Manual for Smartphone Optogenetics Android App

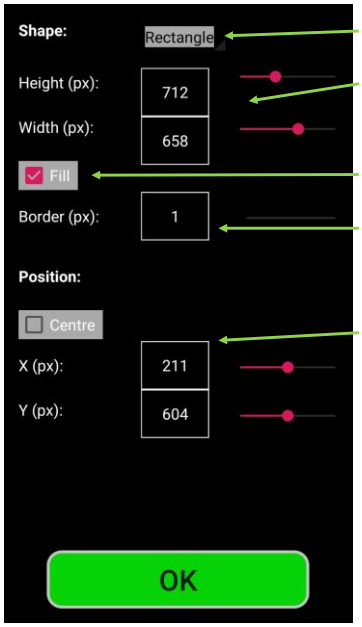
Introduction

This Android app can be used for optogenetic stimulation of small animals. Is has been tested with *Drosophila melanogaster* (fruit fly) larvae and flies. The main aim of the app is to display a time sequence of rectangles or spheres of user-defined size, colour, and location.

Installation and operation of the app

1. Install the app on the smartphone or tablet simply by executing the .apk file. You will find the most recent version in our Github repository:
2. Select settings according to the screens below:

First screen



Select shape:
Rectangle, circle, or picture

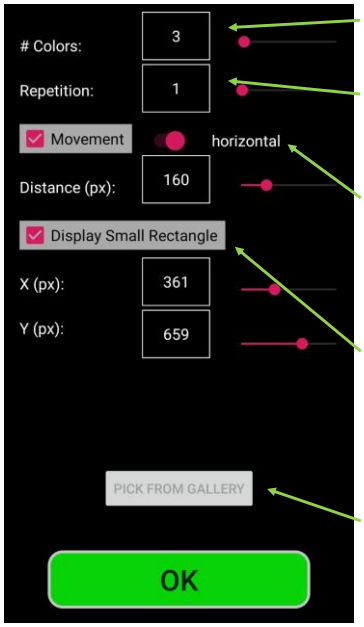
Define height and width:
Use slider or type in

Fill:
Tick if shape is solid, untick if you want to display a hollow frame

Border:
If shape is not filled, then define here the width of the frame

Position:
Define the (starting) location of your displayed object. (0,0) position is in the top left corner of the display. Tick "centre" to centre the position on the display.

Second screen



Select the number of colours
you want to display in a sequence

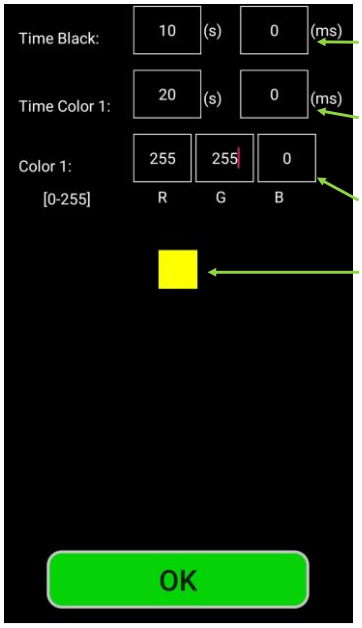
Repetition:
How often is the whole sequence repeated

Movement:
Tick if your object shall move over the display. Select horizontal or vertical movement and the distance that shall be travelled.

Display small rectangle:
Tick if you wish to have an additional white rectangle shown on the display whenever the display shows a colour. Define location by setting x and y values.

Pick from gallery:
If "Picture" was selected on the first screen, then load your image here from the gallery.

Third screen



Time black:
The sequence will always start with a black period. Define the time here.

Time color 1:
Define the time for the displayed colour here.

