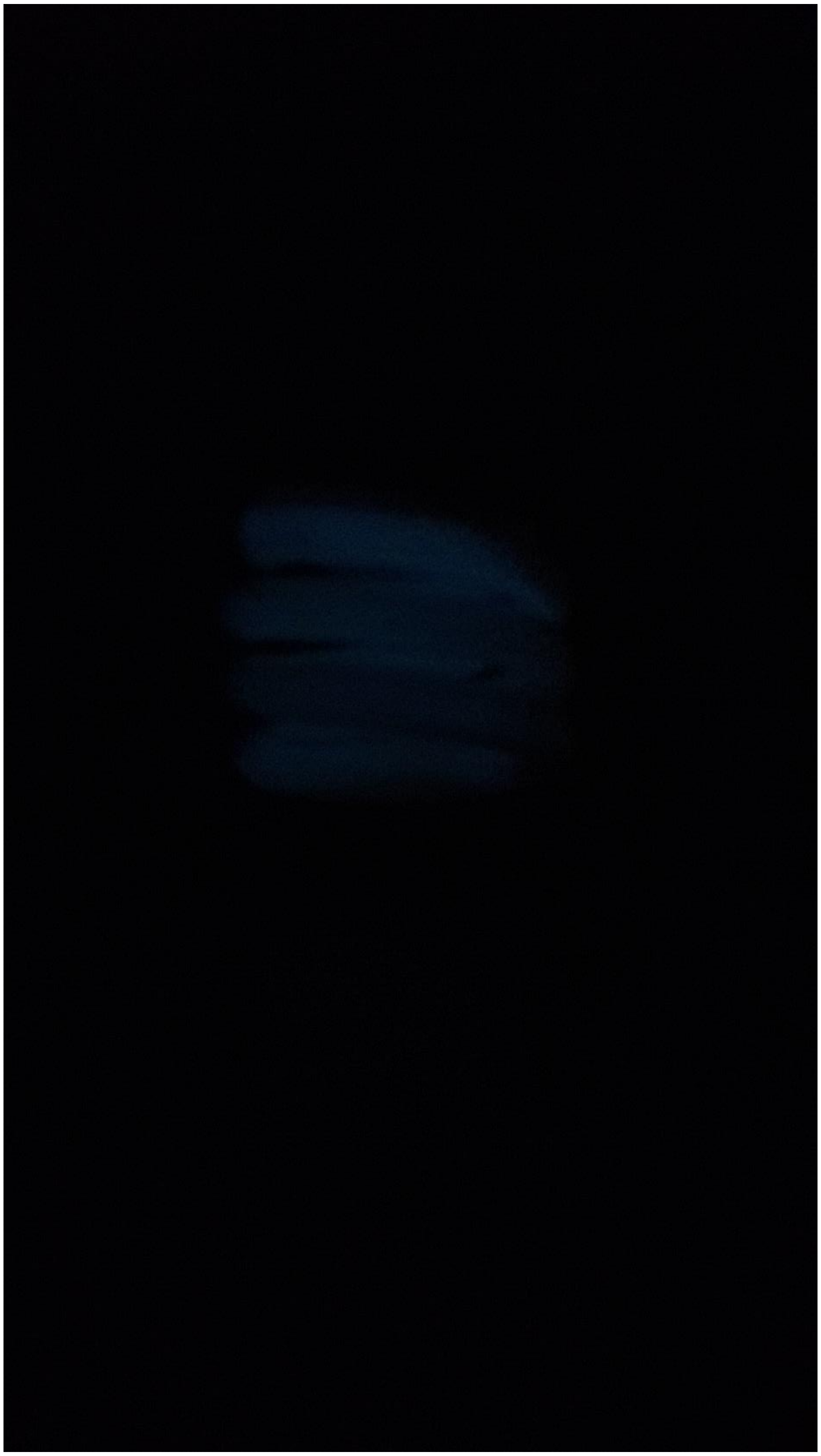
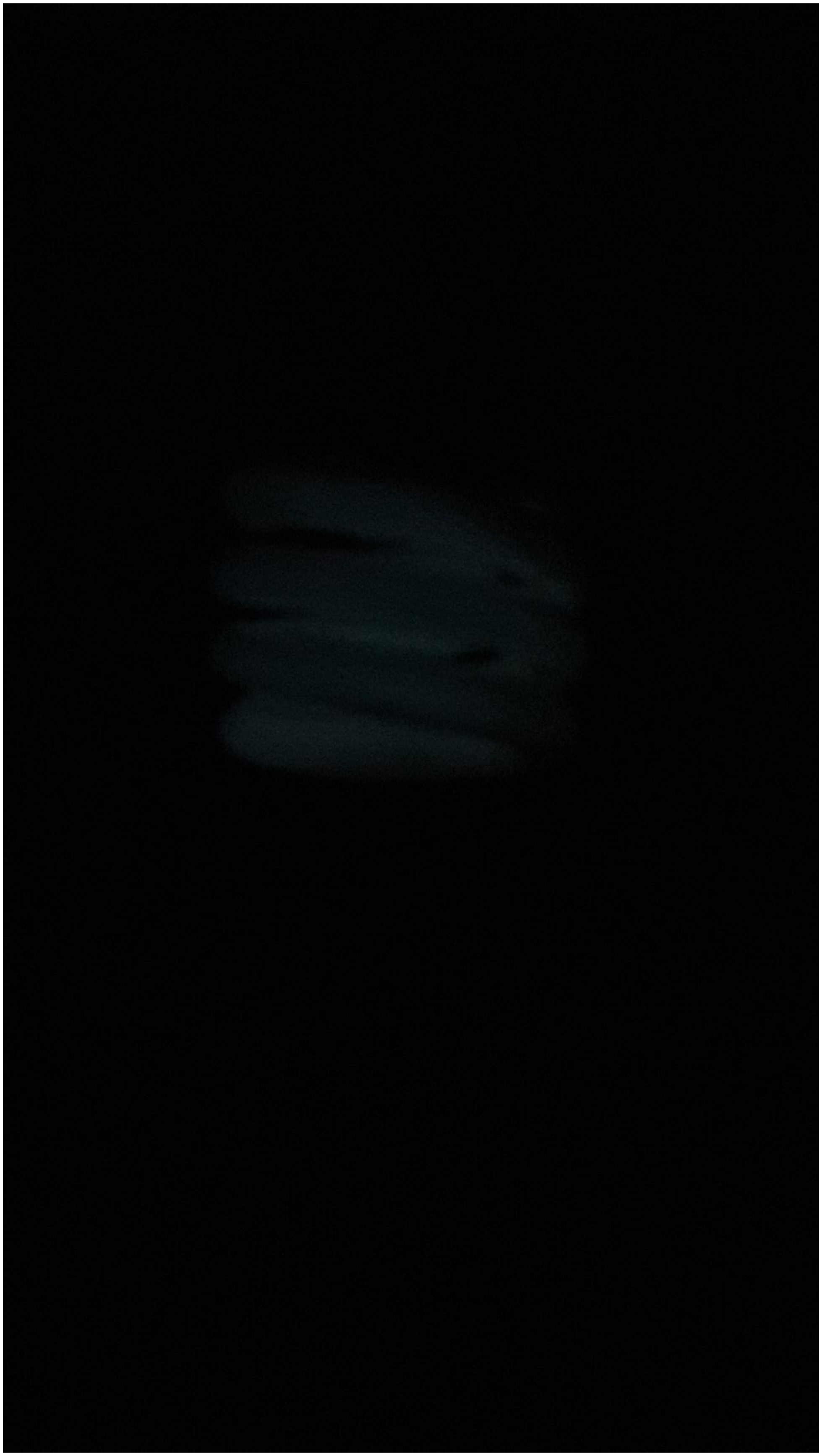
Youssef A. K. Hassan

