | G | H |
| N | O | P | Q | R |

(Fig. 37. The horizontal and vertical distances are set to 5 pixels)

|   |   |   |   |   |
|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 |
| D | E | F | G | H |
| N | O | P | Q | R |

(Fig. 38. The horizontal distance is set to 2 pixels, while the vertical is equal to 7)

|   |   |   |   |   |
|---|---|---|---|---|
| 3 | 4 | 5 | 6 | 7 |
| D | E | F | G | H |
| N | O | P | Q | R |

(Fig. 39. The horizontal distance is set to 7 pixels, while the vertical is equal to 2)

**52 – Size of button borders in pixels.** The border around buttons significantly facilitates the virtual keyboard button selection process. By changing the thickness and the color of the border, the user can reduce the overall stress and increase the speed of work. Highlighting a button with a thick border and a contrasting color scheme allows visually impaired users to have a more convenient working atmosphere (see fig. 40). The default thickness of the button border is 1 pixel.

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| 2 | 3 | 4 | 2 | 3 | 4 | 2 | 3 | 4 |
| C | D | E | C | D | E | C | D | E |
| M | N | O | M | N | O | M | N | O |

(Fig. 40. Different button borders. From left to right: the border thickness – 1 pixel, 5 pixels, 10 pixels)

**53 – Direction of button labels (0-vertical; 1-horizontal).** This parameter is used to define the order of the virtual keyboard button label adding. It has two different values: 0 for the vertical order and 1 for the horizontal one. When the value is equal to 1, the virtual keyboard will be filled row by row, i.e. button labels will be added from left to right and from up to down (see fig. 41). When the value is equal to 0, the virtual keyboard will be filled column by column, i.e. button labels will be added from up to down and from left to right (see fig. 42). By using different button label adding orders and the ability to modify keyboard file cells, the user is able to adjust the matrix appearance in accordance with their personal needs, thus increasing the speed and efficiency of work and text typing. The right selection of the keyboard filling is really important for the scanning modes, i.e. Scanning list/horizontal and Scanning list/vertical. The default value of this parameter is 1 (the horizontal direction).

| SPACE  | ←      | →      | ↑      | ↓      | HOME | END   | ENTER   | BKSP    | DEL   |
|--------|--------|--------|--------|--------|------|-------|---------|---------|-------|
| 0      | 1      | 2      | 3      | 4      | 5    | 6     | 7       | 8       | 9     |
| A      | B      | C      | D      | E      | F    | G     | H       | I       | J     |
| K      | L      | M      | N      | O      | P    | Q     | R       | S       | T     |
| U      | V      | W      | X      | Y      | Z    | .     | ,       | :       | ;     |
| -      | !      | ?      | *      | (      | )    | [     | ]       | +       | =     |
| /      | \      | _      | %      | &      | "    | [M]   | QUICK   | +WORDS  | SAVE  |
| Mouse← | Mouse→ | Mouse↑ | Mouse↓ | TARGET | SEND | SEND- | SCROLL↑ | SCROLL↓ | SPEAK |

(Fig. 41. The horizontal filling mode)

| SPACE | BKSP | 6 | E | M | U | : | [ | &      | Mouse↑  |
|-------|------|---|---|---|---|---|---|--------|---------|
| ←     | DEL  | 7 | F | N | V | ; | ] | "      | Mouse↓  |
| →     | 0    | 8 | G | O | W | - | + | [M]    | TARGET  |
| ↑     | 1    | 9 | H | P | X | ! | = | QUICK  | SEND    |
| ↓     | 2    | A | I | Q | Y | ? | / | +WORDS | SEND-   |
| HOME  | 3    | B | J | R | Z | * | \ | SAVE   | SCROLL↑ |
| END   | 4    | C | K | S | . | ( | _ | Mouse← | SCROLL↓ |
| ENTER | 5    | D | L | T | , | ) | % | Mouse→ | SPEAK   |

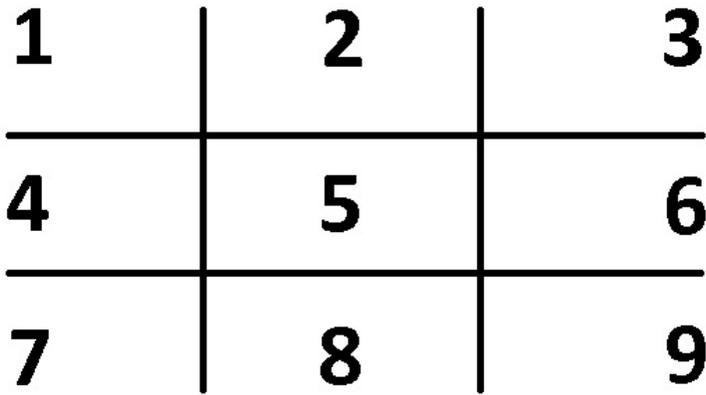
(Fig. 42. The vertical filling mode)

54 – **Positioning of text (1-9)**. Text on the virtual keyboard buttons can be located in accordance with the specific needs of the user. There are 9 variants in total:

1. text is aligned to the left, near the upper border.
2. text is aligned to the center, near the upper border.
3. text is aligned to the right, near the upper border.
4. text is aligned to the left, in the center of a cell.
5. text is located in the center of a cell.
6. text is aligned to the right, in the center of a cell.
7. text is aligned to the left, near the lower border.
8. text is aligned to the center, near the lower border.
9. text is aligned to the right, near the lower border.

The default value of this parameter is – 5 (text is located in the center of a cell).

The following scheme can be used to remember all the possible variants (see fig. 43).



(Fig. 43. Different variants of button text alignment)

**PRO 55 – Positioning** of icons (1-9). Similar to the text, icons of the virtual keyboard buttons can be located in accordance with the specific needs of the user. Text and icon locations are selected independently. Thus, there can be many different variants of their mutual positioning. The default value of this parameter is 5.

**PRO 56 – Scale keyboard icons (in percents)**. When the user selects relatively big images and font sizes, texts and icons may overlap. It's recommended to decrease icon sizes in such situations. The icon size can also be decreased when the program windows size is small or the display supports only low resolutions. This parameter can be used to define a required icon scaling size in percentages. The default value of this parameter is 100.

In order to provide a more convenient working atmosphere and reduce fatigue, **ECTkeyboard** allows the user to change almost all elements of the interface. Furthermore, the font size and color schemes can be selected independently for each button state.

There are 4 such states in the program:

- state 0 – inactive button (this state is defined with parameters 57-62);
- state 1 – active button (parameters 63-68);
- state 2 – selected button (parameters 69-74);
- state 3 – cancellation of the selected button (parameters 75-80).

These states are usually clearly distinguishable during the program operation (see fig. 44).

|            |            |   |   |   |   |   |   |
|------------|------------|---|---|---|---|---|---|
| C <i>1</i> | D          | E | F | G | H | I | J |
| M <i>2</i> | N <i>3</i> | O | P | Q | R | S | T |
| W          | X          | Y | Z | . | , | : | ; |
| ?          | *          | ( | ) | [ | ] | + | = |

(Fig. 44. Various button states in **ECTkeyboard**: 1 – State 0 – inactive button; 2 – State 1 – active button; 3 – State 2 – selected button)

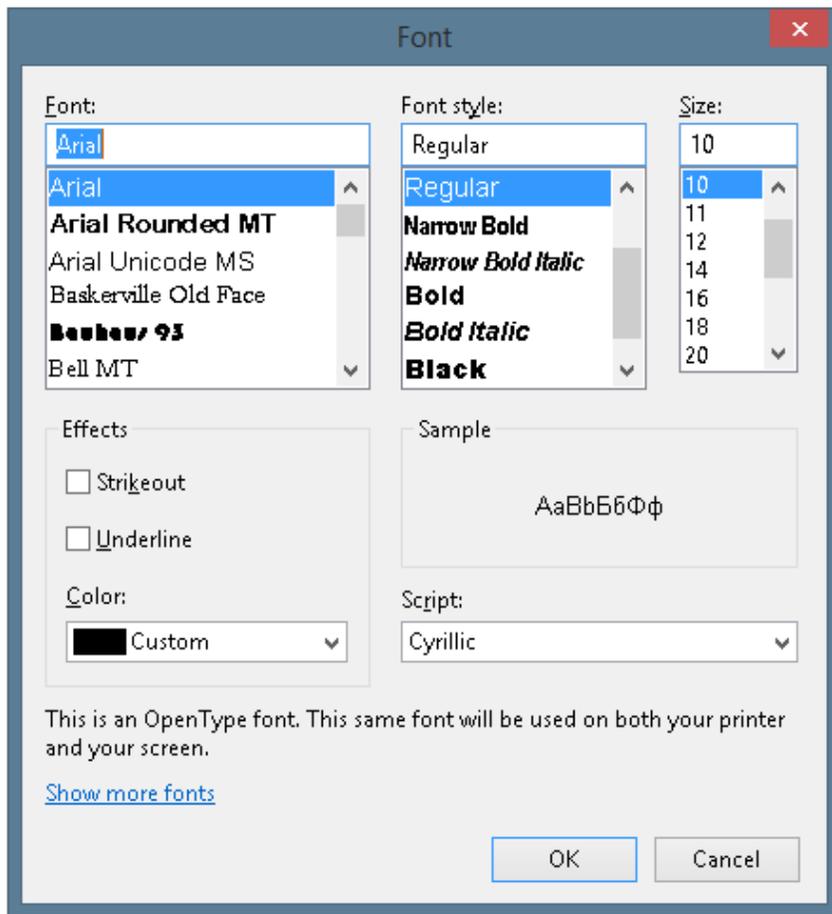
The user can change the following parameters for each of the states:

57 – (63, 69, 75) **Button font name**. It provides the user with the option to select a different font type for each button state, thus providing more flexibility and comfort during work with **ECTkeyboard** (see fig. 45). Thus, each user can choose the most familiar and convenient font.

|   |   |   |          |          |          |   |   |   |
|---|---|---|----------|----------|----------|---|---|---|
| 1 | 2 | 3 | <b>1</b> | <b>2</b> | <b>3</b> | 1 | 2 | 3 |
| B | C | D | <b>B</b> | <b>C</b> | <b>D</b> | B | C | D |
| L | M | N | <b>L</b> | <b>M</b> | <b>N</b> | L | M | N |

(Fig. 45. Various fonts of **ECTkeyboard**: From left to right: Arial, Arial Black, Times New Roman)

It's not necessary to enter the font name in order to select it. The user can double-click on the parameter value field to open a standard dialog window of the operating system and select any font from the list of available fonts of the system (see fig. 46).



