



OPEYE

eZoom

User documentation and guide



Co-funded by the
Erasmus+ Programme
of the European Union

Collaborating partners



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This project has been funded with support from the European Commission.

This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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Introduction

During the last decades, technology has become one of the most important tools as a window to the world. Unfortunately, this window is not open for everyone and presents some accessibility barriers. Those barriers avoid people with different capacities to access the Internet and other digital contents. In order to overcome those limitations, there are some proposals, such as Eye Trackers (ET), but they are not specifically oriented towards visually impaired people (VIP), a collective with special needs which can take very big advantages from the audio-visual media.

In our attempt to facilitate VIP's access to those contents, we've created a software suite, in collaboration with experts from Luxembourg, Poland, Italy, Slovenia and Spain from different professional profiles, all of them related to the fields of visual impairment, special education and enabling technologies. The requisites for the ET system were strongly committed to a low-cost approach, by using a desktop-webcam which almost every user could afford to buy.

A software for gaze tracking has been developed. This software is based on video processing and deep learning. The software itself is meant to be used as an external library but, as it is open source, it can be included in every project and be used as a framework in case that better suits the needs of the development team.

To test the library's capabilities, a magnifier application has been programmed aside - as a proof of concept. This application uses the library to estimate where the user is looking at, magnifying the contents which are being shown in that area. The magnified area is configurable in many ways, for instance, the dimensions, the colour palette and zooming level among others.

You can find more information about our project on the website opeye.eu, especially in the [Survey on gaze estimation in the context of visual impairments](#).

Following you will find a more specific user guide for magnifier application eZoom.

Introduction to visual impairment

According to the World Health Organisation there are approximately 285 million people with visual impairment - from which 39 million people are blind and 246 million partially sighted. 65 % of all visually impaired population are 50 or more years old and about 19 million children have visual impairment. 90 % of all visually impaired population lives in developing countries.

World Health Organization suggest that low vision means visual acuity between 30 % (normal vision has 100 %) and light perception with the best possible correction or a visual field of 20 degrees or less. Partially sightedness is determined in two categories (30 % - 5 % visual acuity or 20 - 10 degrees of visual field) and blindness in three categories (5 % of visual acuity to no light perception and 10 degrees of visual field or less).

The most common eye diseases are: cataracts, age-related macular degeneration, diabetic retinopathy and glaucoma. Different eye diseases result in different types of visual impairment, meaning lower visual acuity and/or smaller visual field, that cannot be improved to normal vision even with optical correction.

Visual impairment can severely affect quality of life. Blind people often have difficulties with their daily activities (e.g., driving, reading, sewing, and walking) and social interactions. Partially sighted persons can have trouble with reading small text, identifying small visual images with low contrast, night blindness etc. and both populations usually need more time to solve tasks at school, work or home and the support of special teachers for the visually impaired.

Magnifying software as a solution to the difficulties of people with low vision

Because of lower visual acuity and/or scotomas (areas of partial alteration in the field of vision consisting of a partially diminished or entirely degenerated visual acuity that is surrounded by a field of normal – or relatively well-preserved vision over visual field) people see the visual content more efficient with individual magnification of smaller text, picture sizes or distance views.

There are several different types of magnifiers available for the visually impaired that can assist them both at home and on the go. When choosing a magnification device, it is important to consider the various vision needs and the visual task. Magnifying lenses are designed in many ways to assist with various applications.

Different types of magnifiers can be used - handheld, stand, spectacle, telescopic and electronic video magnifiers. With video magnifiers one can choose the enlargement and contrast needed and can also use it as text reader or connect it to a computer screen. Additionally, a combination of video magnifier and computer screen can be used on a single monitor using either vertical or horizontal split screen.

In most advanced screen magnification programs, enlargement and other enhancements, such as colour, pointer, cursor, focus, etc enhancements, can be adjusted for individuals.