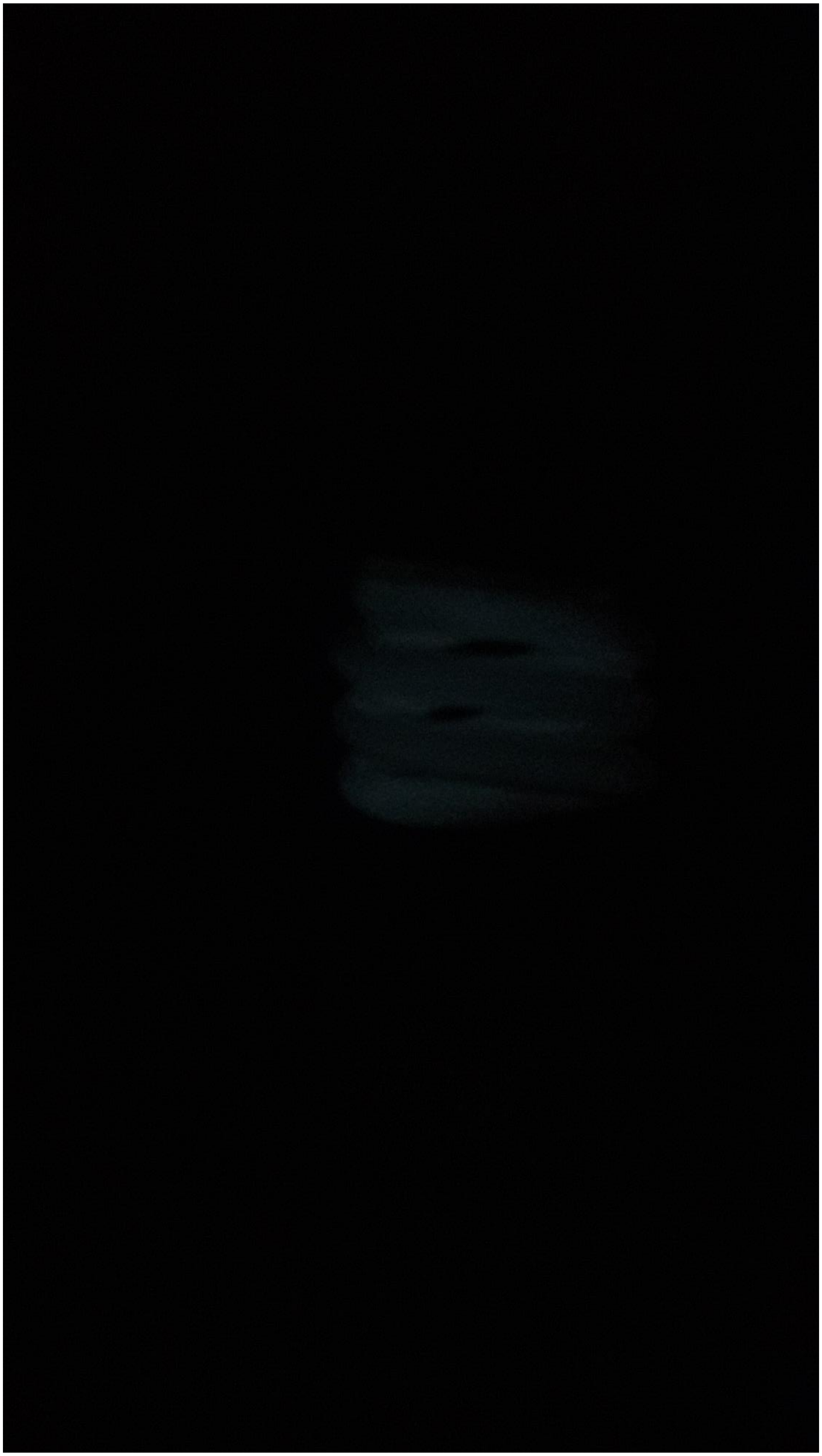
900132871

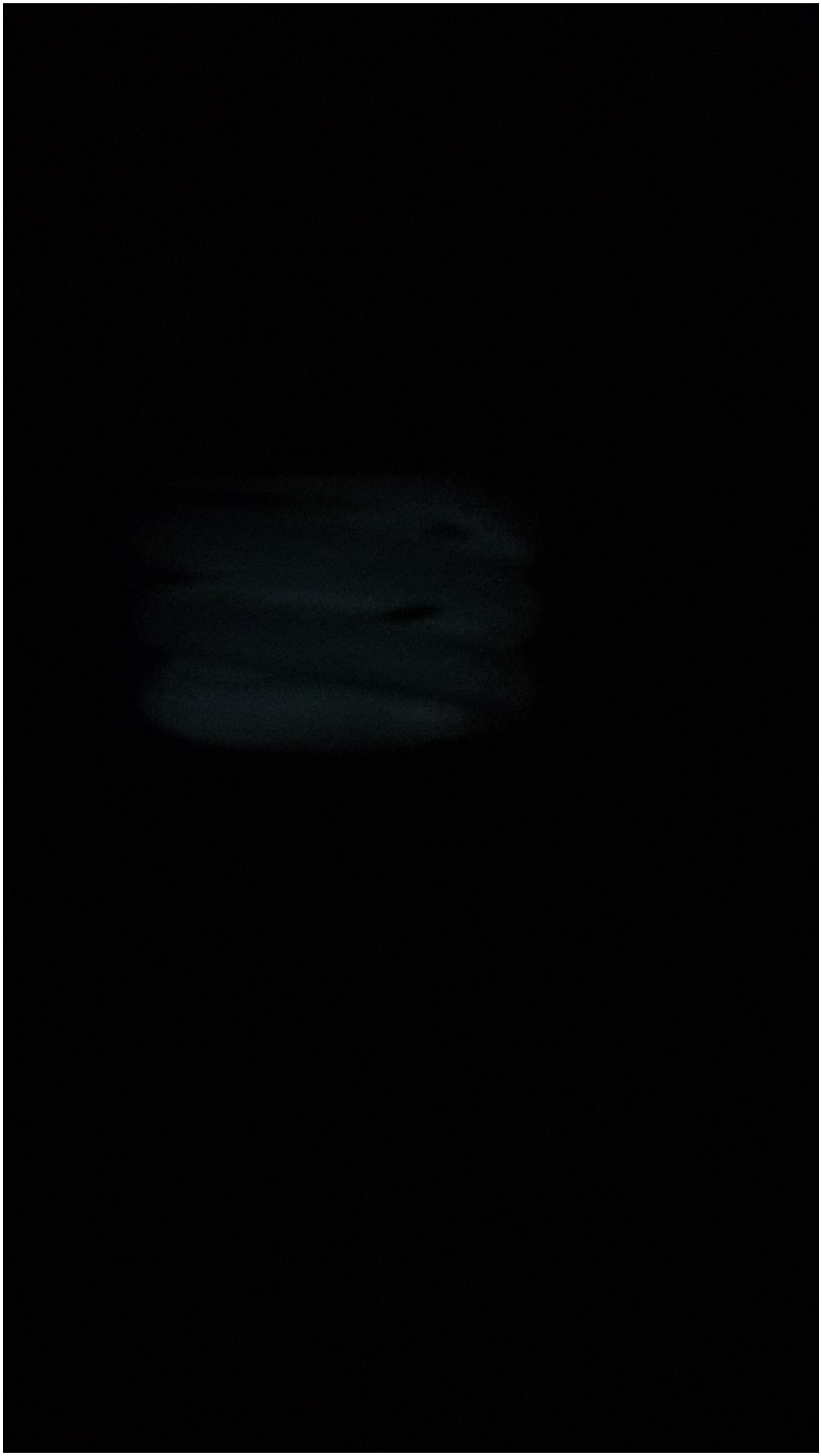
Pinhole Camera:

Creating the pinhole camera and getting good pictures with it was really difficult. I was only able to take pictures of a light bulb. Here are the results:

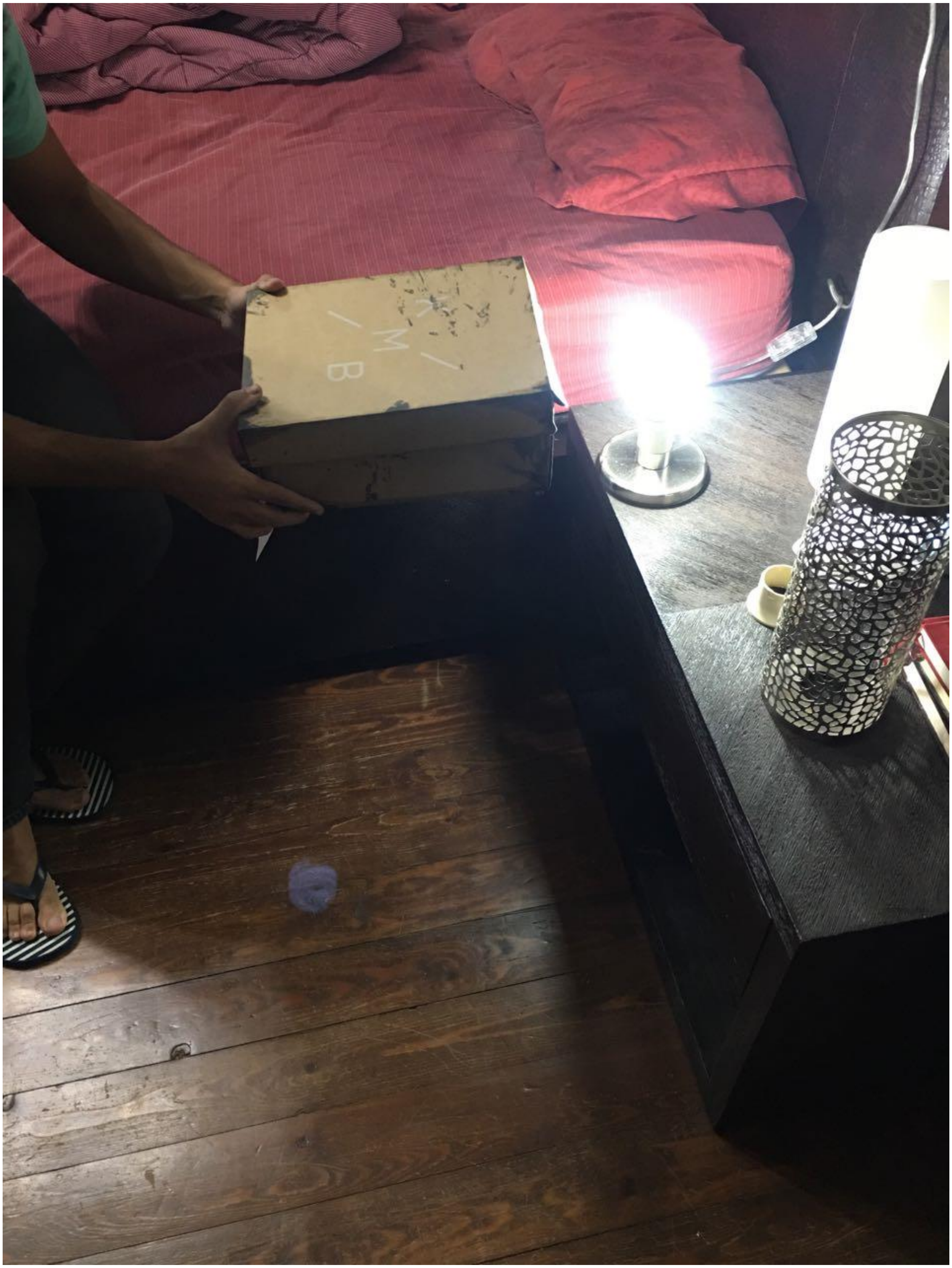


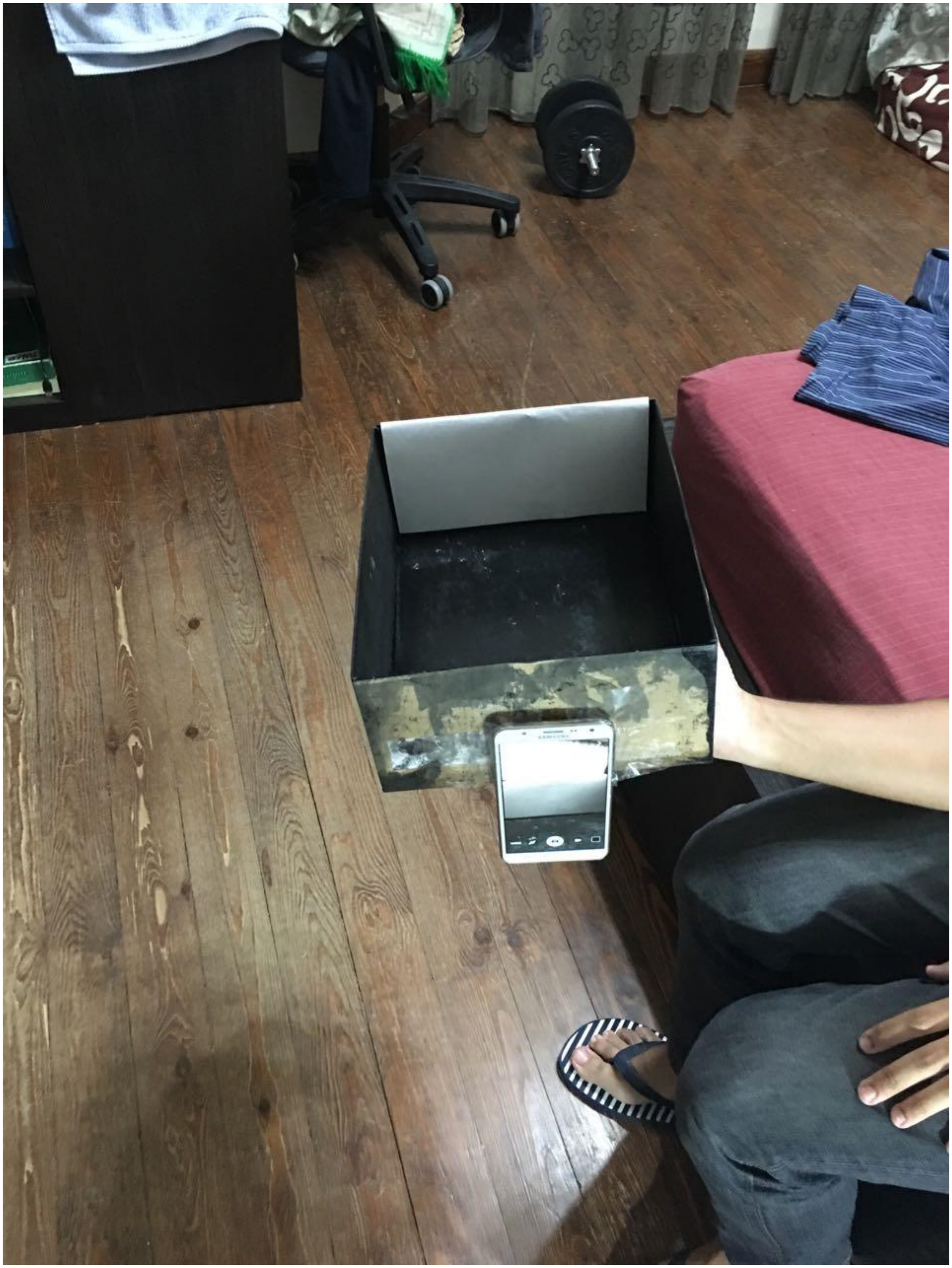


