

SUMMER PROJECT – 2013



EVO-MOUSE

TEAM-MEMBERS

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MOTIVATION FOR THE PROJECT



How evoMouse® Works

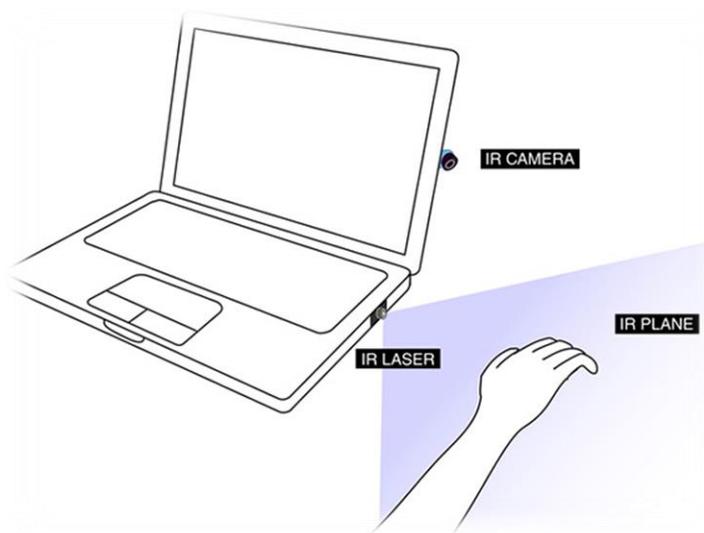


<http://www.youtube.com/watch?v=Dla44WLAITw>

<http://www.youtube.com/watch?v=yHGODp0b8Ks>

INTRODUCTION

With evo-mouse you can perform common mouse operations using only your fingers. You can control the cursor, click and select, double click and right click and drag with basic hand gestures. Works well on any flat surface.

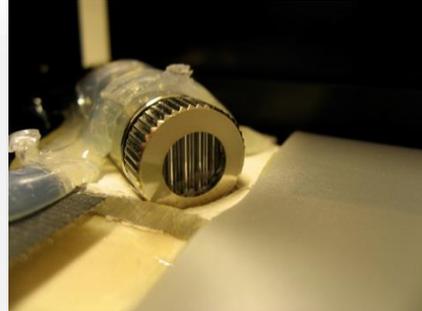


HARDWARE USED

- IR LEDs , resistors and USB cables.
- Normal webcam.
- Photographic filmstrip.
- Stand to hold the camera or it can be adjusted on the laptop itself as shown above.
- Mirrors to improve the intensity of IR region produced by IR source.

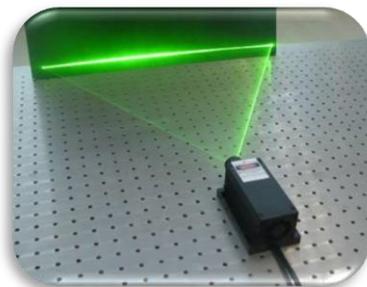
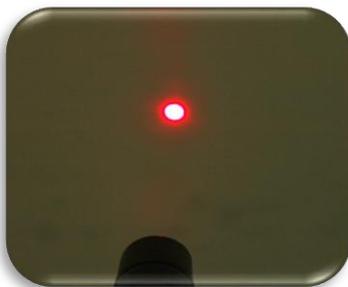
IMPLEMENTATION

- Infrared Laser
- Line generator lens (Line cap)



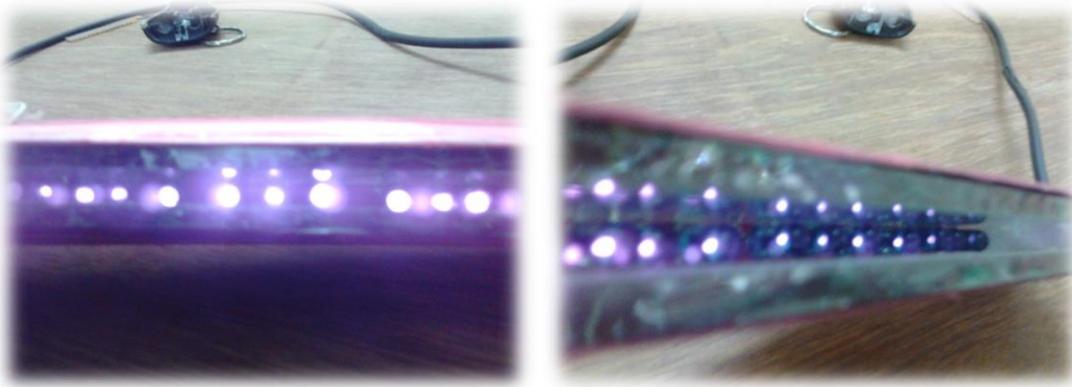
WHAT IS LINE CAP?