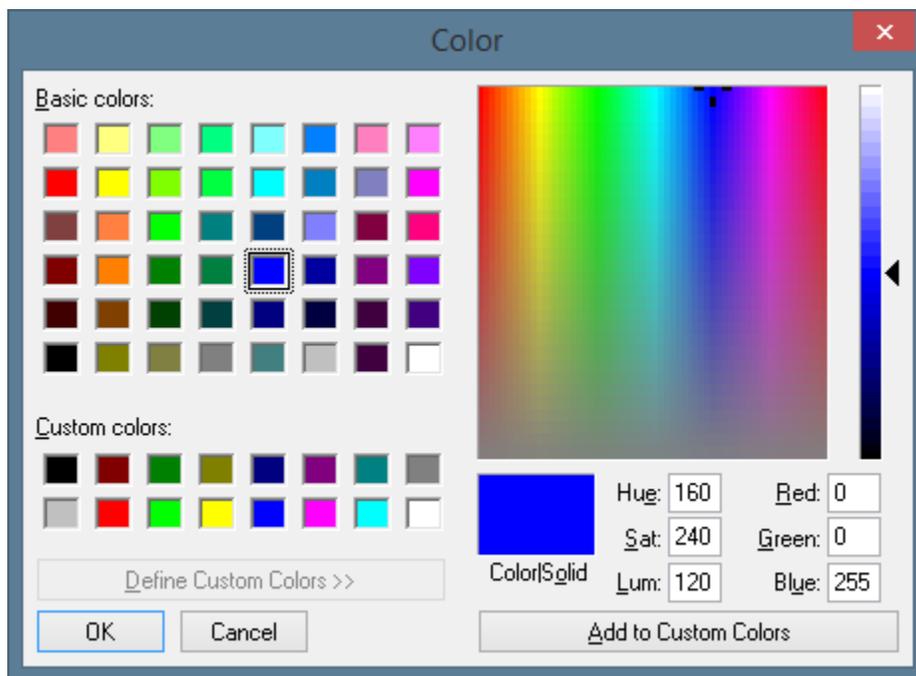
(Fig. 46. Font selection dialog window)

58 – (64, 70, 76) **Font size of button text.** The size of the font directly affects the virtual keyboard symbol selection comfort level. If the keyboard contains fewer buttons and the display supports high resolutions, the user can select bigger font sizes. If the patient is suffering from short-sightedness, astigmatism or other eye disorders, it's also recommended to use bigger fonts, which will provide more comfort and allow the patient to keep concentration and attention without any additional eye stress (see fig. 47). The font size can be entered manually or selected similarly to the type of font.

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| B | C | D | B | C | D | B | C | D |
| L | M | N | L | M | N | L | M | N |

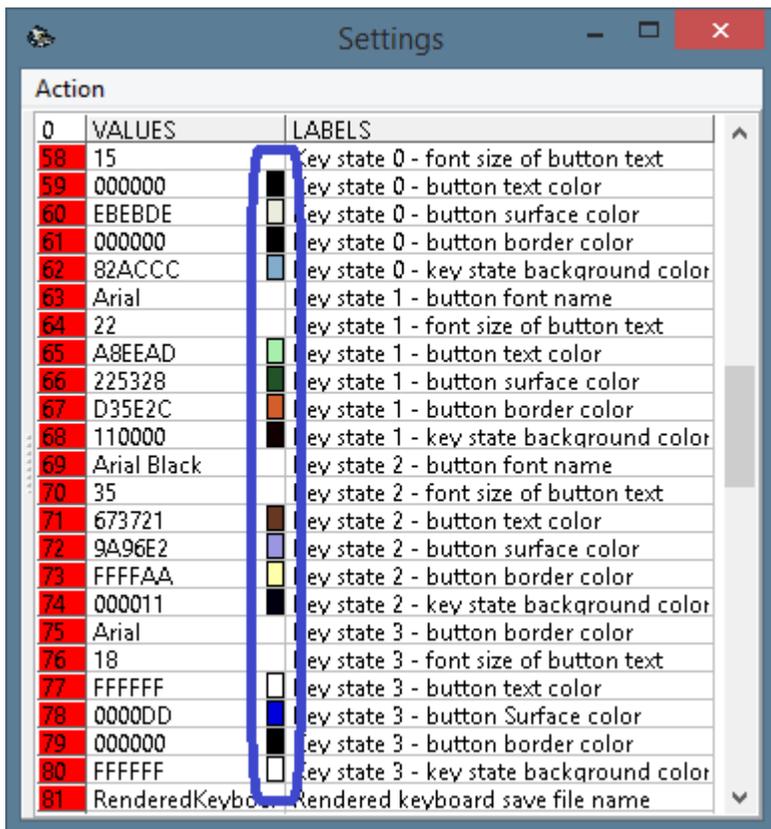
(Fig. 47. Various font sizes of ECTkeyboard: From left to right: 20 pt, 25 pt, 30 pt)

59 – (65, 71, 77) **Button text color.** The button text color has to be different than the button color. The user has to select a dark text color for light buttons and vice versa. Contrasting color schemes provide more clarity, which can be useful for visually impaired patients. If such a color scheme is too stressful for the eyes of the user, it's recommended to use calmer light and pastel colors for buttons and darker for texts. By double-clicking on the parameter value, the user will open a standard color selection dialog window of the operating system (see fig. 48).



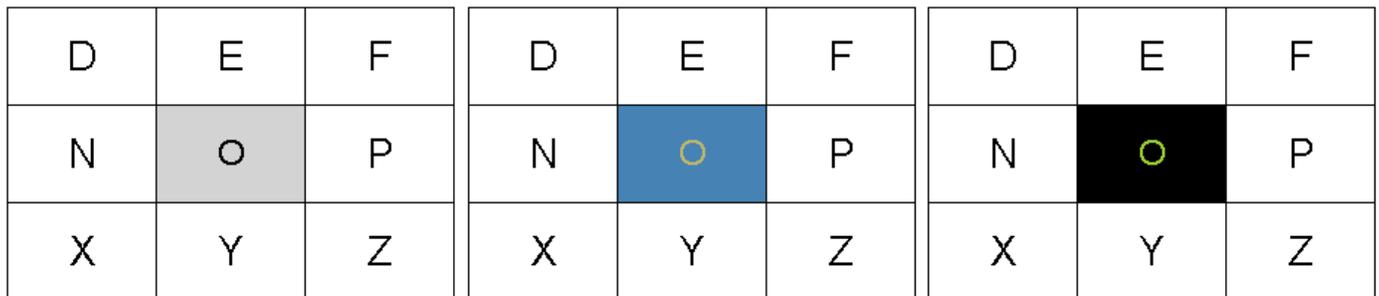
(Fig. 48. The color selection dialog window)

In order to provide easy color selection, the settings window of the program supports previewing the selected color scheme. The user can find a small field of the selected color next to the parameter values (see fig. 49).



(Fig. 49. Color scheme preview in the settings window of the program)

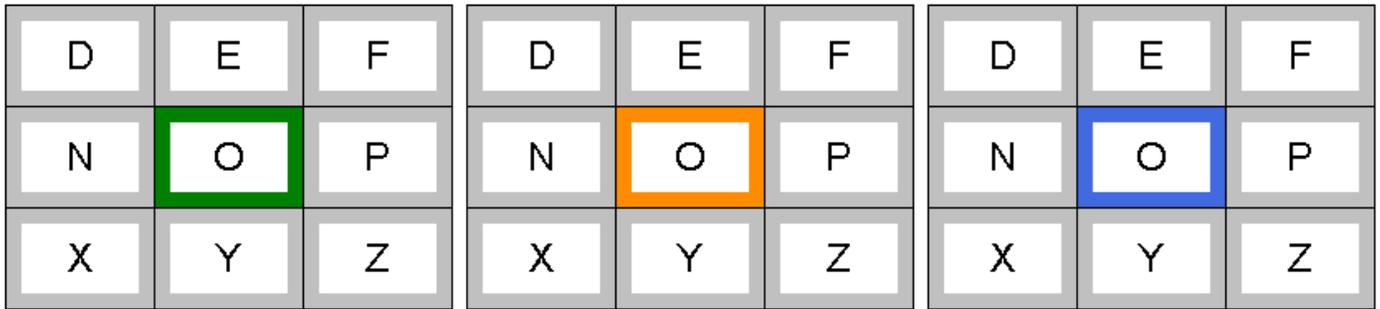
60 – (66, 72, 78) **Button surface color.** Bright colors are recommended for visually impaired patients or for those with problems with color perception. In all other situations, it's recommended to choose less intensive colors in order to reduce the overall stress level. Various color schemes of the virtual keyboard are shown in fig. 50. The left one has a black font (000000) with a light gray background (D3D3D3). The central one has a dark khaki font (BDB76B) with a blue-steel background (4682B4). And finally, the right one represents a more contrasting color scheme – a yellow-green font color (9ACD32) with a black background (000000).



(Fig. 50. Different color schemes for the selected button)

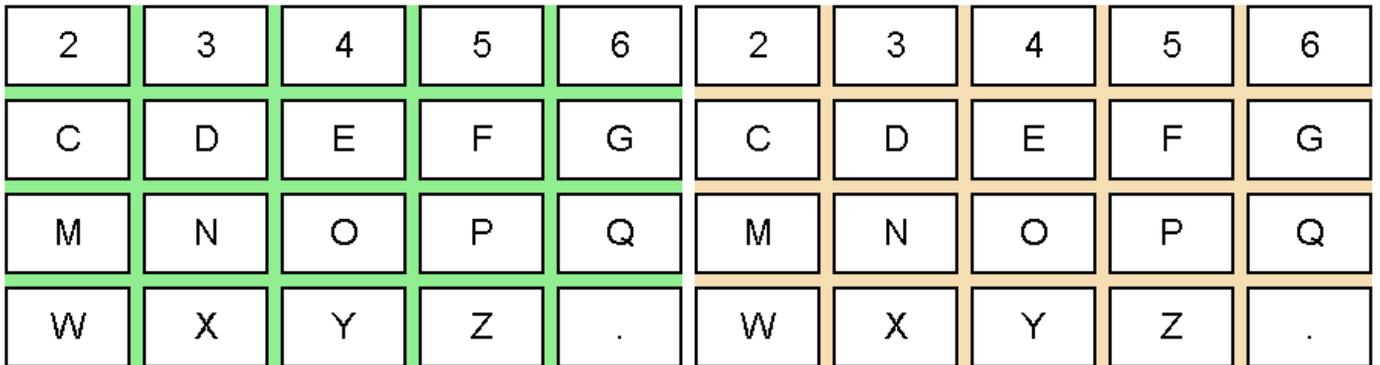
61 – (67, 73, 79) **Button border color.** Additional color borders allow for making the virtual keyboard area (a row, a column or a button) more distinguishable. It allows the user to work faster, concentrating on the highlighted element. The higher the button border thickness (Parameter 52), the more noticeable the highlighted element, and the easier the selection process. It's recommended to use contrasting colors that are different than the main matrix background color and the cell color (see fig. 51). For example, the left

image contains a green color (008000), the central one a dark orange (FF8C00) and the right one a royal blue (4169E0). The color of inactive cell borders is silver (C0C0C0).