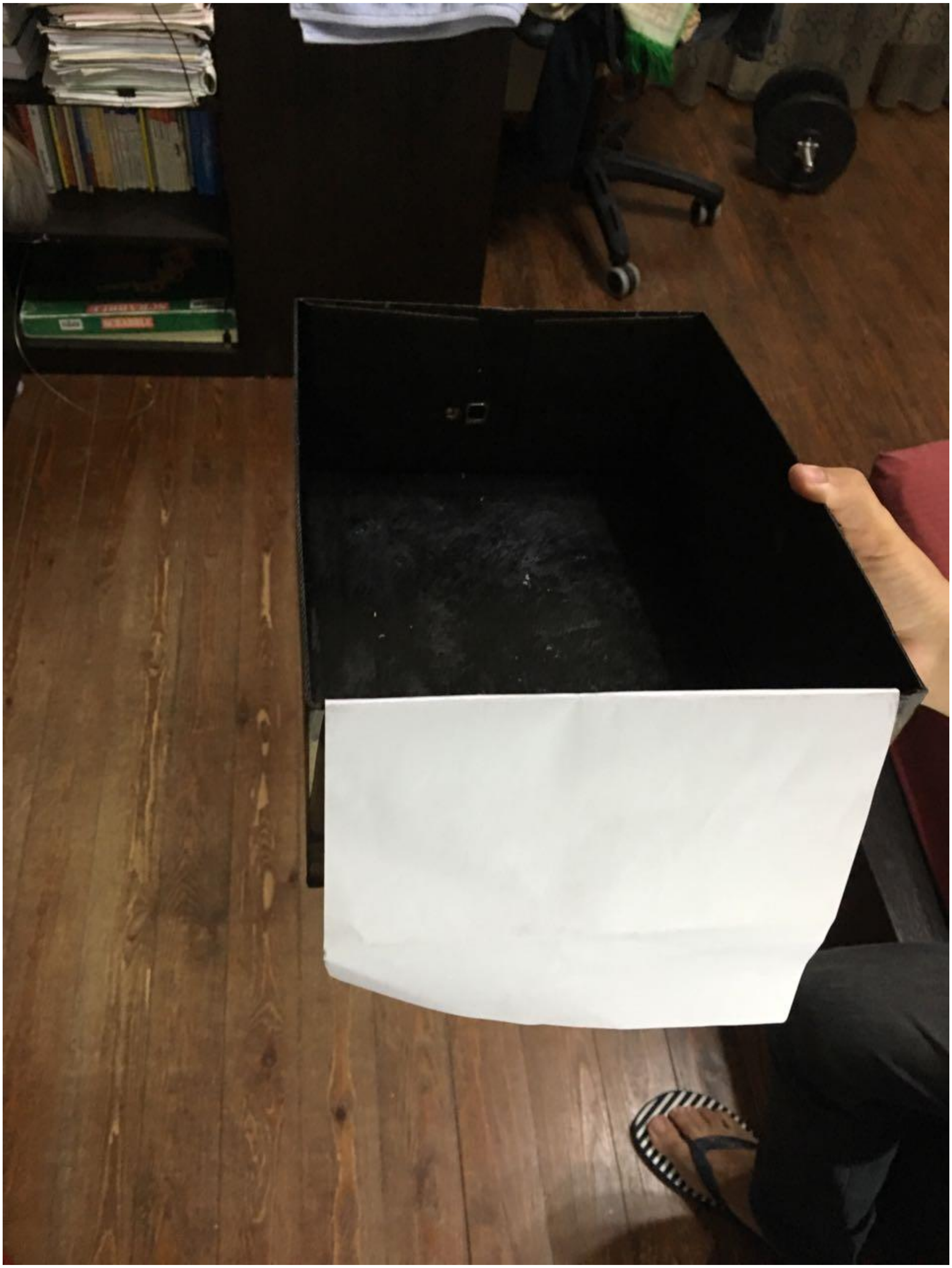




And here is the pinhole camera:

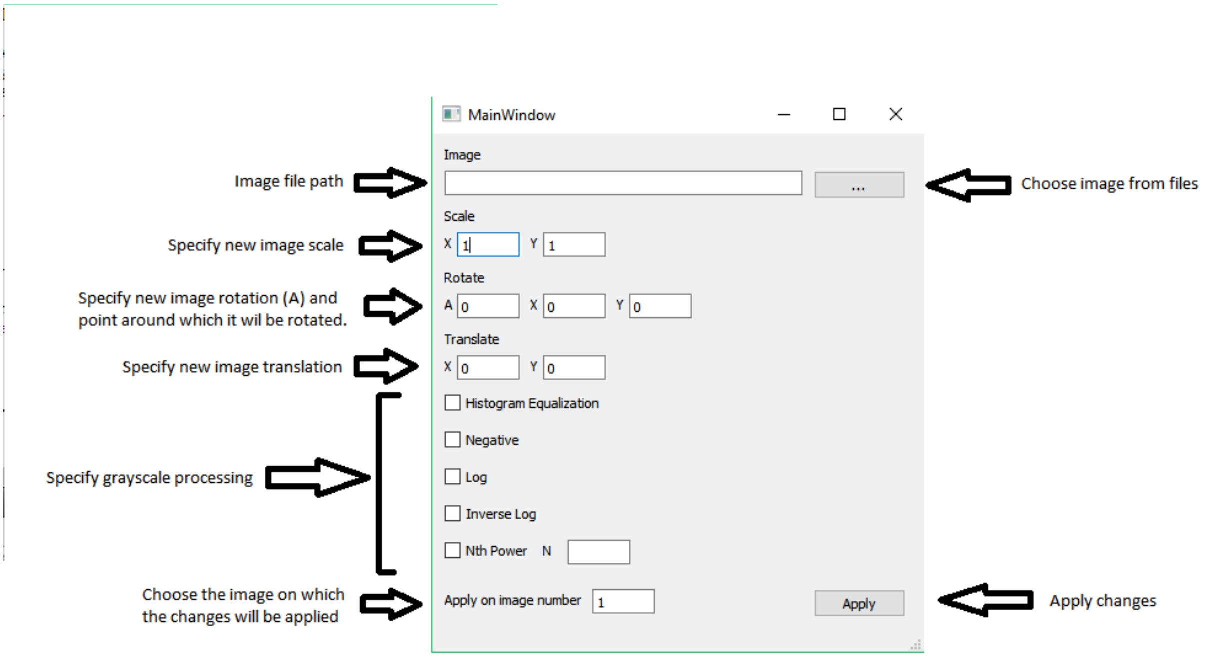






Software:

Qt application (c++)



MainWindow

Image

Scale

X 1 Y 1

Rotate

A 0 X 0 Y 0

Translate

X 0 Y 0

□ Histogram Equalization

□ Negative

□ Log

□ Inverse Log

□ Nth Power N

Apply on image number 1

Image file path

Specify new image scale

Specify new image rotation (A) and point around which it wil be rotated.

Specify new image translation

Specify grayscale processing

Choose the image on which the changes will be applied

Choose image from files

Apply changes

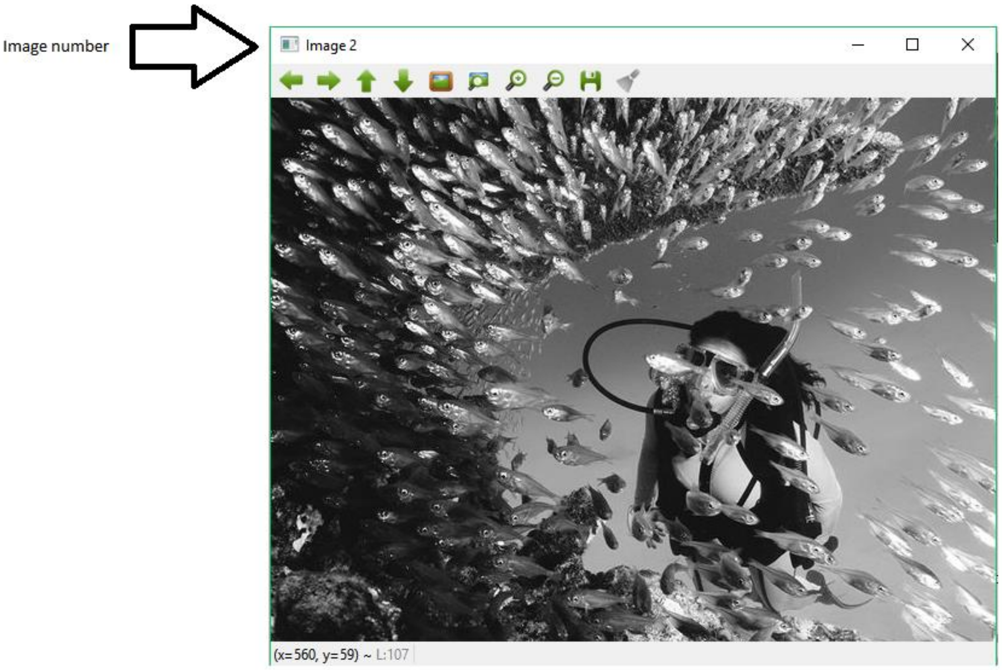


Image 2

(x=560, y=59) ~ L:107

Image number

Algorithm:

If the user checked histogram equalization, then scan the image and create the histogram, then loop from 0 to 255 and create the cumulative distribution function multiplied by 255.

Afterwards, loop on the image size multiplied by the scale specified and apply all transformations and grayscale changes specified (everything is done in one scan of the new image).