A normal LASER when focussed at anything be it a wall or anything else it gets focussed at a single point .A LINE CAP onto any LASER would make it emit in a plane, generating a line when focussed on any subject.



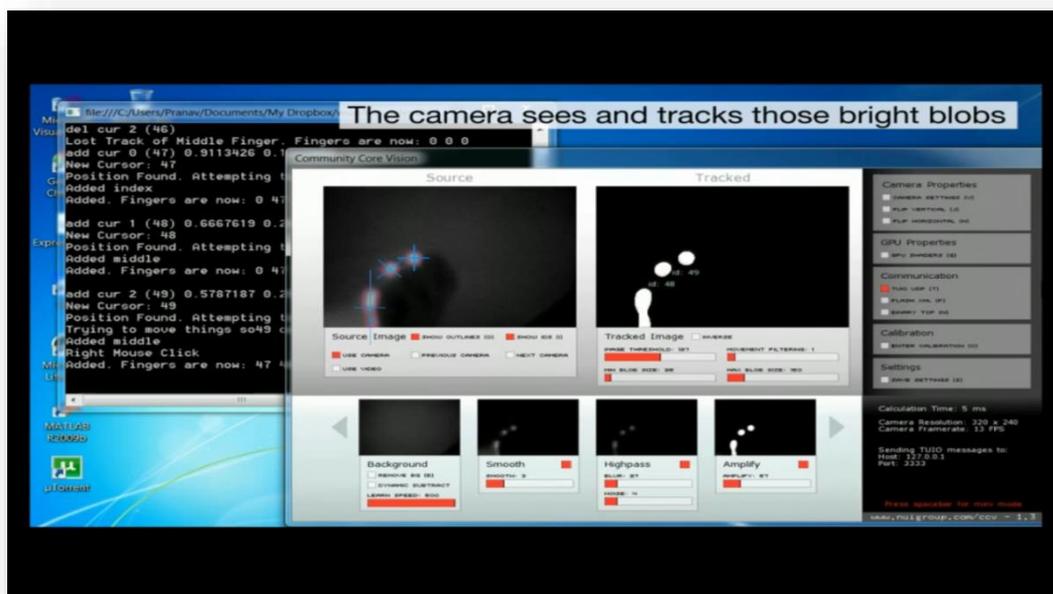
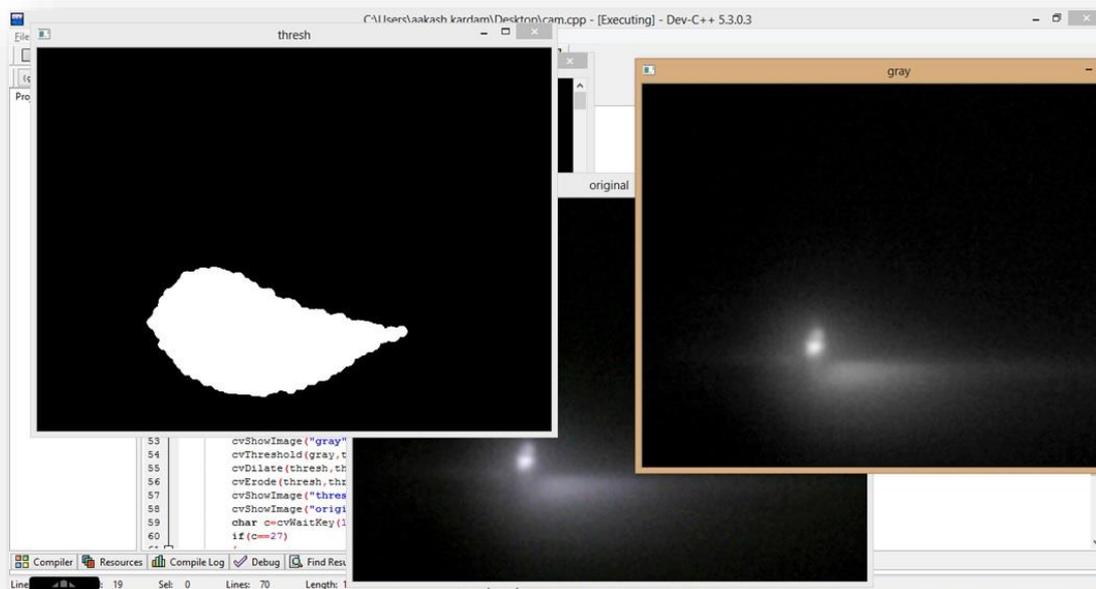
This line generated creates a plane, which is what we require.