Application overview

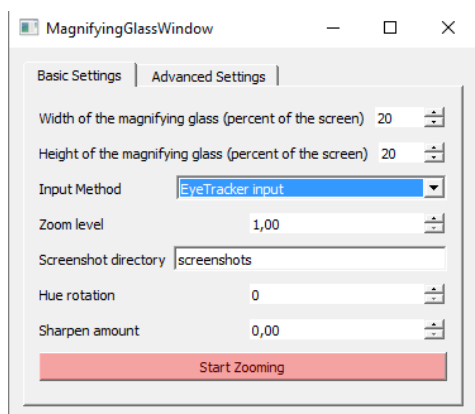
In the showcase application eZoom, the magnification lens is controlled by the user's gaze. This lens shows a portion of the screen magnified while keeping the rest of the screen visible. The lens's position is controlled with the user's gaze and not as otherwise common by the mouse cursor position. The idea is that even with low visual acuity you might still want to perceive the whole screen contents to get more context.

Magnifying Glass Windows Configuration

To start the application, open the folder where the application was copied to and run the file **magnify.exe**.

libEGL.dll	24/10/2018 11.26	Estensione dell'ap...	15 KB
libGLESv2.dll	24/10/2018 11.26	Estensione dell'ap...	2.451 KB
magnify.exe	24/10/2018 11.26	Applicazione	829 KB
opencv_core341.dll	24/10/2018 11.26	Estensione dell'ap...	7.981 KB
opencv_highgui341.dll	24/10/2018 11.26	Estensione dell'ap...	175 KB
opencv_imgcodecs341.dll	24/10/2018 11.26	Estensione dell'ap...	2.562 KB

The configuration window will be displayed and looks as follows:



In the lower part of the window the "Start Zooming" button is located which allows you to activate the magnifying glass which will improve access to the information contained on the screen.

The other options available in the configuration window make it possible to adjust the options of the application more efficiently to the user's needs.

Settings Overview

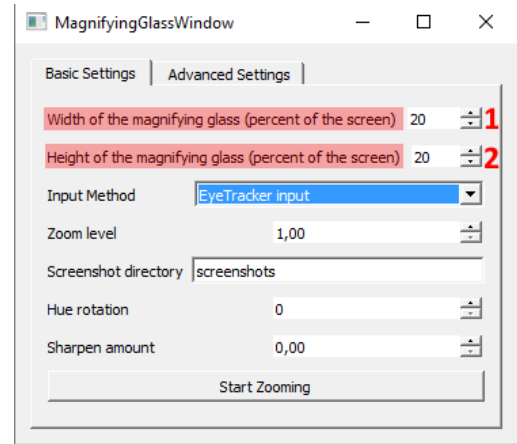
Let's see the individual options available.

Magnifying glass size

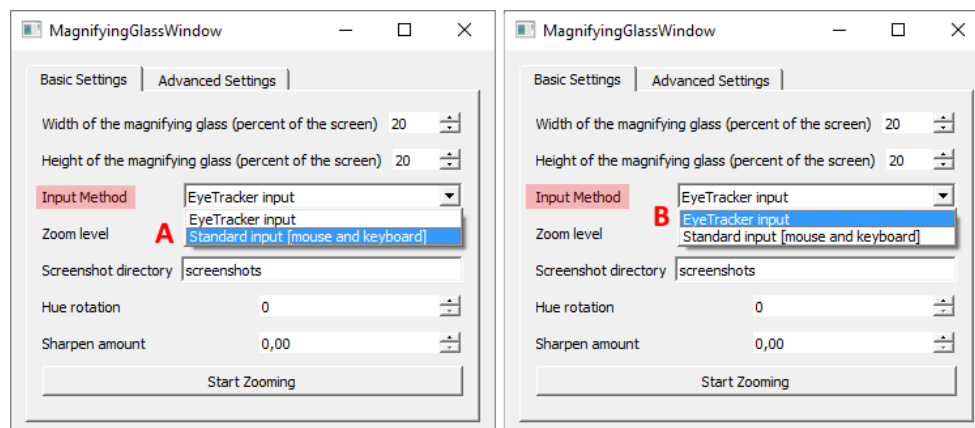
The dimensions of the lens can be changed.