The transformation equations in the code were calculated by multiplying the following matrices:

$$\begin{matrix} Sx & 0 & 0 \\ 0 & Sy & 0 \\ 0 & 0 & 1 \end{matrix} * \begin{matrix} 1 & 0 & Px \\ 0 & 1 & Py \\ 0 & 0 & 1 \end{matrix} * \begin{matrix} \cos(a) & -\sin(a) & 0 \\ \sin(a) & \cos(a) & 0 \\ 0 & 0 & 1 \end{matrix} * \begin{matrix} 1 & 0 & -Px \\ 0 & 1 & -Py \\ 0 & 0 & 1 \end{matrix} * \begin{matrix} 1 & 0 & Tx \\ 0 & 1 & Ty \\ 0 & 0 & 1 \end{matrix} * \begin{matrix} X \\ Y \\ 1 \end{matrix}$$

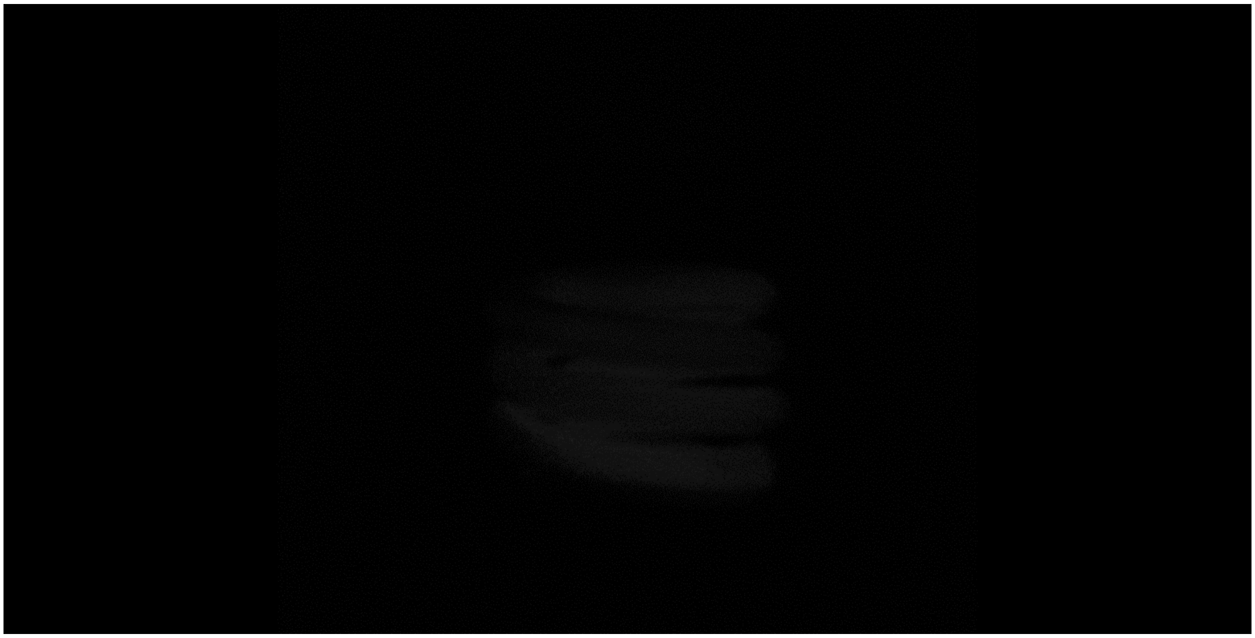
The order of transformations is scale then rotate then translate, and order of grayscale processing is histogram equalization then negative then log then inverse log then nth power.

Sample:

Apply each change individually on image of first bulb:

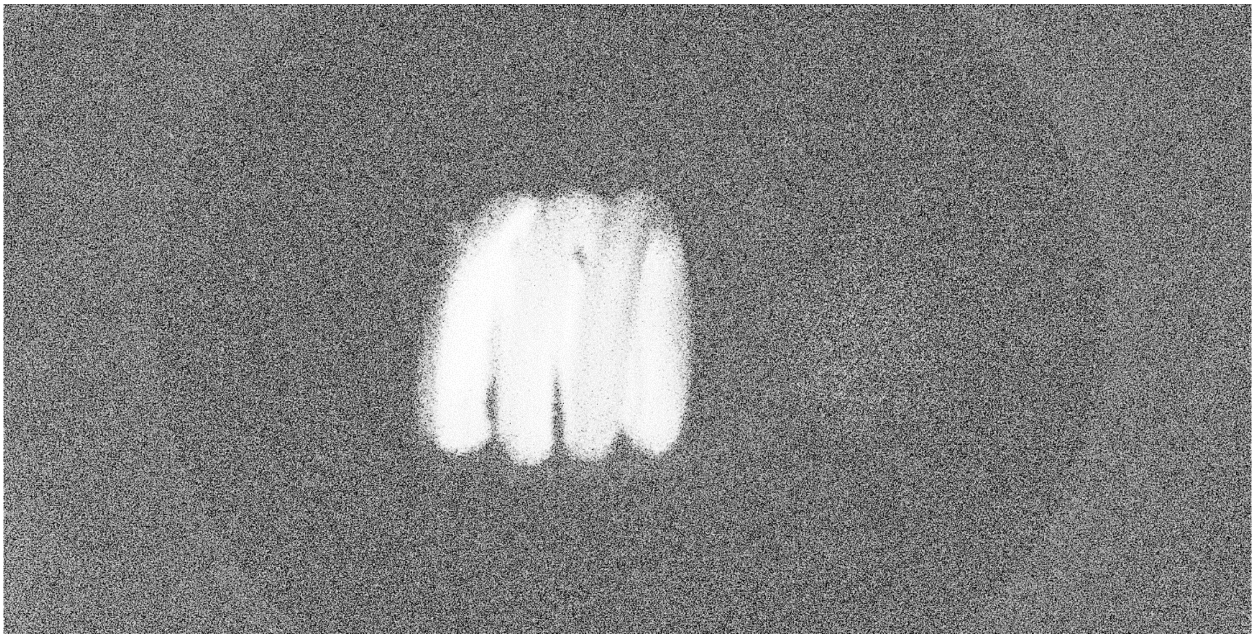
Scale 0.2, 0.2:

