# LPB (Light Painting Bot)

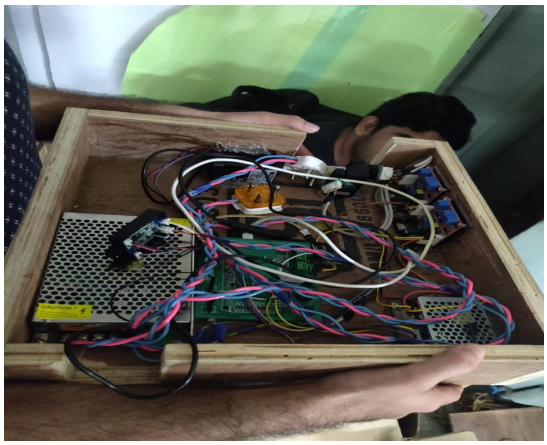
## Team members:

- Deolasee Tejas
- Guduri Venkat Santosh Gautam
- Bondala Sushwath
- Gowrinath
- Rohith Gorantala
- Varad Thikekar
- Sarath Nair
- Awik Dhar
- Nimal P

## MAIN PROJECTOR

These use galvos aligned perpendicular to each other to deflect the laser to the desired point. One of the mirrors is mounted at a height more than the other mirror. These mirrors account for both X and Y axes which help us to access the whole plane. The alignment of UV laser and galvos is such that the light from the laser falls exactly at the centre of the lower mirror(which account for X axis).

A dac circuit is used to drive the galvos. An SD card module which contains the information about the animation. We use Arduino Due to get the information of image from SD card. The UV laser and galvos are powered with the help of smps. All these are placed in a box which has an opening before the galvos for the laser to come out.



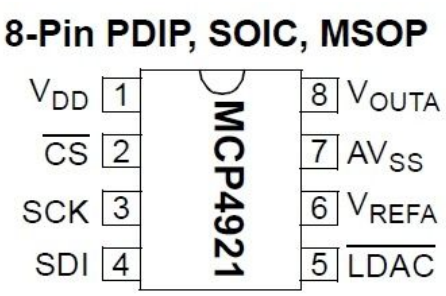
## DIGITAL TO ANALOG CONVERSION:

The galvos needs analog voltage as input which cannot be provided directly using

arduino. So, digital to analog converters are used which convert the digital signals from arduino into required analog signals. The IC used is MCP 4921 which is a 12 bit dac.

image

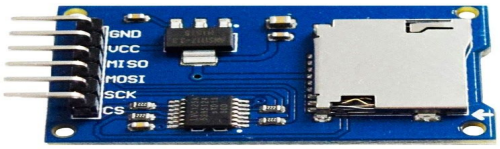
VDD and VREFA are connected to 5V, AVSS and LDAC to 0V, SCK and SDI to the clock and MOSI pins in arduino resp. and VOUT to the galvo drivers. The slave selects are connected to any four digital pins in arduino to optimize the circuit on PCB. In our case we used 22,24,26,28 digital pins of arduino.





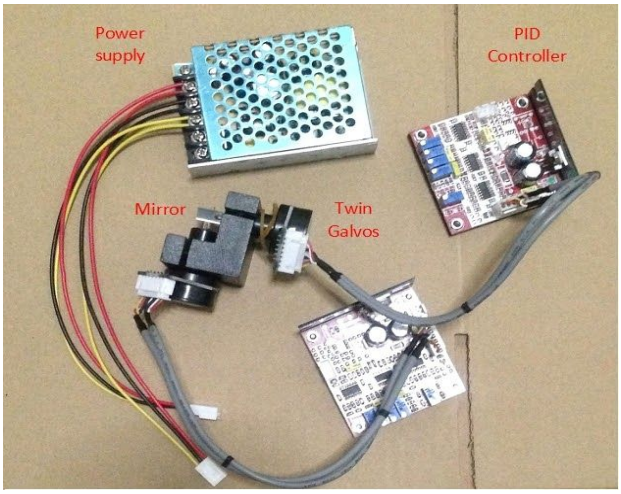
## SD CARD MODULE:

The SD card module is a 6 pin device as shown.
VCC is connected to 5V, GND to 0V, MISO, MOSI and SCK to their respective pins in arduino and slave select to pin 30. The laser modules' enable pins are connected to pin 29 of arduino.



