



USER DOCUMENTATION



IOnlyThink
A BRAIN-COMPUTER INTERFACE SYSTEM

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User documentation of I Only Think

I Only Think (IOT) is a direct neuronal interface which allows, with the help of an electro-encephalographic helmet (EEG headset), to realise some simple actions on a computer, using your thoughts. *IOT* is aimed to permit disabled people, or people which can't use the standard peripherals (mouse and keyboard), to use a computer and access to the numerical world.

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I – PROJECT PRESENTATION

I.1 – Definitions, context and history

I Only Think is a project developed since 2009 as an EIP (EPITECH Innovative Project).

An EIP is an internal project at the School of Computing EPITECH. This is a two-year project launched in the last two years of the course (fourth and fifth years). It is the realization of the work done during the five years of studies in this school.

An EIP is a concrete project, established on all sides by a single group of students and followed by a dedicated teaching team.

IOT is a neural interface for using an EEG headset to perform simple actions directly on computer by thought. It was first created by a group of students in 2009. It was at this time developed in partnership with the INRIA (National Institute for Research in Computer Science and Control, in France), the parent institute of the OpenViBE project.

OpenViBE is a software solution to design, test and use of brain-machine interfaces. It allows, as part of *IOT*, to interface different types of EEG headsets ensuring full interoperability with those compatible OpenViBE.

An EEG headset is an electrode system receiving certain signals from the brain activity. These analog signals are then amplified and converted into digital signals which can be interpreted by a computer using an acquisition device.

In 2011, the project was taken over by a second group of students, also as part of an EIP at EPITECH until mid-2013.

I.2 – Specifications

IOT uses an electroencephalographic helmet (EEG helmet) to analyse and interpret the thoughts of a user and a camera (or webcam) to emulate a cursor via a principle of eye-tracking (tracking eye movement). Both technologies can be used independently or simultaneously.

The project is based on OpenViBE for interpreting signals from the EEG helmet, allowing full compatibility with helmets supported by OpenViBE.

The project is divided in two parts:

- The *Builder*: A simple tool for performing ergonomic layers customized for any program. These layers allow you to choose selectable and clickable areas of each application.
- The *CEG* (or *GEC*, Graphical Environment Controller): This is the core of the project to navigate using the EEG helmet and / or eye-tracking. The CEG is able to load the layers generated using the Builder and then associate them with corresponding applications or programs. The CEG also has a standard layer used with any programs.

I.III – Prerequisite

I.III a – Hardware configuration

We recommend the following hardware configuration to run *IOT*:

- An EEG helmet compatible with OpenViBE (list of compatibility: <http://openvibe.inria.fr/supported-hardware/>)
- A video-camera or webcam high resolution (to use the eye-tracking solution)
- A computer with a dual-core processor is highly recommended (mandatory for the eye-tracking solution)

I.III b – Software configuration

We recommend the following software configuration to run *IOT*:

- The OpenViBE software (download at: <http://openvibe.inria.fr/downloads/>)
- A Microsoft Windows 7 (32 bits or 64 bits) or Linux (tested on Ubuntu and ArchLinux) operating system

The rest of this documentation has been realized using the Microsoft Windows 7 operating system, the Linux procedure being very similar.

II – INSTALLATION OF IOT

II.I – Standard installation

To complete the installation of IOT, just download the full installer available on our web page inside the "Download" part.

The Microsoft Windows installer is available (.exe) and a Debian package (.deb) for installation on Debian and Ubuntu. Please then follow the standard procedure for installing on your operating system.

MD5 hash controls are generated for each publication to ensure the safety of users. We strongly encourage you to check any file downloaded using these hash controls.

II.II – Installation from the sources

To allow installation on any operating system, sources are also available for download.

These sources are available as an archive in various formats on our website inside the "Download" part.

You can download them to compile, read, or modify to your liking.

Installation instructions of these sources and the list of external dependencies are subject to an external documentation available within the archive or on our web page, "Documentation" part.

MD5 hash controls are generated as well for each publication to ensure the safety of users. We strongly encourage you to check any file downloaded using these hash controls.

II.III - Installing and Configuring OpenViBE

OpenViBE is a necessary software to use IOT for the various interactions between the EEG helmet and the CEG.

You will find all information about its installation and configuration for use with IOT on our web page, "Documentation" part.