By changing the value of option 1, you can change the width of the lens by indicating a percentage value relative to the overall width of the screen (see shortcut in List of shortcuts).

By changing the value of option 2, you can change the height of the lens by indicating a percentage value in relation to the overall height of the screen (see shortcut in List of shortcuts).



Input Method



The movement of the lens on the screen can be managed in two different ways:

Standard input [mouse and keyboard]

By choosing this option the lens will follow the mouse pointer. In case the Facilitated Access option has been activated that foresees the use of the numeric keypad as an alternative to the mouse, the movement of the lens can be controlled also with the keys of the numeric keypad.

EyeTracker input

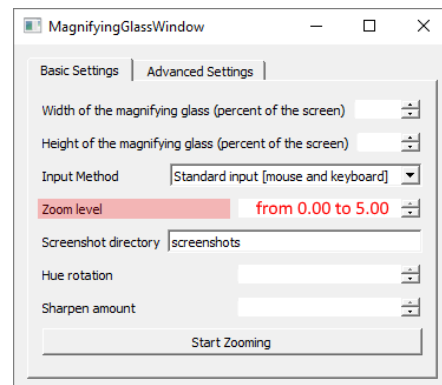
By choosing this option the lens will follow your gaze while browsing the contents on the screen. Make sure you have the camera pointed to your face and eyes. Only one person should be in front of the camera. Make sure the illumination is optimal.

Zoom Level

Through this option it is possible to change the zoom level of our lens.

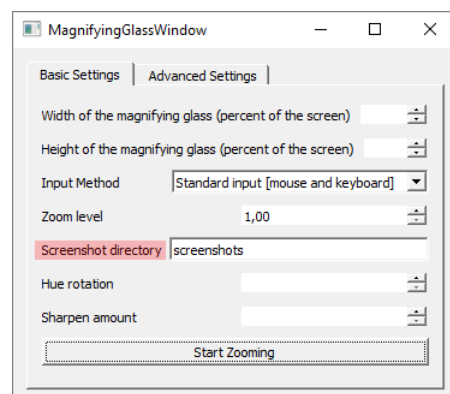
The minimum magnification value is 0, the maximum value is 5.

Values with centesimal portions can be used.



Screenshot directory

While looking a page on the screen with the magnifier, it is possible to screenshot some useful images or information and indicate in which folder screenshots will be stored.

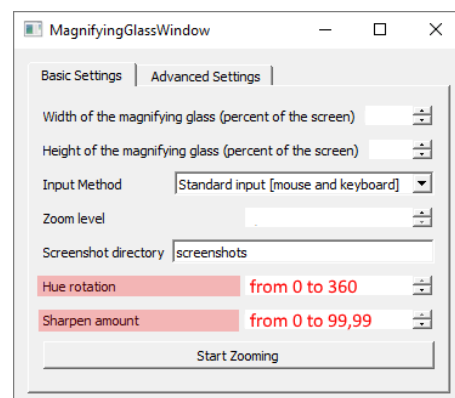


Colour palette & Sharpen amount

By changing the Colour palette and Sharpen amount options, you can improve the presentation quality of the image within the lens.

The Colour palette value must be defined in a range from 0 to 360.

The Sharpen amount must be defined in a range from 0 to 99.99.



Information for developers

If you are a developer and interested in using the library in your own projects, feel free to visit the following links:

- Technical documentation:
<https://github.com/Opeye-erasmus/OPEYE/tree/master/documents>
- Source code:
<https://github.com/Opeye-erasmus/OPEYE>

List of shortcuts

Start/Stop magnification	Ctrl + Enter (Numpad & Default)
Increase Zoom level	Ctrl + Arrow Up
Decrease Zoom level	Ctrl + Arrow Down
Increase Magnification Window height	Ctrl + Alt + Arrow Up
Decrease Magnification Window height	Ctrl + Alt + Arrow Down
Increase Magnification Window width	Ctrl + Alt + Arrow Right
Decrease Magnification Window width	Ctrl + Alt + Arrow Left
Show/Hide configuration window	Ctrl + Spacebar
Take a screenshot	Ctrl + P
Close application	Alt + F4