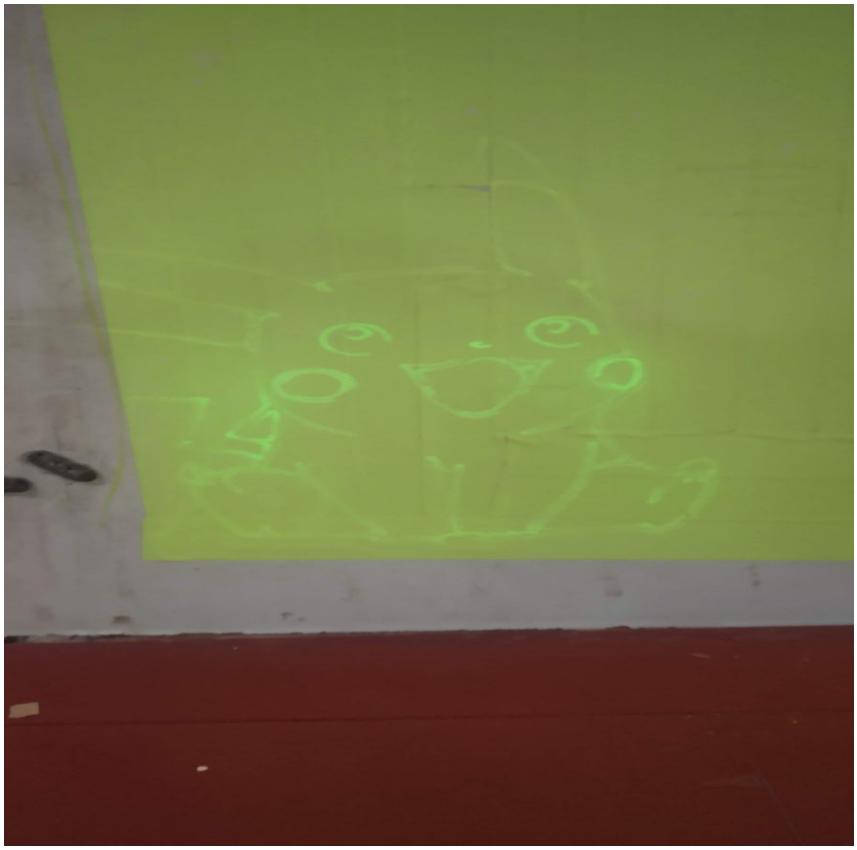

## GALVOS AND THE DRIVER:

The amount by which mirrors move is controlled by the drivers. The input to the drivers is connected to the dac and the power supply to a separate unit that converts the input AC supply to DC 15V.




## SCREEN:

We used a 7x7 feet screen. A phosphorescent tape is attached on the entire screen.
When laser falls on it then the part of the screen at which laser is pointed glows for some time and fades away after some time. We can also control the speed of fading away using arduino.



## OUTLINE OF WORKING:

The SD card contains the information about the coordinates of the points to which the laser has to be deflected. It also has the information about when the laser has to be switched off. All this information is in the form of encoded characters. SPI interface is used to communicate this information to the arduino and the arduino decodes it. Then, arduino controls the dac and enable pins of lasers based on this information.
The galvo drivers move the galvos based on the output from dac. The light from the laser falls on the mirrors of galvos and gets deflected to the desired point on the screen. By continuously pointing at different points on the screen we can get our desired painting.

Working video of projector

## PHOTOSHOP:

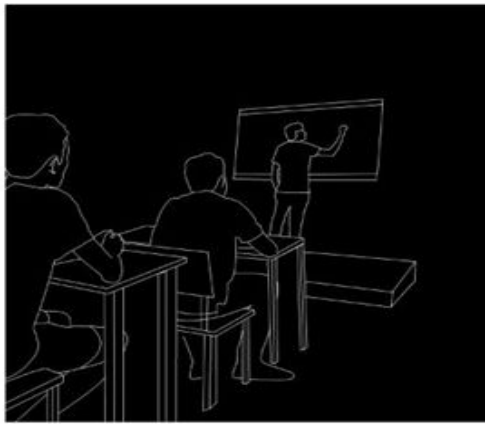
We used adobe photoshop to do animations. The presentation was done by drawing many images frame by frame.

The image to be drawn are edited using photoshop. We took the outline of the image using the pen or the pencil tool. Also, the background is made as white and the outline as black in colour. This is done as the Inkscape only take borders while converting the images to g-codes. While editing, we also removed many features from the images so that it doesn't become too complex.

The editing was done in the following way.

We had two storylines: a sem in insti and stars of the decade.

For the story part of 'a sem in insti' we took photos of a student doing his usual stuff in the semester like going to class, sleeping in class, writing exams, playing sports etc.



And for the ‘stars of the decade’, we downloaded the images of some superheroes and villains (like ironman, batman, darth vader, baby yoda etc) and edited them.

Once the editing is done, the image is exported as jpg format and converted to g-code using a software called Inkscape and then finally the image is encoded.

# IMAGE PROCESSING

This is the drive for the project
https://drive.google.com/drive/folders/1Mv06Buu8jg-gBJ6YJaJ3CvqRLEfV9AeK

The drive for Image processing(Envisage 7.0 codes)
https://docs.google.com/document/d/1GEGBQvt73DwjLWoSDc451Gm6C3PrghC9I08YxTMT5S4/edit

We used the same codes as in 7.0. The process is mostly same expect for automation where you're gonna have to change the mouse positions for Inkscape. Keep one inkscape window open so that the new window opens in the same spot.

For the automation process more laptops the better as the process will take a lot of time. We used the computers in Chem DCF to speed up the process. Some devices work better(more

bug free) than others so stick to those. We managed to get 60 cup free iterations of pyauto at a time, sometimes 100. Try using a powerful device if possible.
The only python editors that worked properly for pyauto was IDLE. You also use PyCharm, might be better.

When you are making after effects videos make sure the composition is of a square size as Inkscape parameters will squish everything to a square. This issue was caught too late and the gcode generation takes 2-3 whole days. So before starting automation, make sure everything checks out, have your super coords verify.

Generally, unexpected cups may happen so try to finish the whole thing at the very least 10 days before the show.