III – THE *BUILDER*

III.1 – Launching of the *Builder*

To start the *Builder*, go to the *IOT* installation folder and run the executable file named "builder.exe." A layer then appears (the screen becomes a little more opaque) and a toolbar on the left.

III.11 – *Builder* utilisation

III.11 a – Principle

The *Builder* is used to create custom layers for applications to choose selectable and clickable areas for each application. It makes the use of the *CEG* (or *GEC* for Graphical Environment Controller) more convenient and faster.

Using the *Builder*, although recommended, is not required to operate the *CEG*.

The *Builder* requires a valid person to be used.

III.II b – Menu

Here is the description of the possible actions of the toolbar (top to bottom):



Picture 1 – Toolbar

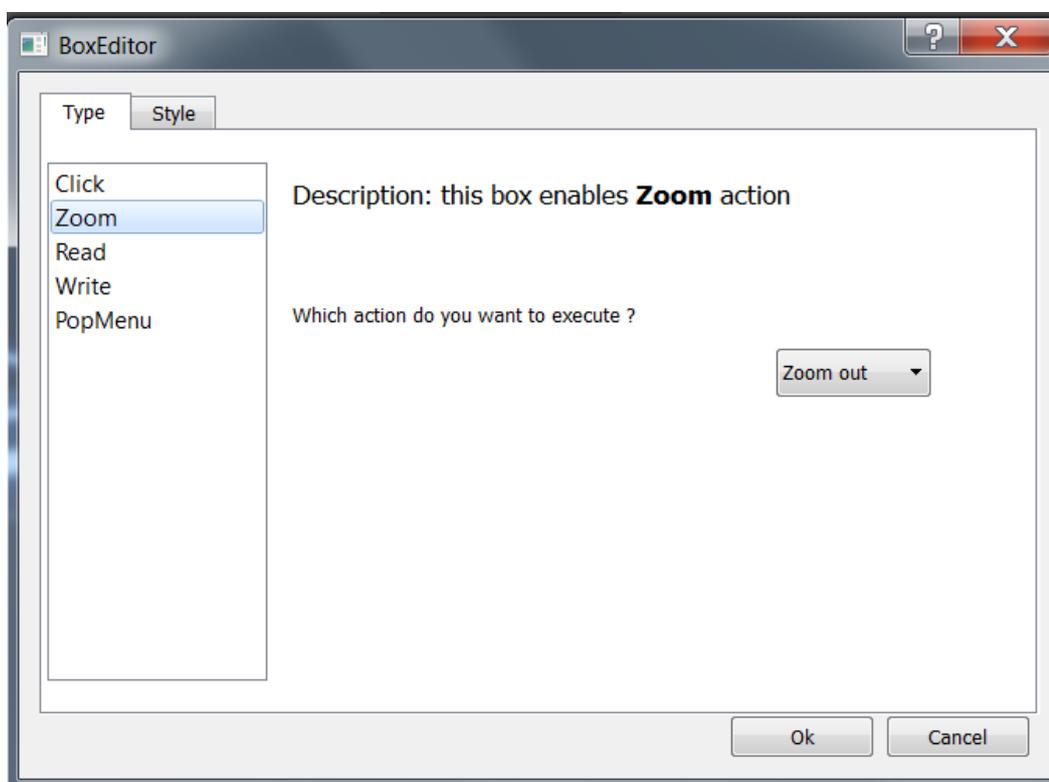
III.II c – Function "Edit Box type"

The tab "Type" allows you to assign actions to a Box.

Here is the list of available actions:

- "Click" simulates the click of the mouse (left click, middle click, right click, double left click)
- "Zoom" divides the layer into sub-slap
- "Read" hides the box to read the text behind (ability to define the time during which the box is hidden)
- "Write" allows you to write text
- "PopMenu" brings up a menu (can define the type of menu)

In addition, the "Style" tab allows you to define the style of your Box (colour, shape, etc.).