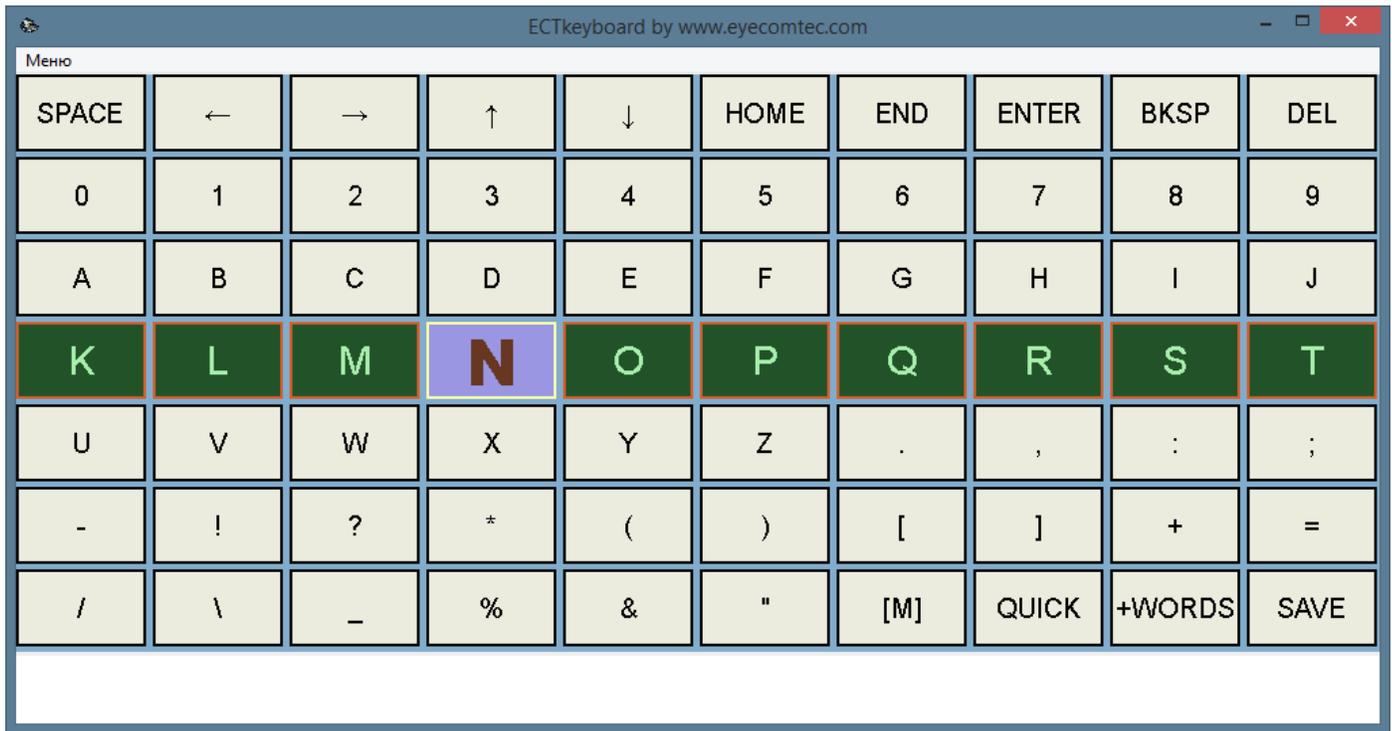
(Fig. 51. Different button border colors)

**62 – (68, 74, 80) Key state background color.** This parameter defines the background color of the area under the virtual keyboard buttons. If the user selects a higher horizontal (Parameter 50) or vertical (Parameter 51) distance between the buttons, the space between buttons will be the background. (see fig. 52). The left image has a light-green background (90EE90), the right one a wheat color (F5DEB3).



(Fig. 52. Various keyboard background colors)

The ability to change colors of all interface elements and their fonts gives the user great flexibility and makes it possible to set the program in accordance with the specific needs and physical condition of each single patient. An example of the main program window of **ECTkeyboard** is shown in fig. 53.



(Fig. 53. Example of the main window of the program)

**PRO 81 – Rendered keyboard save file name.** In order to make the setting process more convenient and to use received images in any third-party image editors, **ECTkeyboard** allows the user to export the image of the virtual keyboard. The default value of this parameter is `RenderedKeyboard.bmp`.

The following parameters from 82 to 84 are necessary only in situations where the program is used in conjunction with an eye-tracking device and the 4<sup>th</sup> working mode is selected (gaze control of the cursor buttons).

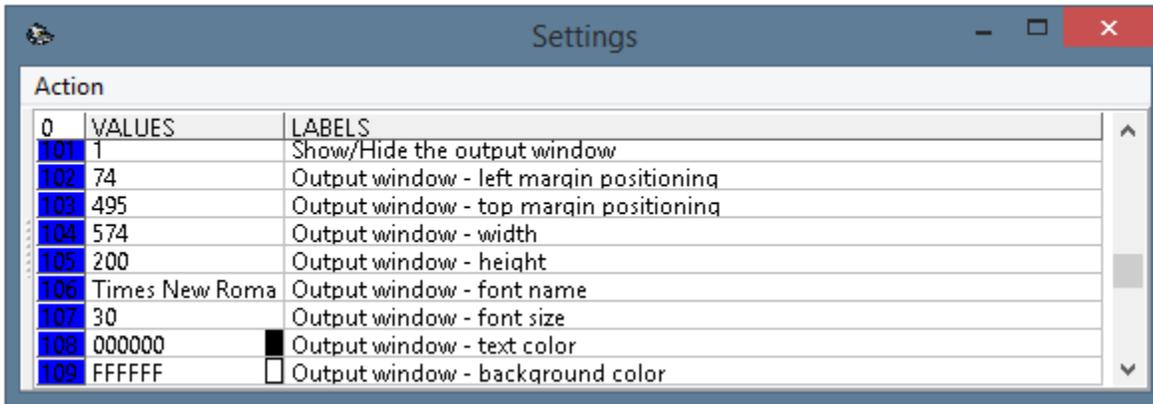
**82 – Size of row shift in pixels.** This parameter can be used to define by how many pixels the cursor will move when the user is looking in the corresponding direction. The default value for this parameter is 5 pixels.

**83 – Size of column shift in pixels.** This parameter works similarly to the previous one, allowing the user to change the value of the up or down cursor movement shift. The default value for this parameter is 5 pixels.

**84 – Disable the cursor at empty border cells.** This parameter can have two different values: 0 and 1. If the parameter value is 1, the user is allowed to move the cursor beyond the borders of the virtual keyboard. In such cases, buttons won't be highlighted or pressed. The default value is 0, i.e. the user can't stop the typing process.

**85 – Repaint delay of the main window (keyboard) (in ms).** An increased performance level of **ECTkeyboard** allows the user to change the main program window refresh rate. The default value of this parameter is 100 milliseconds, i.e. the virtual keyboard is redrawn 10 times per second.

## Text output window settings (101-109)



(Fig. 54. The settings window of the program, parameters 101-109)

101 – **Show/Hide the output window**. This parameter of the settings window allows the user to show the text output window on startup of **ECTkeyboard** (if the parameter value is set to 1) or hide it (if the parameter value is set to 0). If the text output window is not shown during the start of the program, the user can show it by using the **Show Output Window** menu item or by pressing the **F5** hotkey.

The text output window is a simplified text editor, which can be used to type various texts in the symbol by symbol mode. When the user terminates **ECTkeyboard**, the text is automatically saved and will be available during the next working session. The appearance of the text output window is shown in figure 55.



(Fig. 55. Appearance of the text output window)

The header of the text output window contains five variables: X, Y, L, C and P. X is the current horizontal position of the cursor. For example, if the patient types 15 symbols in a new row, the value of X will be 15. Y is the current vertical position of the cursor; in other words – a number of a row. L is the total length of the row at the current cursor position. C is the total number of symbols in the text output window. P is the current position of the cursor relatively to the whole text.

As with all other windows of the program, the text output window is totally customizable, i.e. by changing various program parameters, the user can change the font type and size, resize and relocate the window on the desktop, or choose colors for symbols or the background.

102 – **Output window – left margin positioning**. This parameter allows the user to change the distance between the left border of the desktop and the border of the program window. Even though it's easier and more convenient to move the window by using the mouse cursor, some situations require incredibly

precise window positioning. For example, in cases where the user wants to locate the text output window strictly above the main window of **ECTkeyboard**.

**103 – Output window – top margin positioning.** This parameter works similarly to the previous one and allows the user to change the distance between the upper border of the desktop and the border of the window.

**104 – Output window – width.** Allows setting the window width in pixels. It's recommended to increase this value when larger fonts are in use (e.g. for visually impaired patients) or in cases where **ECTkeyboard** takes all the available space on the desktop.

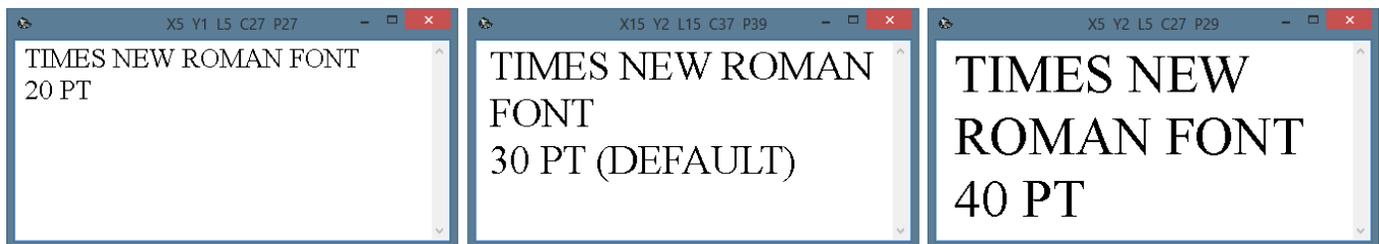
**105 – Output window – height.** This parameter works similarly to the previous one, allowing the user to define the text output window height in pixels. It's recommended to increase this value when larger fonts are in use or for longer texts, thus allowing the user to see more of the text at the same time. The user won't use cursor buttons too often in order to check the previously typed text.