OUR OWN IR SOURCE (IR LED ARRAY)



MAKING OF AN IR CAMERA

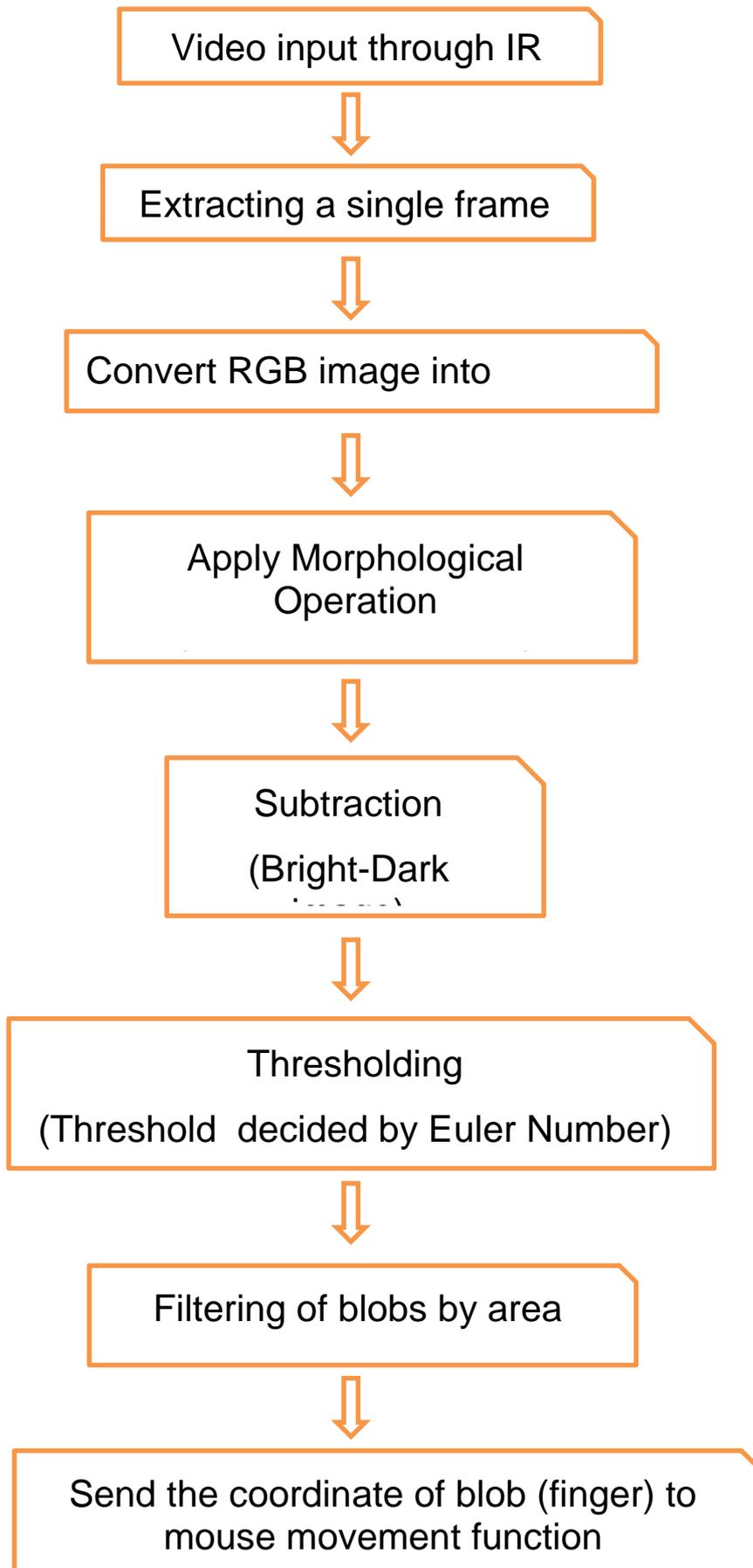
- Unscrew the lens assembly from it's holder. The focus on most webcams is achieved using the screw thread that is also used to hold the lens in.
- Remove the IR filter. IR filter stops IR light getting through to the sensor.
- Find a bit absolute black photographic film, you can usually find a bit before the real photo's start. Cut small bit out similar size to the IR filter that you just removed.
- Place it at the same location where IR filter was present.
- Re-assemble the rest of the camera. This is how the final IR region looks like where we have to move our finger.