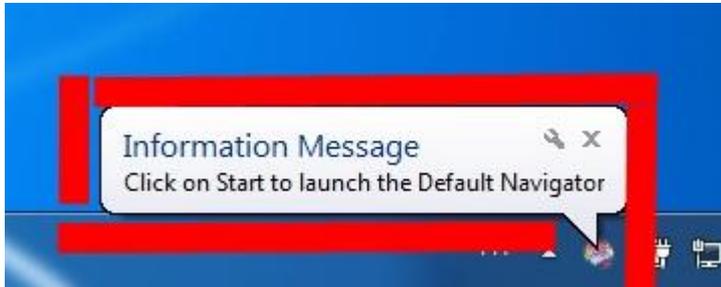


Picture 2 – Box configuration menu

IV – THE CEG (OR GEC FOR GRAPHICAL ENVIRONMENT CONTROLLER)

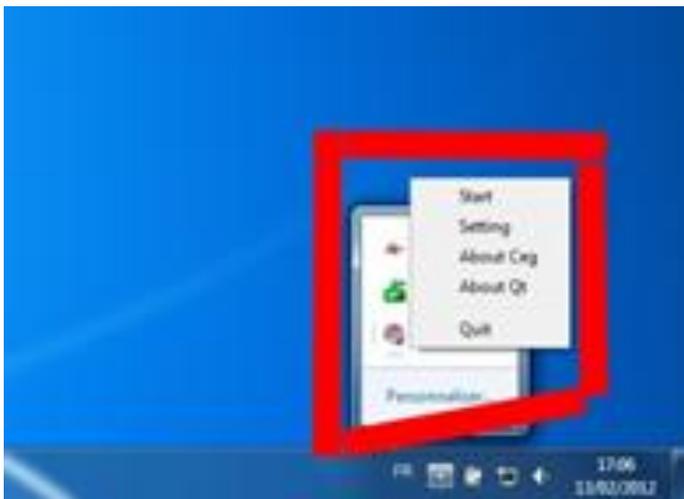
IV.1 – Launching of the CEG

To launch the CEG, go to the IOT installation folder and run the executable file "ceg.exe." You should see an icon at the bottom right of your screen (systray area) and a notification like the picture below.



Picture 3 – CEG launching message

Then make a right click on the icon "I Only Think" at the bottom right of your screen. You will see a menu giving you the choice between the execution of the CEG and its various parameters.



Picture 4 – Start menu

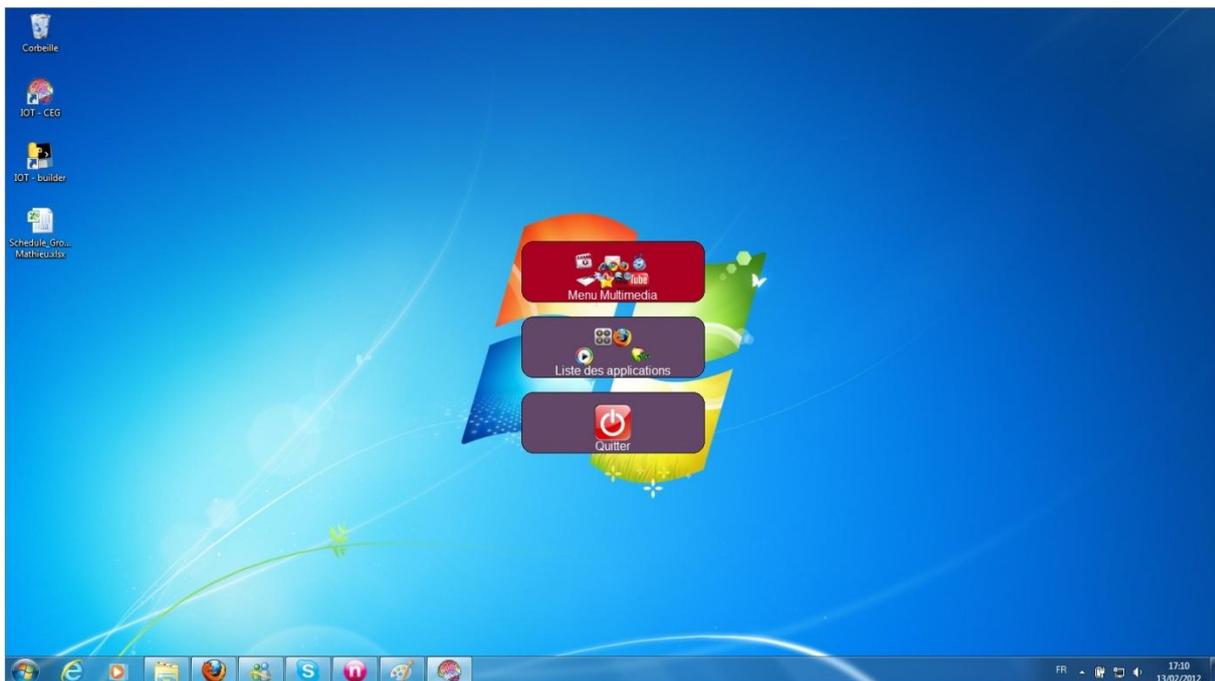
IV.II – CEG utilisation

The CEG is the core of IOT and allows any user to use a computer by thought.