**106 – Output window – font name.** This parameter can be used to change the text output window font (see fig. 56). The font name can be entered manually, as well as selected from the list of available system fonts. The default font for the text output window is Times New Roman.



(Fig. 56. Various fonts in the text output window of **ECTkeyboard**)

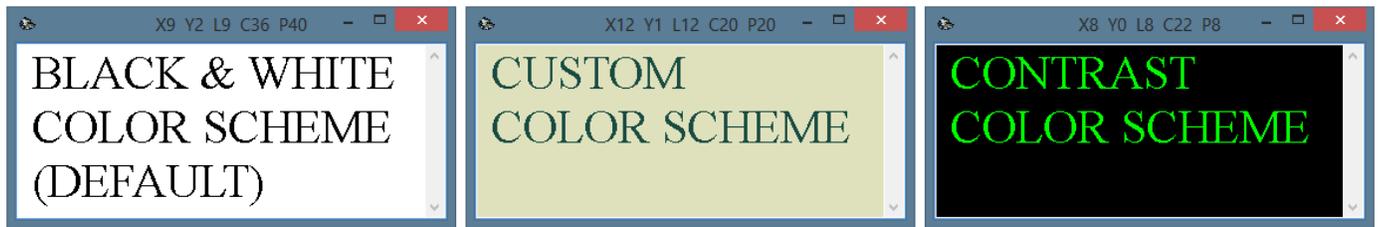
**107 – Output window – font size.** Can be used to set the size of the font in the text output window (see fig. 57). The default value of this parameter is 30. When changing this parameter, it's recommended to select the size in such a way that the user won't be tired after continuous working sessions with the program, but the window will contain enough text to avoid excessive scrolling. Font size changes take immediate effect in the text output window, which makes the program setting process more convenient and easy.



(Fig. 57. Various font sizes in the text output window)

**108 – Output window – text color.** This parameter allows the user to set any desired color of the text output window font. Colors of the background and font have to be selected properly in order to avoid eye stress of the user and make all letters visually clear. Visually impaired users or those with problems of color perception can use bright and high contrast colors. Various text output window color schemes are shown in figure 58. The default value is 000000 (black color).

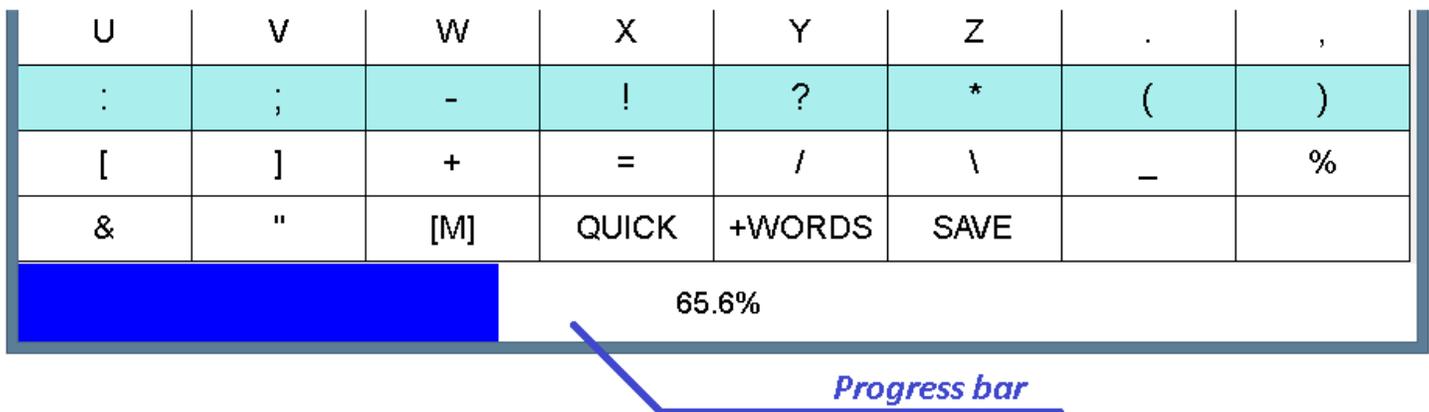
109 – **Output window – background color.** The background color is also selected depending on the font color in order to provide the most convenient reading environment and reduce stress. The default value of this parameter is FFFFFFFF (white color). Warning! Color changes won't become effective until the user selects the **Set Current** menu item in the **Action** menu of the settings window or in the main menu of the program.



(Fig. 58. Various color schemes of the text output form)

### Progress bar settings (131-149)

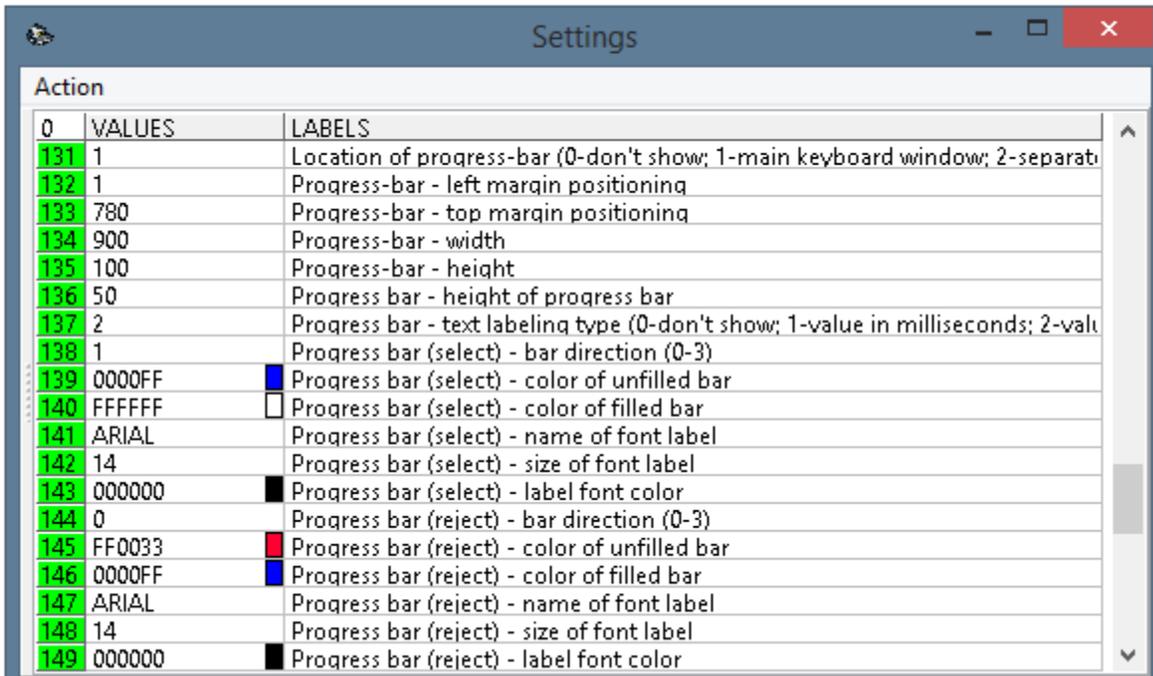
The progress bar is an important element of **ECTkeyboard** that helps the user to make the selection of any desired button, or cancel such a selection when it's required. The progress bar is a stripe with a countdown. It is located under the virtual keyboard area by default (see fig. 59).



(Fig. 59. Appearance of the progress bar with default settings of the program)

During the selection of a required element of the virtual keyboard, or in the case of cancellation of the selection, the progress bar is filled with color. The user can also control the remaining time for the selection in milliseconds or the filling percentage.

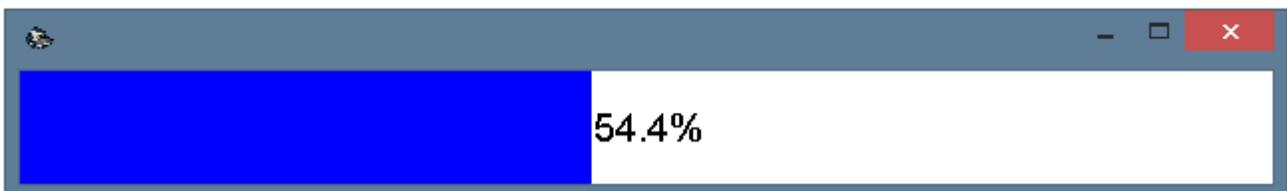
The progress bar is totally customizable: the user can change the filling direction and choose the color of the stripe, the font color, and size. The size of the progress bar can also be changed at will.



(Fig. 60. The settings window of the program, parameters 131-149)

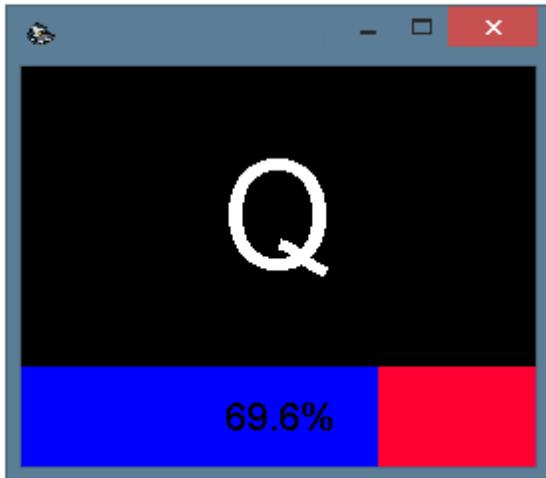
131 – **Location of progress bar**. By changing this parameter, the user can show or hide the progress bar. In cases where the progress bar is shown, the user can change its position. The parameter can have one of the following numeric values:

0. the progress bar is not shown. The progress bar can be hidden in cases where **ECTkeyboard** is working on computers with low display resolutions, when the user requires some additional space for other application windows. The progress bar can also be hidden in cases where the user is already familiar with the program, and the progress bar is simply distracting him.
1. the progress bar is shown in the main window of the program under the virtual keyboard area.
2. the progress bar is shown as a separate window. Positions and dimensions of this window can be changed arbitrarily (see fig. 61).



(Fig. 61. The progress bar is shown in a separate customizable window)

3. the progress bar is shown in the current button selection window. This value can be used in cases where the user is working with the program in one of two available step by step modes (Scanning List Horizontal or Scanning List Vertical). Such methods are mainly used with the current button selection window, and the progress bar will be located at the bottom (see fig. 62).



(Fig. 62. The progress bar in the current button selection window)

The default value of this parameter is 1 (the progress bar is shown in the virtual keyboard window).

Parameters 132-135 can be used to change dimensions and position of the progress bar when it's shown in a separate window.

