ECE 153B Final Project Proposal

By Brycen Westgarth and David Mleczko

Overview:

We are going to use the STM32L476 Discovery board to create a 2D image plotter that can convert digital image data into a physical ink drawing consisting of marker dots. The main mechanical portion of our device will be a marker mounted on a 2 axis rail system driven by stepper motors that will allow us to access each portion of our drawing medium in cartesian coordinates. A black pixel in the image will correspond with a marker dot in the corresponding "pixel" on the paper. The marker will be mounted on a flexible component that will allow it to be dropped down to the level of the paper by a servo motor to make a dot. We plan to implement 2 options for the source of the image data: Preloaded data from a jpeg, or data taken directly from the on board camera module. Both sources of data will be limited by a max resolution of 640x480. If the user chooses to use the on board camera the camera module will send image data to the microcontroller using I2C. If the user chooses to use external image data stored on an SD card the microcontroller will access that data using an external SD card reader communicating with SPI.

Peripherals:

- Camera Module
- 3 stepper motors
- Stepper motor driver
- SD card reader
- Servo motor

Software Design:

Image Processing

We will write software for image processing that will convert our image to black and white data that can be used to control the servo motor. Data will be implicitly indexed in relation to the position of the marker on the paper.

Communication:

We will write code that will allow us to communicate with our serial interface modules(Camera module and SD card reader) which will be the sources of our image data. The camera module communication will follow the I2C protocol while the SD card reader will follow the SPI protocol

Plotting:

We will write code that will allow us to drive our stepper motors and control the position of our 2D rail system holding the marker. Stepper motors will be driven to move the marker in calibrated distances corresponding to the pixels of our images in both the x and y directions.

High level control software:

We will need software that dictates proper delay and procedure when controlling the different mechanical and software components of our total machine as well as any user interface we decide to add.

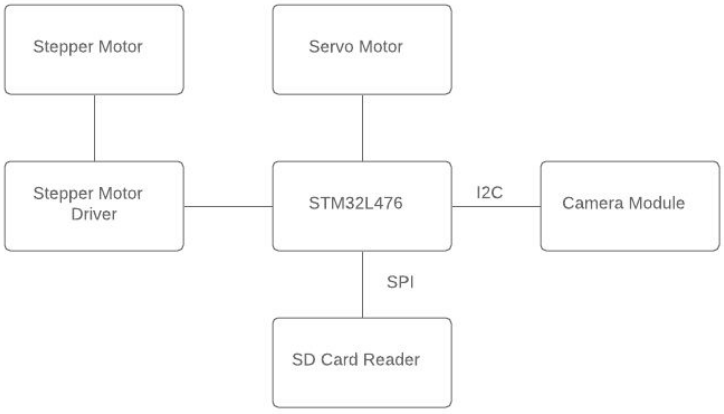
Responsibilities:

Brycen - Camera Module communication and interface, Image conversion software, SD card reader communication and interface
David - Stepper Motor and Servo control software, Overhead control software
Both - Mechanical Construction, Calibration, Misc Testing software

Goals:

- Accurate X-Y coordinate plotting
- Non-distorted image
- Mechanical reliability
- 640x480 max image resolution
- Reasonable drawing speed

Block Diagram:



Website:

https://sites.google.com/view/dotmatrixphotoprinter/home