IV.II a – Execution

During the execution of the CEG, you will see a menu that offers three actions:

- "Media Menu" provides access to frequently used applications
- "Application List" lists the applications previously configured in the Builder
- "Exit" exits the CEG



Picture 5 – Main menu

IV.II b – Standard utilisation

When running an application, if the software does not find any custom layer in the Builder, a layer will be displayed on the screen as in the picture below.

You can then navigate through different areas using the different available actions (right, down and select).

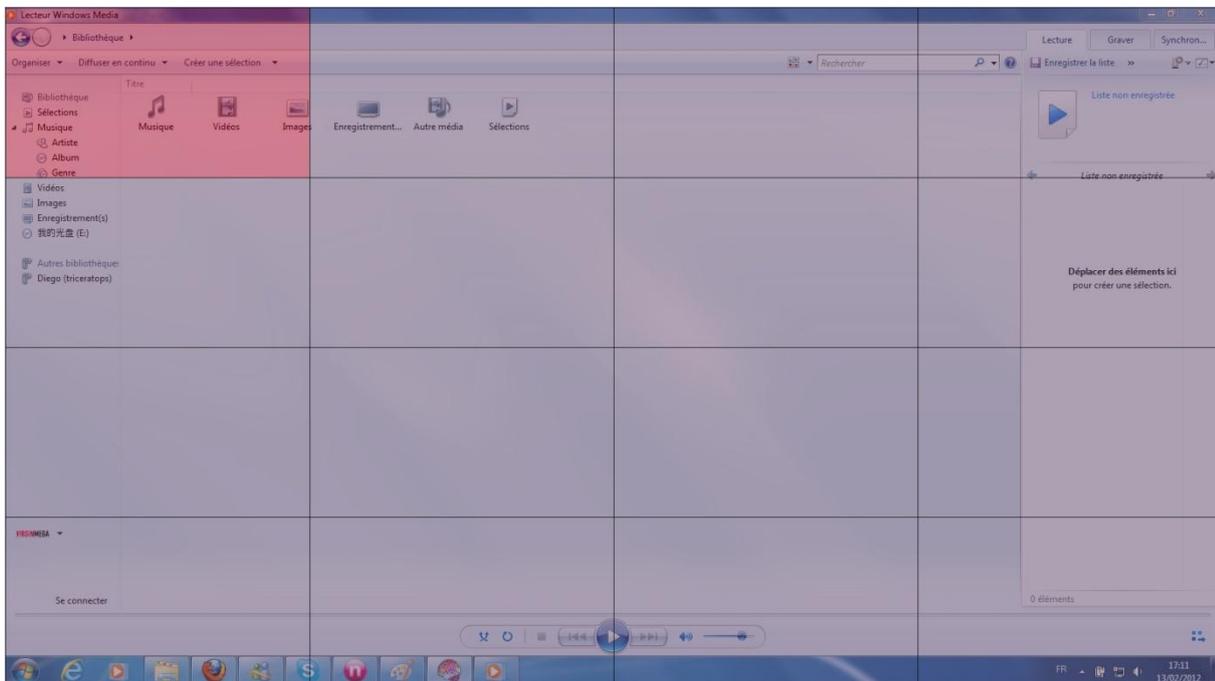
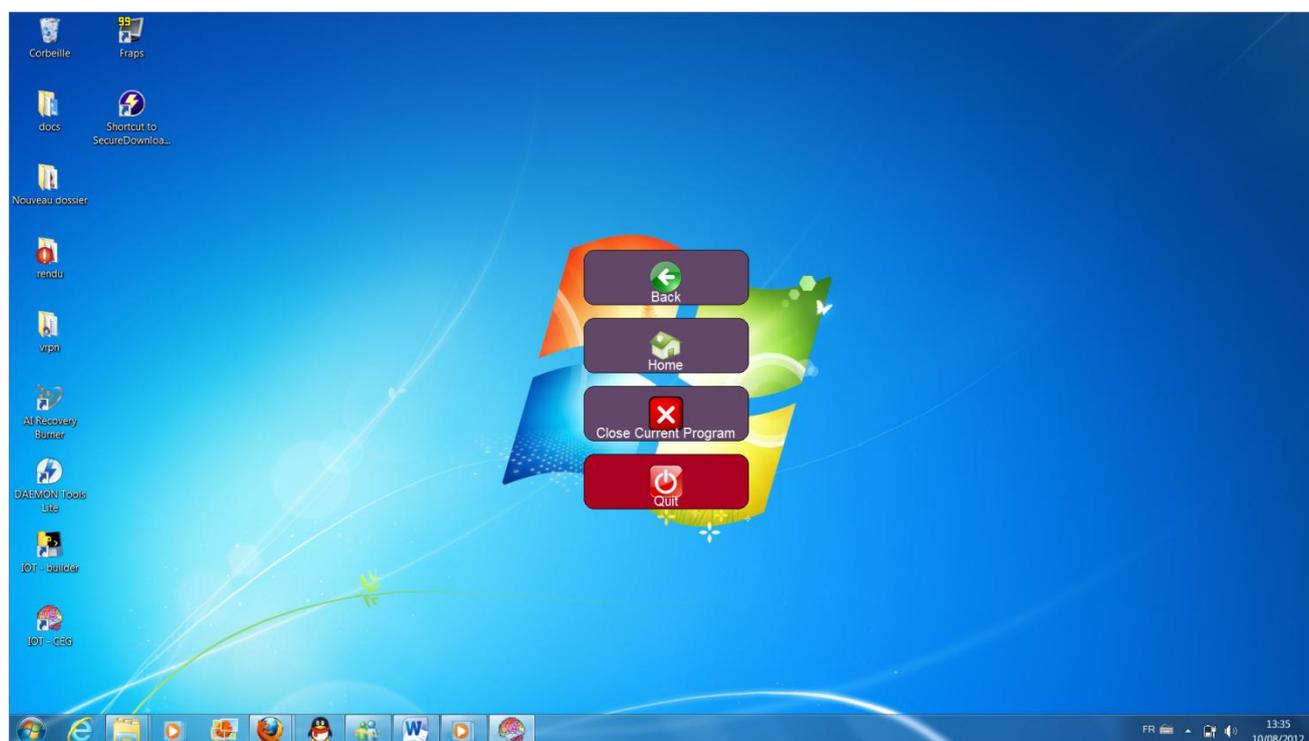