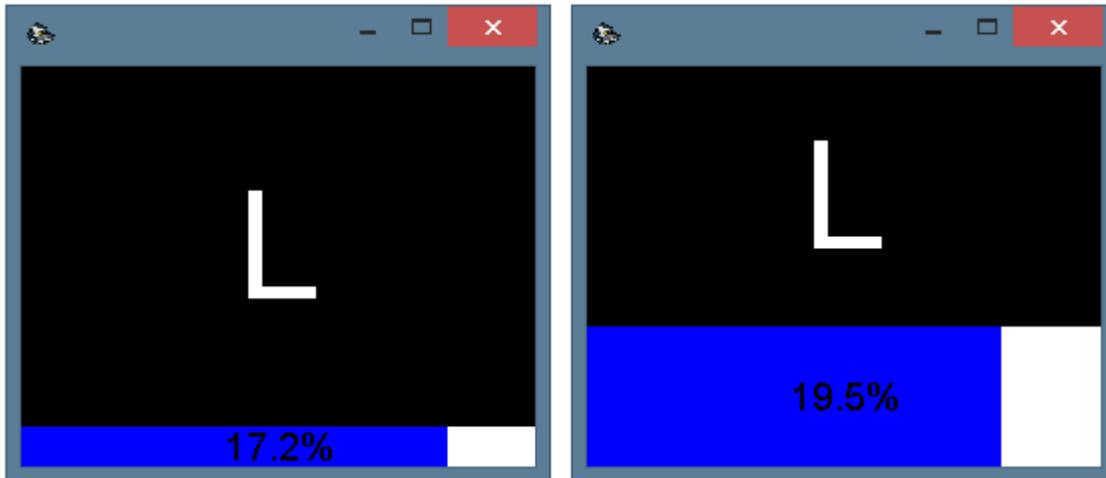
**132 – Progress bar – left margin positioning.** Defines the distance between the left border of the desktop and the progress bar window.

**133 – Progress bar – top margin positioning.** Sets the distance between the upper border of the desktop and the progress bar window.

**134 – Progress bar – width.** Defines the horizontal size of the progress bar window in pixels. The default value for this parameter is 900 pixels.

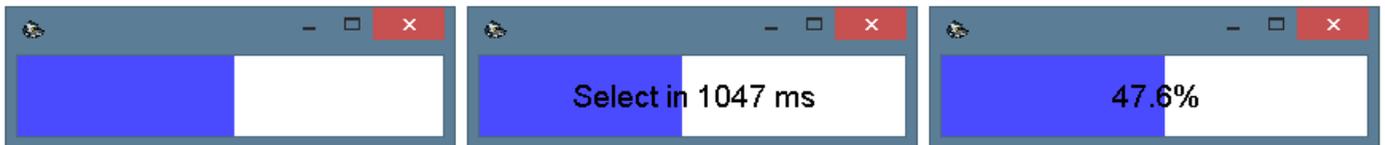
**135 – Progress bar – height.** Sets the vertical size of the progress bar window in pixels. The default value for this parameter is 100 pixels (without the window header).

**136 – Progress bar – height of progress bar.** This parameter can be used to define the progress bar height in the virtual keyboard window or in the current button selection window (see fig. 63). The progress bar height can be increased when it's filling in the vertical direction (up to down or down to up) or in cases where the patient requires a larger font in the progress bar. The default value for this parameter is 50 pixels.



(Fig. 63. Various progress bar heights: left – 20 pixels, right – 70 pixels)

**137 – Progress bar – text labeling type.** ECTkeyboard supports three various progress bar indication methods. If the value of this parameter is 0, the progress bar will not contain any text information. The selection process will be shown with the filling of the stripe. If the value is equal to 1, the progress bar will show the selection delay in milliseconds, and if it's equal to 2, it shows the remaining selection time as a percentage of the total delay time. (see fig. 64).



(Fig. 64. Text information of the progress bar)

The progress bar works during the selection of a virtual keyboard element, as well as during the cancellation of such a selection. Different appearances of the progress bar for each mode makes it more convenient in operation. The user may select various color schemes for each mode (e.g. use more pastel colors for selection and more contrast for the cancellation). The user may also set different filling directions.

Parameters 138-143 define the appearance of the progress bar during the selection, while parameters 144-149 define appearances during the cancellation of the selection.

**138 – (144) Progress bar – bar direction.** This parameter can have one of the following values:

0. filling from left to right;
1. filling from right to left;
2. filling from the top to the bottom;
3. filling from the bottom to the top.

Different progress bar filling modes are shown in fig. 65.

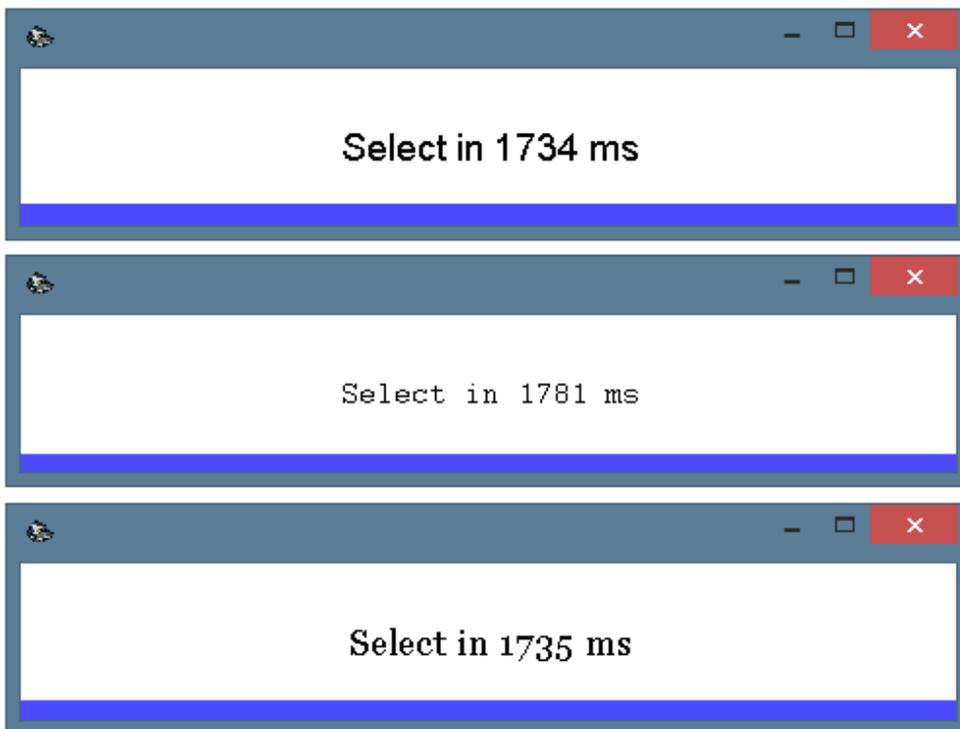


(Fig. 65. Progress bar filling modes)

139 – **(145) Progress bar – color of the unfilled bar.** The active color is the color that will fill the progress bar. It's not recommended to select colors that are too bright or sharp for the selection mode, because such colors can distract the user from the virtual keyboard area. Vice versa, it's more convenient to use brighter colors and larger fonts for the cancellation mode.

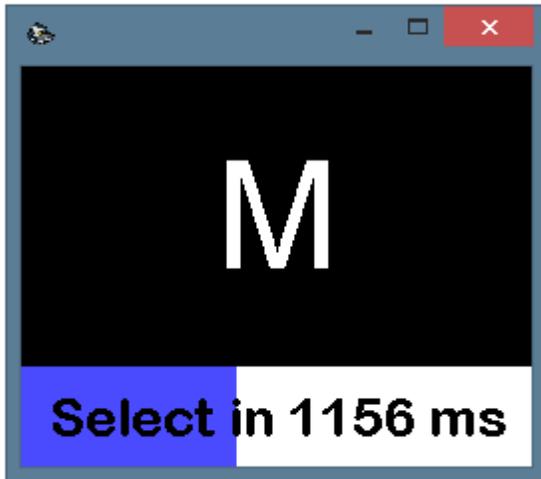
140 – **(146) Progress bar – color of filled bar.** The inactive color is the shade of the progress bar when the user is not making any selection.

141 – **(147) Progress bar – name of font label.** If the progress bar is used to show any type of text information, the user is allowed to change the font of such information (see fig. 66). Arial is set as a default font.



(Fig. 66. Various fonts of the progress bar. From the top to the bottom: Arial, Courier, Georgia)

142 – **(148) Progress bar – size of font label.** Increased fonts can make text information of the progress bar clearer and easier to recognize. Big fonts are recommended for visually impaired users. It's recommended to enable step by step entry mode of **ECTkeyboard** and locate the progress bar in the current button selection window (see fig. 67). The default value for this parameter is 14.



(Fig. 67. Bigger font of the progress bar located in the current button selection window)

143 – **(149) Progress bar – label font color.** It's recommended to select the text color of the progress bar that is in higher contrast to both active and inactive progress bars. For example, the user can select two pastel and light colors for the progress bar states and a dark color for its text.

### Current button selection window settings (161-173)

| Action | VALUES | LABELS   |
|--------|--------|--|
| 161    | 1      | Show/Hide the current button window                    |
| 162    | 669    | Current button window - left margin positioning        |
| 163    | 495    | Current button window - top margin positioning         |
| 164    | 200    | Current button window - width                          |
| 165    | 200    | Current button window - height                         |
| 166    | 000000 | Current button window - background color               |
| 167    | 2      | Current button window - positioning of icon (1-9)      |
| 168    | 5      | Current button window - positioning of text (1-9)      |
| 169    | Arial  | Current button window - font name of text              |
| 170    | 56     | Current button window - font size                      |
| 171    | FFFFFF | Current button window - font color                     |
| 172    | 7      | Current button window - icon column from the icon file |
| 173    | 100    | Current button window - scale icons                    |

(Fig. 68. The settings window of the program, parameters 161-173)

The current button selection window is used to show a big thumbnail of a currently selected virtual keyboard button symbol. It provides additional comfort for visually impaired users and reduces the overall stress level during continuous operation of **ECTkeyboard**. Recommended working modes for the current button selection window are 2 (Scanning List Horizontal) and 2B (Scanning List Vertical). Both working modes do not involve

row and column scrolling. Thus, the user will always see a thumbnail of a symbol in the separate window and will be able to select it.

161 – **Show/Hide the current button window**. Values for this parameter are 0 and 1. When the value is equal to 0, the additional window is shown. When it's equal to 1, it's hidden. The default value is 0.

