University of Riverside

BCOE

Cs179J

Ferrofluid Display

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Chapter 1

What is Ferrofluid Display?

Ferrofluid display is another piece of artwork to put in your home. It uses an iron metallic substance to display shapes, text, or images. People can interact with it and impress your guest.

1.1 Objectives

Our objective is to create a frame with a 5x5 cells with functional stepper motors and solenoids.

Chapter 2

High Level Description

There are 5 rows with 5 columns. Each of the cells have a magnet that go in and out. The magnets are able to pull the ferrofluid from the bottom and bring it to the corresponding point from the user inputed in the touchscreen display. The ferrofluid display can show shapes, text, and images.

2.1 User Guide

When the user turns on the machine, wait for a few seconds, so the carriages can go to the starting point. After, it is ready for the user to draw and image in the touch screen. If the user press a cell in will turn black. This indicate that you want to put the ferrofluid in that cell. Once the user is ready to draw, they can press the "draw" button. The machine will start drawing. After it is done, it will return to the starting point and wait for the user to draw again.

2.2 Programs and Components

For this project, I used two ATMEGA 1284 micro controller.

1. Programs:
    - Arduino
    - Nextion Editor
2. Components:
    - Bluetooth- Receive data from bluetooth the Dharti's project
    - 5 stepper motors- to move the in the x-axis
    - 5 solenoid- to push the magnet out
    - 5 limit switches- when press, the machine knows it is at the starting point

- Touch screen LCD- display GUI interface and user can draw
- Glass container filled with ferrofluid and rubbing alcohol
- 5x5 Frame- to hold all the parts together
- 5 stepper motor driver- to control the steppers
- 5 Rerap 3D printer shield board
- 12V 10amp power supply

2.3 Links

Below are the links to my project video and files:

- Youtube:
- $https://youtu.be/1CVyrlaZ3W4(Part1)$
- $https://youtu.be/VaxKsCIpK_w(Part2)$
- gitHub: https://github.com/georgeuy2/cs179jSeniorProject

Chapter 3

Conclusion

3.1 Issues

The first problem I had was 5 of my motor drivers stopped working right before the presentation. I found out that the positive wire and negative wire where chewed by my dog and they were in contact. Second problem, I bought motor drivers and motor shield and I got them the day of the video is due. So, I did not have enough time to implement all my features to the new set up. Lastly, the glass for the container was not good for the ferrofluid. The ferrofluid stained the walls of the glass. I assumed the glass I bought was not as smooth than the one I tested with.

3.2 Final Thoughts

This project was one of my most challenging individual projects. I knew when I submitted the proposal for this project, it was extreme for one person. But, I knew I could get most of it done.
What could I have done better, if I do this again, which I will? First, I would redesign everything again. This time I will not use stepper motors. I will create a small solenoid for each cell. This will improve power and efficiency. The ferrofluid display version 1 was an amazing stressful experience and I learned plenty from it.