Image 6 – Standard layer

If you go to the right, a menu appears and offers you four actions:

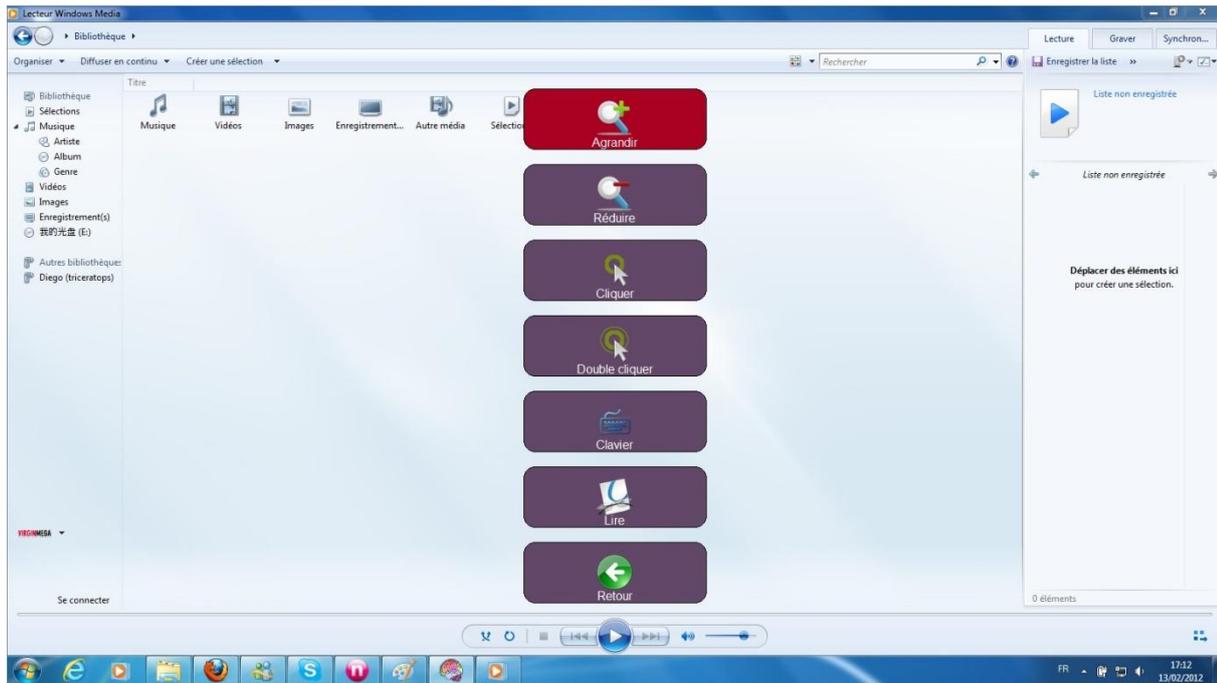
- "Back" returns to the layer
- "Home" closes the layer and backs to the first menu (see IV.II a)
- "Close Program" closes the application layer and backs to the first menu
- "Exit" leaves the CEG