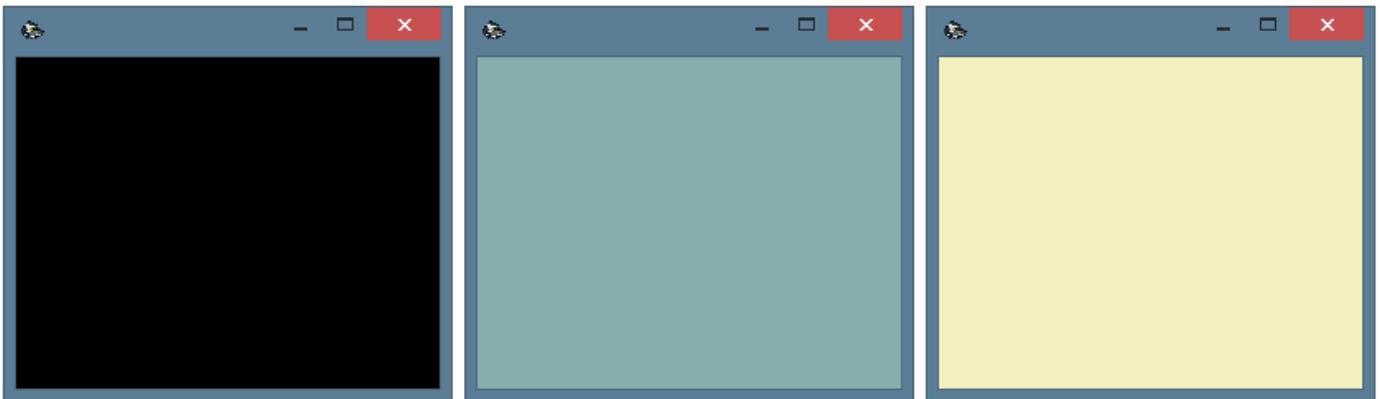
162 – **Current button window – left margin positioning**. Defines the precise distance between the left border of the desktop and the current button selection window. It can be used to set an exact position of the window.

163 – **Current button window – top margin position**. Sets the precise distance between the upper border of the desktop and the current button selection window.

164 – **Current button window – width**. Changes the horizontal size of the current button window. The default value for this parameter is 256 pixels. It's recommended to choose the size of the window that can fit the whole symbol thumbnail (this window always uses big fonts) and the progress bar when necessary.

165 – **Current button window – height**. Defines the horizontal size of the current button window. The default value for this parameter is 200 pixels.

166 – **Current button window – background color**. Allows the user to select any desired background color (see fig. 69). This color can be selected with the palette, as well as by manually entering its code in the RRGGBB format. The default value for this parameter is 000000 (black color).



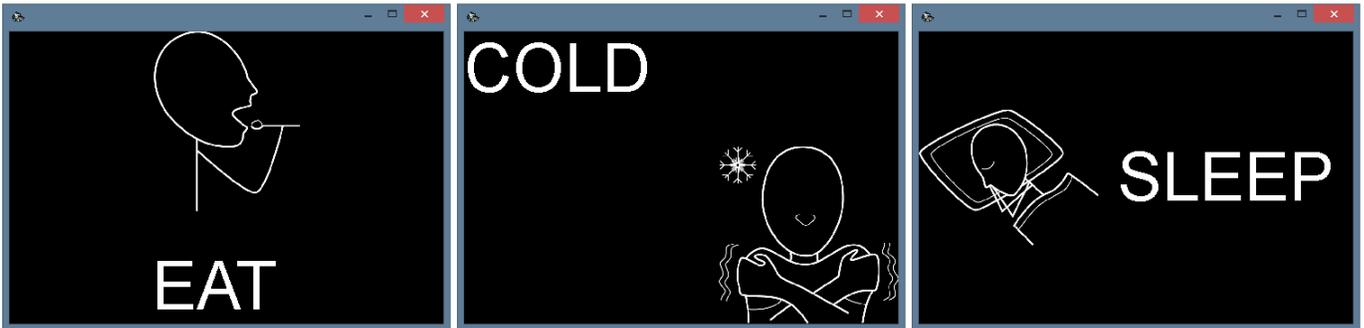
(Fig. 69. The user can select any background color for the current button window)

**PRO** 167 – **Current button window – positioning of icon**. In addition to the text on virtual keyboard buttons, this window can be used to show icons (see fig. 70). Text and icon positions are changed separately. This parameter value can have one of the following values:

1. the icon is aligned to the left, near the upper border.
2. the icon is aligned to the center, near the upper border.
3. the icon is aligned to the right, near the upper border.
4. the icon is aligned to the left, in the center of a cell.
5. the icon is located in the center of a cell.
6. the icon is aligned to the right, in the center of a cell.
7. the icon is aligned to the left, near the lower border.

8. the icon is aligned to the center, near the lower border.
9. the icon is aligned to the right, near the lower border.

The default value of this parameter is 2.



(Fig. 70. Different icon positions in the current button window)

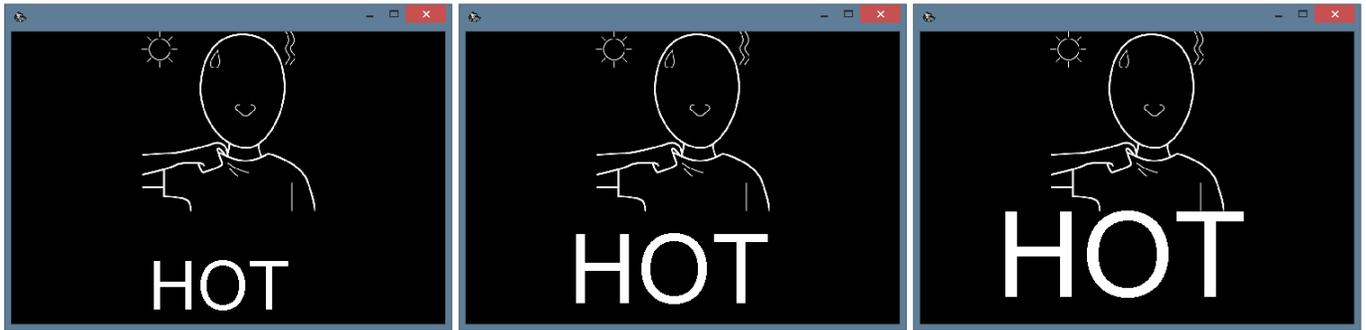
**168 – Current button window – positioning of text.** This parameter works similarly to the previous one. The default value for this parameter is 5. In order to avoid overlapping texts and icons, it's recommended to choose different positions for them.

**169 – Current button window – font name of text.** In order to make the operation of **ECTkeyboard** more comfortable, this allows the user to choose any of the fonts installed in the system to show in the current button window (see fig. 71). Arial font is used by default.



(Fig. 71. Different fonts in the current button window. From left to right: Arial, Bookman Old Style, Comic Sans MS)

**170 – Current button window – font size.** The main purpose of the current button window is to show enlarged buttons of the virtual keyboard. Thus, it's recommended to use bigger fonts in comparison with those from the virtual keyboard area. The default value for this parameter is 56, but the user can select any other desired value (see fig. 72).



(Fig. 72. Different font sizes for the current button window: 56, 80, 100)

171 – **Current button window – font color.** The proper selection of background and font color allows the patient to reduce eyes stress during program operation. The default colors are black for the background and white for the font, but the program allows for choosing any other comfortable colors (see fig. 73).



(Fig. 73. Color schemes for the current symbol window)

**PRO 172 – Current button window – icon column from the icon file.** The file with icons contains all the file names with icons for each state of the buttons (inactive, active, selected, cancellation of selection). File names for each state are located in a separate column of the file. This parameter allows the user to define the column with icon files that will be used for the current button window.

**PRO 173 – Current button window – scale icons.** When necessary, the user can increase or decrease icon scaling in the current button window. This parameter allows the user to select the icon size as a percentage of the initial size. The default value for this parameter is 100.

## Quick entry window settings (201-217)

| Action | VALUES           | LABELS  |
|--------|------------------|---|
| 201    | 1                | Show/Hide the quick entry window  |
| 202    | 890              | Quick entry window - left margin positioning                                  |
| 203    | 495              | Quick entry window - top margin positioning                                   |
| 204    | 200              | Quick entry window - width  |
| 205    | 199              | Quick entry window - height   |
| 206    | Arial            | Quick entry window - (word) font name   |
| 207    | 20               | Quick entry window - (word) font size   |
| 208    | 000000           | Quick entry window - (word) text color  |
| 209    | FFFFFF           | Quick entry window - (word) background (window) color                         |
| 210    | Words3000-En.txt | Quick entry window - name of file with current vocabulary                     |
| 211    | 0123456789abcdef | Quick entry window - list of symbols used to numerate the list of suggestions |
| 212    | ABCDEFGHIJKLM    | Quick entry window - list of symbols used for text                            |
| 213    | WordsUser.txt    | Quick entry window - name of file containing USER vocabulary                  |
| 214    | Arial            | Quick entry window - (number) font name                                       |
| 215    | 20               | Quick entry window - (number) font size                                       |
| 216    | 0000FF           | Quick entry window - (number) text color                                      |
| 217    | FFFFFF           | Quick entry window - (number) background (window) color                       |

(Fig. 74. The settings window of the program, parameters 201-217)

The quick entry window is created to find words in the automatic mode, using just several letters entered by the user from the virtual keyboard (see fig. 75).

The screenshot shows the ECTkeyboard application window with a virtual keyboard and a quick entry window. The keyboard has a menu bar with various navigation and function keys. The quick entry window displays the text "ECTKEYBOARD IS VERY FLEXIBLE AND ADOPTABLE APPL" and a list of suggestions for the word "APPL".

| Menu   |        |        |        |        |      |       |         |         |       |
|--------|--------|--------|--------|--------|------|-------|---------|---------|-------|
| SPACE  | ←      | →      | ↑      | ↓      | HOME | END   | ENTER   | BKSP    | DEL   |
| 0      | 1      | 2      | 3      | 4      | 5    | 6     | 7       | 8       | 9     |
| A      | B      | C      | D      | E      | F    | G     | H       | I       | J     |
| K      | L      | M      | N      | O      | P    | Q     | R       | S       | T     |
| U      | V      | W      | X      | Y      | Z    | .     | ,       | :       | ;     |
| -      | !      | ?      | *      | (      | )    | [     | ]       | +       | =     |
| /      | \      | _      | %      | &      | "    | [M]   | QUICK   | +WORDS  | SAVE  |
| Mouse← | Mouse→ | Mouse↑ | Mouse↓ | TARGET | SEND | SEND- | SCROLL↑ | SCROLL↓ | SPEAK |

58.4%

ECTKEYBOARD IS VERY FLEXIBLE AND ADOPTABLE APPL

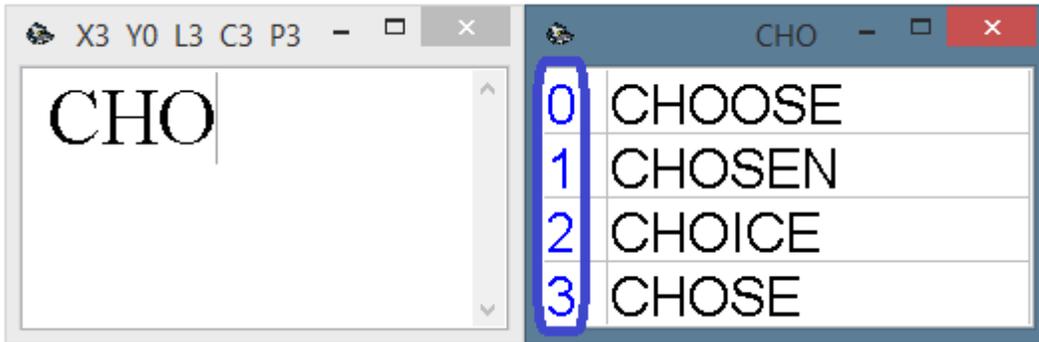
2

APPL

- 0 APPLY
- 1 APPLICABLE
- 2 APPLICATION

(Fig. 75. The program interface with the quick entry window (vocabulary))

During the program operation, the header of the quick entry window contains the first letters of the word entered by the user. All the words in the quick entry window are marked with numbers and letters (see fig. 76). In order to use the vocabulary, the user has to press the 'Quick' button of the virtual keyboard and select the number or the letter of the corresponding word.