Rotate around center 90 degrees:

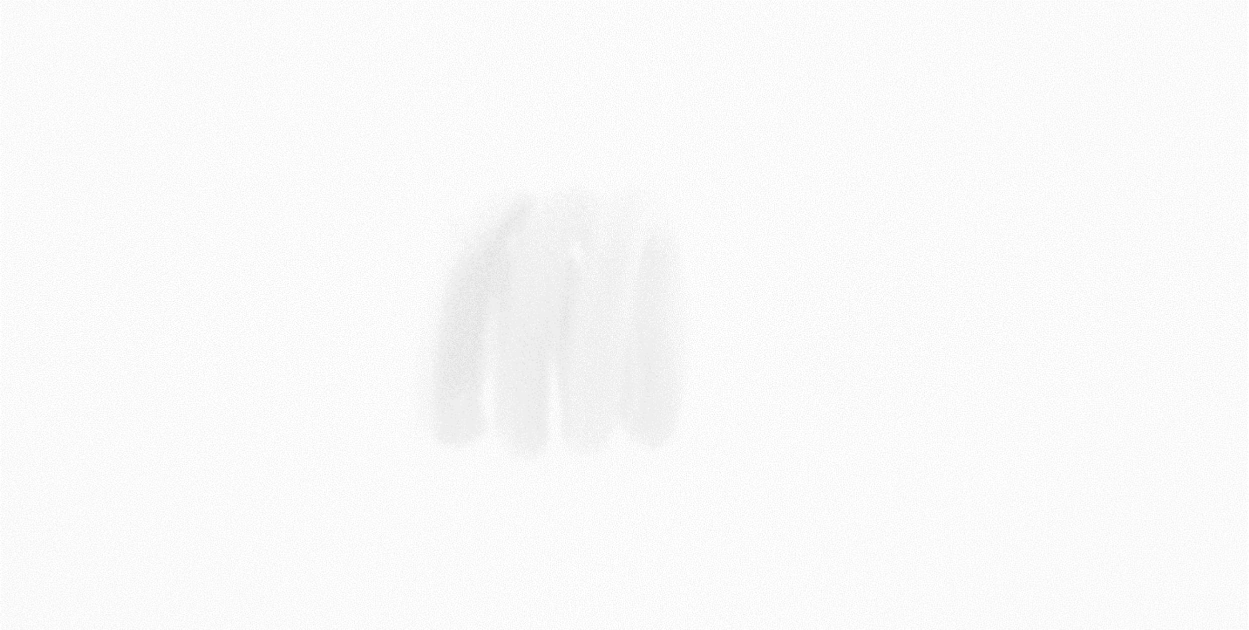


Translate 1000, -500:

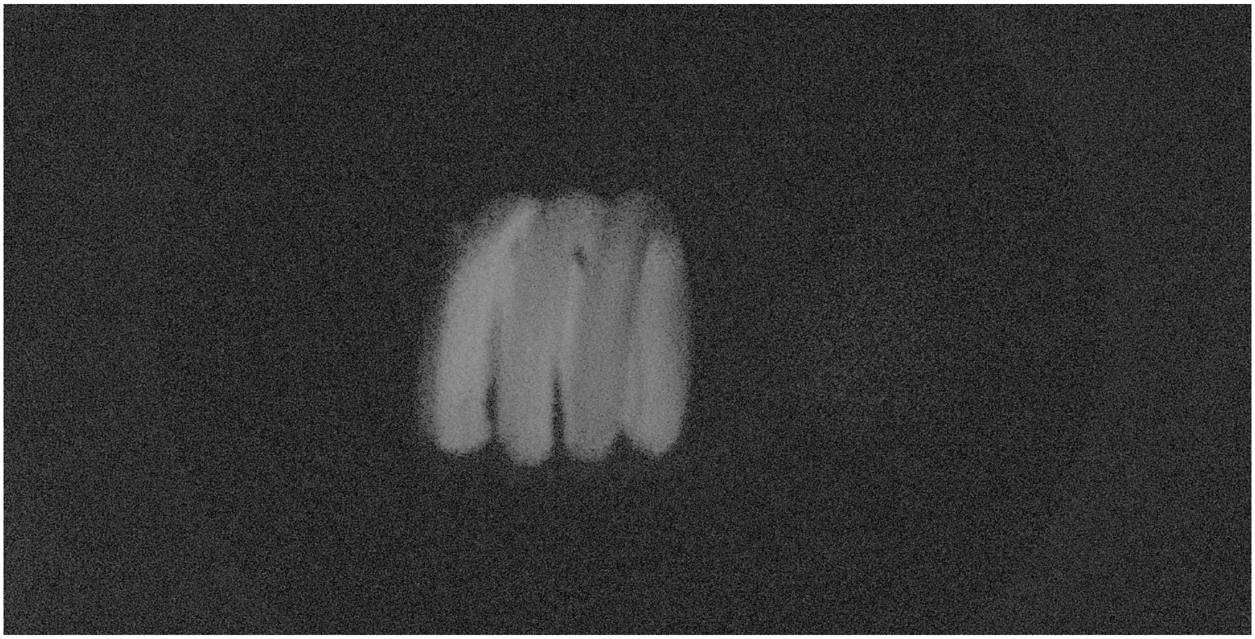
Histogram Equalization:



Negative:



Log:



Inverse Log:

Square Root:

Squared:

[redacted]

The submission will include the source code, this report, and all the images in this report separately.