Picture 7 – Right menu

If you use the action "Select", a new menu appears and offers you the following:

- "Zoom" zooms in on the selected area
- "Reduce" zooms out on the selected area
- "Click" simulates the left click of the mouse
- "Double click" simulates the double left click of the mouse
- "Keyboard" brings up a virtual keyboard
- "Read" hides the menu to read the contents placed in the background
- "Back" returns to the layer



Picture 8 – Actions menu

IV.II c – Utilisation with a custom layer

If an application has a layer which has been customized using the Builder, this application directly opens with the layer above.

You can then navigate through the different boxes using the available actions ("Right", "Down" and "Select").

If you go straight to the right a menu appears, similar to the default usage, and offers the same actions. (cf.IV.II b)

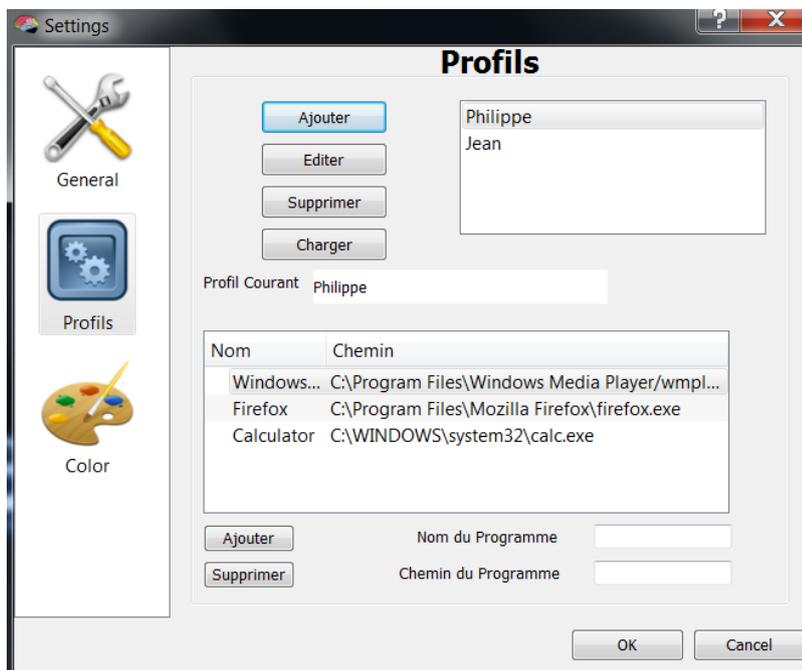
If you use the action "Select", the operation defined when creating the layer occurs. (cf.III.II c)

IV.II d – Settings

The "I Only Think" icon in the system tray can also change the settings of CEG.

Here are the different editable parameters:

- "Language" changes the language used
- "Default Boxes" changes the number of division of the layer (eg, if the value is 4, you have a layer with a 4x4 grid)
- "Colour" changes the colour of layers and Boxes
- "Profiles" custom the actions you can perform and the applications for the menu



Picture 9 – Settings menu

FURTHER INFORMATION

License

IOT is an open-source project under the GNU/GPL license. The complete terms of use of the GNU/GPL license are available on the following address: <http://www.gnu.org/licenses/gpl.html>.

Contact

Please visit our Web page for any further information: <http://eip.epitech.eu/2013/iot/> .

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