(Fig. 76. Using numbers for the fast word selection from the vocabulary)

201 – **Show/Hide the quick entry window.** This parameter makes it possible to show or hide the quick entry window. When the parameter value is 1, the window is shown; when it's 0, the window is hidden.

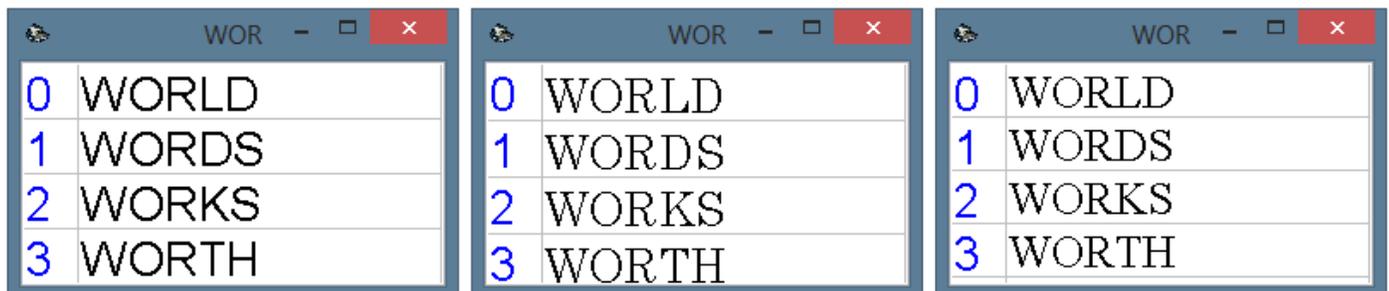
202 – **Quick entry window – left margin position.** This parameter defines the distance in pixels between the left desktop border and the frame of the quick entry window.

203 – **Quick entry window – top margin position.** Similar to the previous parameter, this one defines the distance in pixels between the upper desktop border and the frame of the quick entry window.

204 – **Quick entry window – width.** This parameter defines the horizontal size of the vocabulary. It's recommended to select this value in such a way that the window can fit the longest words from the vocabulary. The default value for this parameter is 200 pixels.

205 – **Quick entry window – height.** This parameter sets the vertical size of the quick entry window. The height of the vocabulary has to be enough to show not less than 10-15 words. The height also depends on the font size. The default height value is 500 pixels.

206 – **Quick entry window – (word) font name.** Similar to other program windows, the user can select any font type for the quick entry window (see fig. 77). Arial is set as the default font. This parameter only affects areas with words; in order to change number and symbol areas, it's required to change parameters 214-217.



(Fig. 77. Various fonts in the quick selection window. From left to right: Arial, Century, Times New Roman)

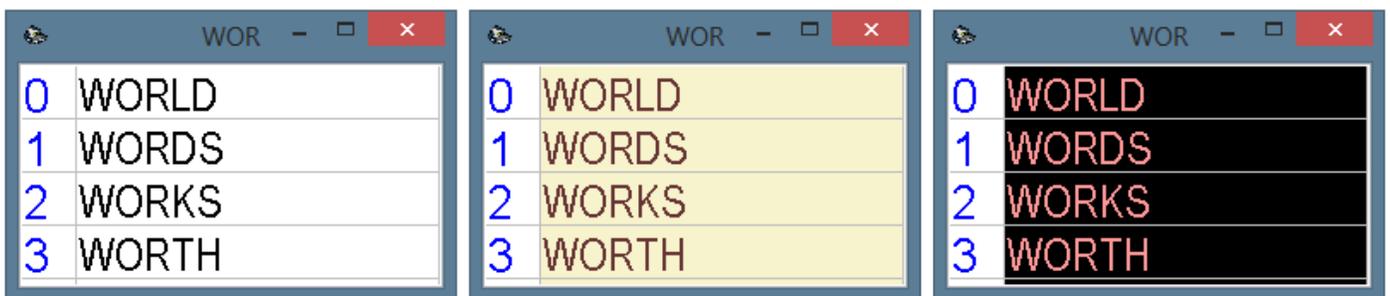
207 – **Quick entry window – (word) font size.** The user can change the quick entry window font size at their discretion (see fig. 78). It's recommended to increase the size only for visually impaired patients. An excessive increase of the font size may result in a lower amount of words in the list. Thus, the user will have to enter one or even several additional letters in order to reduce the amount of words in the list, thus increasing total entry time.



(Fig. 78. The quick entry window interface with different font sizes)

208 – **Quick entry window – (word) text color.** By changing this parameter manually or selecting a color from the system palette, the user can select a desired font color for the quick entry window. It's recommended to select contrasting colors for the background and the font in order to avoid additional eye stress during continuous operation of the program. Various color schemes are shown in figure 79. The black color is used by default for words in the quick entry window.

209 – **Quick entry window – (word) background (window) color.** This parameter works similarly to the previous one. It's recommended to choose soft colors for continuous working sessions and contrasting colors for visually impaired users. The default background color of the vocabulary is white.



(Fig. 79. Various color schemes for the quick entry window. Colors for numbers and letters that are used to select words are set separately)

210 – **Quick entry window – name of the file with current vocabulary.** The main vocabularies of the program contain a list of three thousand most commonly used words. Currently, there are vocabularies in English, French, and Russian. In order to change the working vocabulary, the user has to enter its name manually, or select it using the standard dialog window of the operating system.

**PRO** 211 – **Quick entry window – list of symbols used to enumerate the list of suggestions.** The program uses English letters and number in order to select words from the quick entry window. This parameter value contains all the letters and numbers that can be used to make a selection. The default value for this parameter is 0123456789abcdef (16 symbols). Thus, the user can select one of 16 words from the quick

entry window. If it's necessary to increase the amount of words in the quick entry window, the user has to add some symbols to this parameter value.

**212 – Quick entry window – list of symbols used for text. ECTkeyboard** forms the quick entry words list, based on several letters typed by the user on the virtual keyboard. In order to make it possible, the value of this parameter has to contain all the symbols that can be typed by the user. The default value for this parameter contains all uppercase and lowercase letters of the English alphabet.

**213 – Quick entry window – name of the file containing user vocabulary.** In some cases, the basic set of vocabularies may not be sufficient for the user. For example, the user may need to type names, locations and other words that are not available in the standard vocabulary. If the user types such words frequently, they are required to type them every time, significantly decreasing the overall working speed. At the very same time, if the user enables automatic adding of the user's words to the vocabulary, it may include various words with mistakes. Therefore, the program offers an additional vocabulary for all words that the user wants to add to the quick entry window. The user can add new words to the vocabulary by using the +WORDS command of the virtual keyboard.

Parameter 213 allows the user to select the name of the file that will be used for the additional vocabulary. The default name of the file is WordsUser.txt. This file will be created in the main folder of the program.

**214 – Quick entry window – (number) font name.** This parameter works similarly to parameter 206, affecting the symbol selection area.

**215 – Quick entry window – (number) font size.** This parameter works similarly to parameter 207, affecting the symbol selection area. It's recommended to use the same values for both of parameters (this one and parameter 207) in order to provide more convenient symbol selection.

**216 – Quick entry window – (number) text color.** This parameter works similarly to parameter 208, affecting the symbol selection area. The default value is 0000FF (blue color).

**217 – Quick entry window – (number) background (window) color.** This parameter works similarly to parameter 209, affecting the symbol selection area.

## Downloads

The latest version of the program can be downloaded from the EyeComTec website, using the following link:  
<https://eyecomtec.com/ECTkeyboard.zip>



# Registration and activation of EyeComTec software products

In order to complete the registration process, it's required to fill in a short form, which contains contact information and reasons to use assistive technologies.

- [The registration form for private users \(non-commercial use\). For people having a physical need for our products\\*](#)
- [The registration form for medical companies \(commercial and non-commercial organizations: hospitals, rehabilitation centers and doctors\)\\*\\*](#)
- [The registration form for commercial customers from non-medical fields \(involved in the processes of production, assembling, quality control and manufacturing\)\\*\\*](#)

\* The registration is not obligatory for private users, however, it's still recommended.

\*\* The registration is obligatory for any legal entities and commercial customers.

**Attention!** Free licenses for EyeComTec software products may be issued for customers with a real physical need of assistive technologies of this type (to get more information, please check the '**Free license**' section of the '**License agreement**' chapter). The more information is provided about a disease that caused full or partial loss of mobility, the higher the chances of getting approval and receiving a free license for EyeComTec products. All the information received from customers is thoroughly checked by our staff, thus all application forms with no information about the disease of the patient (C1 and C2) will be rejected.

The registration form contains several blocks with various questions:

- A. Information about the patient: the full name, an e-mail address, a phone number, a country and a city of residence;
- B. Information about an assistant or a caregiver of the patient: a full name, an e-mail address and a phone number;
- C. Information about the disease or situation that caused reduced mobility. It's recommended to use the C2 field to provide some additional information (e.g. possible reasons of the disease, current state of the patient, chances for rehabilitation and so on);
- D. Additional information: the date of birth of the patient, sex, native language (if the patient knows any other language, it can be indicated in the D3 field);
- E. In this section the customer has to select one or several EyeComTec program products required for the patient;
- F. Feedback section. In case the customer had already used EyeComTec program products, he or she is offered the chance to evaluate their usability. The customer can also indicate how they first heard about the EyeComTec Company, as well as provide us with any other information that is considered important according to the user.