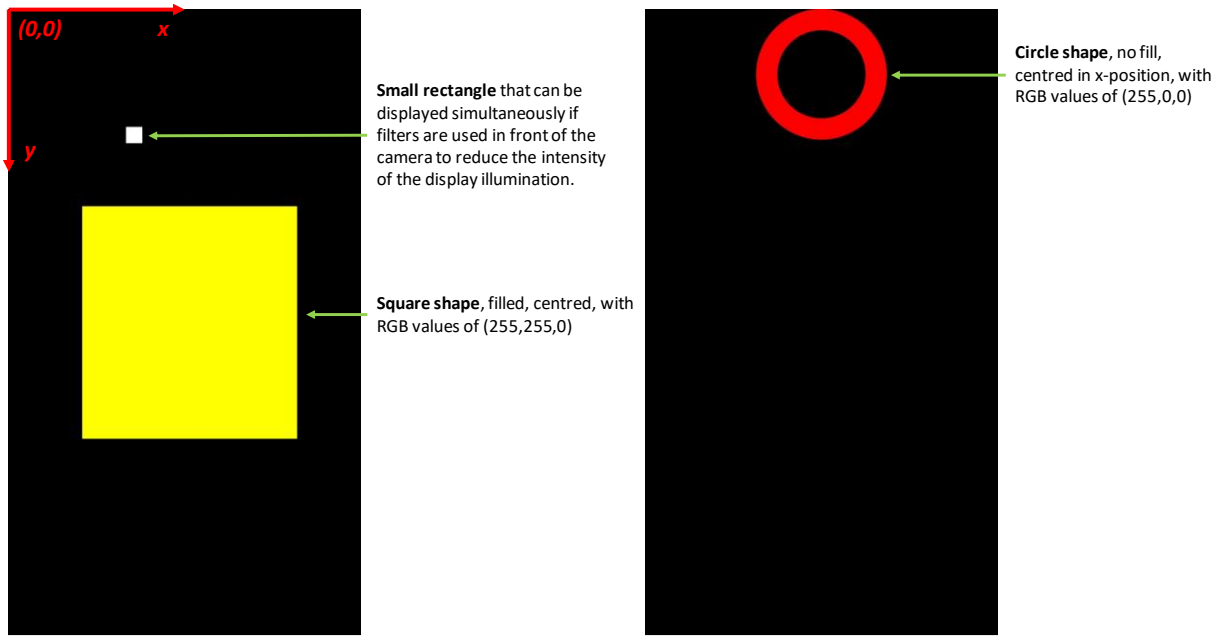
Color 1:
Select a colour from the RGB space by typing numbers between 0 and 255.

The colour defined above is shown here.

The third screen will be repeated if more than one colour was selected

3. If more than one colour was selected, the third screen is repeated for each colour.
4. As a result, you will obtain a time sequence of black screen followed by the colour and shape selected. Two examples are shown below:

Examplary output screens



5. After the stimulation sequence has finished, the screen will remain dark until the user goes back. Going back once, will bring the user to the first screen displaying default values. Going back twice, the user will see the previously entered values.

Notes

- The **light intensity** can be selected by selecting appropriate RGB values. Independent of the current display brightness levels, RGB values of 255 will set the pixel intensity to the maximum possible with the used smartphone. Note that – depending on the used smartphone model – RGB values do not always scale linearly with brightness.
- **If the display does not react** (e.g., due to agarose or water droplets on top), lock and unlock the screen. This should solve the problem without needing to remove everything.
- The **small rectangle** that can be displayed by ticking the respective box on the second screen was introduced for the following reason: We used an infrared light source for illumination of *Drosophila* larvae. The display intensity was very high compared to the contrast achieved by the infrared light source and caused overexposure of the camera. Thus, we mounted an additional red longpass filter in front of the camera. Doing so, blue and green patterns displayed on the smartphone became invisible for the camera. So in order to record when the display was turned on and off, the small white rectangle, which is synchronized to the timed stimulation, was displayed outside the stimulation area.
- If **movement** is selected, it is advised to start at (x,y) = (0,0) position. Starting at other positions, we noticed some problems on older smartphones.

If you find any bugs or problems, please send us an email so that we can improve the app:
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