SOFTWARE USED

- Dev-Cpp 5.3.0.3 as an editor and compiler.
- OpenCV library 2.1 for image processing.
- CVblob library to track blobs.

PROPOSED ALGORITHM FOR MOUSE MOVEMENT



The frame by frame feed through the camera is processed step by step.

The RGB image is first converted to grayscale and then binary setting up a decent threshold value ,obviously by hit and trial method.

Your finger tips gets illuminated as blobs onto the screen .you would normally get more than one blob (u need to number them and set priority.)

The camera finally track those bright blobs and the co-ordinates of centroid of the preferred blobs are passed into the MOUSEEVENT function.

ALGORITHM FOR LEFT CLICK

B – Signifies black frame without any blob.

W- Signifies frame with blobs in it.

We basically extract and process each frame. The most intuitive way of clicking is nothing but tapping on the surface itself which is what we are most familiar nowadays and it is the most widely used thing in modern laptops, so by hit and trial only we tapped on the surface where we are using our mouse and counted the number of **B** frames we are getting and then by setting an upper and lower limit for the condition which would be true and would trigger off that clicking function.

Another way of looking at it is when your hand is placed inside that IR region it is being easily

captured by the camera and when lifting that finger up shows our intend to click at that particular set of co-ordinates. Once you have lifted your finger up the camera than captures nothing but the black frames without any blobs in it. This is what we count and used and once we get the finger again the counter resets to zero.

ALGORITHM FOR RIGHT CLICK

Another reliable information we got out of our code was the area of the blob. We wrote our right click condition using this info. Before using such a thing we had to make sure what area we are getting , since there were unwanted blobs as well and flickering all around.

Idea of HOW TO RIGHT CLICK ? is also inspired by the modern computers only, idea was to show two fingers to the camera and calculate the total sum of the two BIG blobs (two fingers) and decided a threshold for area. If the area is larger than the decided value , it triggers off the right click function.

ACKNOWLEDGEMENT

We would like to thank our club coordinators **Shivendu bhushan-Sonu agarwal-Swapnil upadhyay** for having faith in us and providing us with this opportunity to realise our dream and make it a reality . These 40 days really taught us great things. Starting with **SHIVENDU BHUSHAN** who was also one of our mentor always helped us and motivated us in bad times and sorry situations and special thanks to **SWAPNIL JHA** ,our second mentor who would provide with good suggestions at times when we were totally hopeless.

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<http://opencv.willowgarage.com/documentation/cpp/index.html>

Making of IR camera

<http://www.hoagieshouse.com/IR/>

OpenCV ebooks

<http://www.cse.iitk.ac.in/users/vision/dipakmj/papers/OReilly%20Learning%20OpenCV.pdf>

For more details see our project wiki

http://students.iitk.ac.in/projects/eclub/Evo_mouse