It's recommended to fill in all the fields of the form.

## Registration verification

After submitting all the information into the registration form and providing all required data, the customer will receive a verification request to the e-mail address that was indicated on the registration form.

**Attention!** *It's required to confirm this verification request; otherwise the registration process will be stopped.*

After completing the verification process, the EyeComTec staff will check the completeness and accuracy of the provided information. After that, the customer will receive a serial number for the required software to the e-mail address that was indicated on the registration form.

## **Serial number activation and key obtaining**

It's required to activate the received serial number. In order to do that, the user has to follow the following link: <https://eyecomtec.com/25-Activation>.

A page with the activation form will be opened. The user has to indicate:

- User Name – the full name of the user (this name can be different than the name of the serial number owner);
- User E-Mail – an email address, which will be used to link the license;
- Serial Number – the serial number that was received by the e-mail address indicated during the registration process;
- Hardware ID – a hardware code, which can be obtained directly in the program.

**Attention!** *It's really important to indicate a correct and working main e-mail address, because all technical support will be provided exclusively to this address. We kindly recommend you to check all the provided information. Mistakes in the e-mail address can be changed only once and such a change will be considered as a hardware change (in order to get more information, please check the '**License hardware linking**' section).*

**Attention!** *In case an expected email from EyeComTec hasn't arrived within a reasonable period of time (usually up to 48 hours), it is recommended that users check their 'Spam' folder, as the email might have been directed there in error.*

**Attention!** *Only Latin symbols can be used in order to fill this form in (A...Z, a...z)! All non-Latin symbols will be automatically filtered. E.g. the user has to write '**Strasse**' instead of '**Straße**', or '**Michele**' instead of '**Michèle**' and so on.*

In versions of programs that were published starting from July 2016, the hardware code can be found in the **About** window, within the **Hardware ID** section.

**Attention!** *The user has to check the hardware code by launching the program only on the very same computer and hard disk partition where the user is going to launch the program in future. If the user performs the activation on one computer, but wants to work on another, all program copies will work as non-registered applications and won't be considered as properly licensed software!*

After filling in all the fields of the activation form, the user has to press the button to submit the information. A new page with a key code will appear. An email containing this code will also be sent to the e-mail address that was indicated during the registration process. The user has to copy this code and save it to the folder of the program. The name of the key file has to be the same as the name of the main file of the program with the .key extension (e.g. the key for the **ECTkeyboard** application has to be saved as ECTkeyboard.key).

In versions of programs that were published starting from July 2016, the user has a more convenient way of key adding. The user can just copy the key code (including the following symbols ' === '), paste it into a text field of the About window and press OK. The program will automatically save the key file in its folder. After that, the user has to restart the program.

**Attention!** *If there is an old key in the program folder, it's going to be removed and replaced with the new one. A copy of the old key will be saved as a backup file with the .bak extension. The name of this file will contain the name of the program and the date and time of saving in the YYYYMMDD-HHMMSS format (e.g. ECTkeyboard.key\_20160615-130722.bak).*

The registration of the user and program activation processes are considered as completed at this stage.

## **License hardware linking**

A free license for a program is valid for 1 year from the moment of activation. The user has the possibility of re-activating the license in case of a hardware or hard disk failure. Such re-activation can be done only once. To do that, the user has to contact the technical support of the EyeComTec Company, indicating the reason of the required license re-activation. The user can also contact technical support in order to change mistakes in the e-mail address that was indicated during the activation of the program, however, in that case the user won't be able to re-activate the program in case of a hardware failure. In both cases, such requests will be processed by the company's staff on a first-come first-served basis.

In case the user is trying to activate one serial number on a different computer, an error window is going to be shown.

The EyeComTec Company issues various types of software licenses. Depending on the license type, there can be the following options of the software use:

1. A license is linked to the serial number of the C: partition of a hard disk, the processor identification number, the computer name and the user name. This license has the strictest type of license hardware linking. It doesn't support the transfer of the program not only to any other computer, but even to a different partition of a hard disk. This type of license is offered for all patients who have a real physical need for EyeComTec assistive technologies.
2. A license is linked to the serial number of a hard disk and the processor identification number. This license type allows the user to transfer the program to any partition of the hard disk in the boundaries of only one computer.
3. A license is linked to the serial number of the storage device that was used during activation process. This option allows the user to link a program to a portable storage device and use it on various computers.
4. A partner license. In that case, the license is not linked to any computer parameters. Such programs will be considered and work as properly licensed on any equipment. There's no need to re-activate it. EyeComTec issues this type of license only for partners who are responsible for the safety of the license key and can guarantee impossibility of its compromising.

# License agreement

## General terms

This license agreement establishes substantive provisions, as well as describes the permitted and prohibited ways of use of the software developed by EyeComTec. The licensee has the right to use software products of EyeComTec only under the conditions described in this License Agreement.

All the software and all related intellectual assets (copyrights, algorithms, source code and technical documentation) are fully owned by the EyeComTec (LAZgroup SA) company. EyeComTec can provide a free exclusive and non-transferable license to any entities which are involved in charity or non-profit activities. In order to use software for commercial purposes, such a company has to contact EyeComTec directly and purchase a license. Any commercial use (with pecuniary interest) of the software developed by EyeComTec without license is strictly prohibited.

During the determination of the conditions and restrictions of use, the copyright holder provided all the information on a limited warranty basis as well as provided the rejection of any liability. This project is totally voluntary, and the parent company is not liable for any issued support packs or updates in front of those users who use software products of EyeComTec free of charge.

All users are obligated to observe and follow the requirements of this License Agreement.

## Restrictions on use

The end user is not allowed to use or permit the use of EyeComTec software products in any manner that may affect their functionality, including: modification of program binary source code, or participation in any operation that aimed at reverse engineering (decompilation) of software for personal or professional gain.

Also, the end user of the software under no circumstances has the right to change copyright information or use the names of software products in an inappropriate manner in order to obtain financial or material benefits. The user has no right to change, make copies of, sell, sublicense, advertise or distribute EyeComTec software products in any manner that is not allowed by this license agreement. As a charitable gesture from the company, all users are allowed to share EyeComTec software product installation packages amongst themselves and with other people.

Upon receipt of the license, the user does not receive any right to own copies of the software, and the copyright holder may prohibit subsequent sales.

All licensees have no right to re-pack the software and distribute it by including the software in a huge variety of installation packages that contain malicious programs or advertisement in any form.

## User registration

The registration of EyeComTec program products is mandatory for commercial customers and legal entities. Programs can be purchased directly from EyeComTec, as well as from partner companies. When the customer completes payment for software products, the company sends separate serial numbers for each copy of the purchased software. In case there are advanced versions available, the customer also receives links to download such versions.

Those users who have a physical need for EyeComTec assistive technologies can also complete the registration process. In that case, they can receive license keys for free versions of programs (to get more information, please check the '**Free license**' section of the '**License agreement**' chapter).

Private users can work with published versions of EyeComTec programs without registration or obtaining a license key. But in that case, such customers won't be able to use the technical support of the company. Furthermore, the 'About' window with various information will be shown during every launch of the program, offering the user to complete the registration process.

EyeComTec can issue free licenses for private or charity non-commercial use. Such companies are required to complete the registration process and indicate information about the planned use of the program products (field of use, aims and goals).

Any commercial use of published software without obtaining a license will be considered as an infringement of the User Agreement (to get more information, please check the '**Restrictions on use**' and '**Paid commercial license**' sections of the '**License agreement**' chapter).

User registration is the easy and safe way to provide feedback between the development company and consumers: patients and medical centers.

Collection of such statistical data is extremely important for EyeComTec, because it allows the company to get detailed information about the needs of specific users, and improve the software in accordance with these needs. The program complex is developed continuously and many features of current versions were invented due to feedback from users.

In addition, a database of contacts allows for informing patients promptly about new and yet unpublished software products and updates of the EyeComTec program complex. Furthermore, users are able to receive information on the functionality of basic and advanced versions in a timely manner.

## Differentiation of commercial and noncommercial licenses

### 1. Noncommercial License

#### 1.A. Noncommercial license for clients with physical needs.

(this type of license does not apply to customers, who are undergoing a paid rehabilitation course – see section 2.2, paragraph A)

EyeComTec software products are provided free of charge to all people who are experiencing a physical need in the use of such a category of programs. This group of people includes all those patients who suffer from various forms of paralysis or other muscular activity restrictions. All software products are free for non-

commercial use. E.g. when the patient uses our software for text typing, he or she is not obligated to purchase a commercial license.

#### 1. B. Noncommercial license for charitable organizations.

Charity companies and rehabilitation centers can use all EyeComTec software products free of charge if they provide their services to patients on a free basis.

### **2. Paid commercial License**

#### 2.A. Commercial license for paid clinics and rehabilitation centers.

A commercial license for program products of EyeComTec is necessary in any case of paid services provided by medical companies or rehabilitation centers. Such a commercial license is required for each separate copy of the program in use. Only one copy of each licensed program may run at the same period of time.

All the assistants and third-party specialists who provide paid services to their patients and involve EyeComTec software products in their work are also obligated to purchase a commercial license.

In any case where the user is undergoing paid treatment, involved in a rehabilitation program in a commercial institution or uses the paid services of any third-party medical specialist, he or she is not allowed to use a personal non-commercial license. The user is strictly not allowed to use any EyeComTec software product to communicate directly with any paid healthcare specialist or representative of a commercial establishment. In such cases, the rehabilitation facility or attending specialist are obligated to use and provide to the patient their own commercially licensed copy of the software. This restriction extends over the entire period of treatment or rehabilitation of the patient.

#### 2.B. Commercial license for software integrators and resellers.

All the companies and experienced specialists who provide paid services for the installation and integration of EyeComTec software products to third parties, as well as maintenance and technical support for such programs, are obligated to purchase a commercial license. The sale of software products to customers with a physical need of them is strictly prohibited (see section 2.1, paragraph A).

#### 2.C. Commercial license for extended program versions that are intended to use in a non-medical environment.

The EyeComTec Company developed extended versions of their programs (in particular, ECTtracker), which are successfully used in factories, shops, automated assembly lines and quality control systems. Such program versions are distributed on individual licenses and are not intended for public distribution. In order to get the full information about features of programs, a full quotation including price of purchase and support, as well as the cost of specialist training, please contact the EyeComTec Company.

Furthermore, our company developed various additional applications that can significantly enhance the functionality of our programs. When such applications are in use with extended versions of our programs, they can be used for additional automation of analyzing and controlling manufacturing processes.

Specialists from the EyeComTec Company are ready to create an individual system that is best suited for your needs. The system is going to be created on software modules that were created taking into account all the distinctive features of the processes.