

3D POV Display

Initial Project Description

Possible Sponsor: U.S. Navy

Senior Design - Group 8

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Project Description:

The motivation of this project is to create a 3D persistence of vision tube that can display a variety of preset images such as a programmable clock or programmable text displays. Since all of the above features are common in most all of these type of projects our group felt it would be interesting to add the feature of allowing for a VGA input (such as from a laptop) so that a video could be displayed on the tube. This video could be anything from a movie to pre-recorded advertisements.

One of the objectives of this project is to make the tube with high resolution so that it would be capable of displaying the complex animations associated with video playback. This would also require a fast refresh rate in order to get close to the seamless displays that your televisions or computer monitors create without any flickering. We also want the project to be lightweight and non-bulky, somewhere in the size and weight range of a small television or computer monitor. Audio and video inputs would be desirable, with the possibility of built in speakers. We would also like there to be some sort of HUD for inputting of custom messages or banners for some of the various preset images or for setting the clock image. We would like the project to be cost efficient but durable. Finally the project should be capable of running off a battery or common electric outlet.

The function of the project is to create this device for and hopefully get sponsored by the Navy recruitment office. Their specifications for a project they would be interested in funding was light weight, portable, and capable of grabbing people's attention. Our team feels that this project would be sufficiently attention grabbing and perfect for displaying Navy recruitment advertisements with either the built in text banner presets or by displaying advertisements through the VGA input.

Specifications and Requirements:

- 256 LEDs
- 60 Hz refresh rate
- 30 rps
- 61 cm diameter (cylinder)
- 80 cm height (cylinder)
- 12-15 lbs (not including batteries)
- Operates on 120V AC or 12V DC
- VGA Input via DB15 Connector

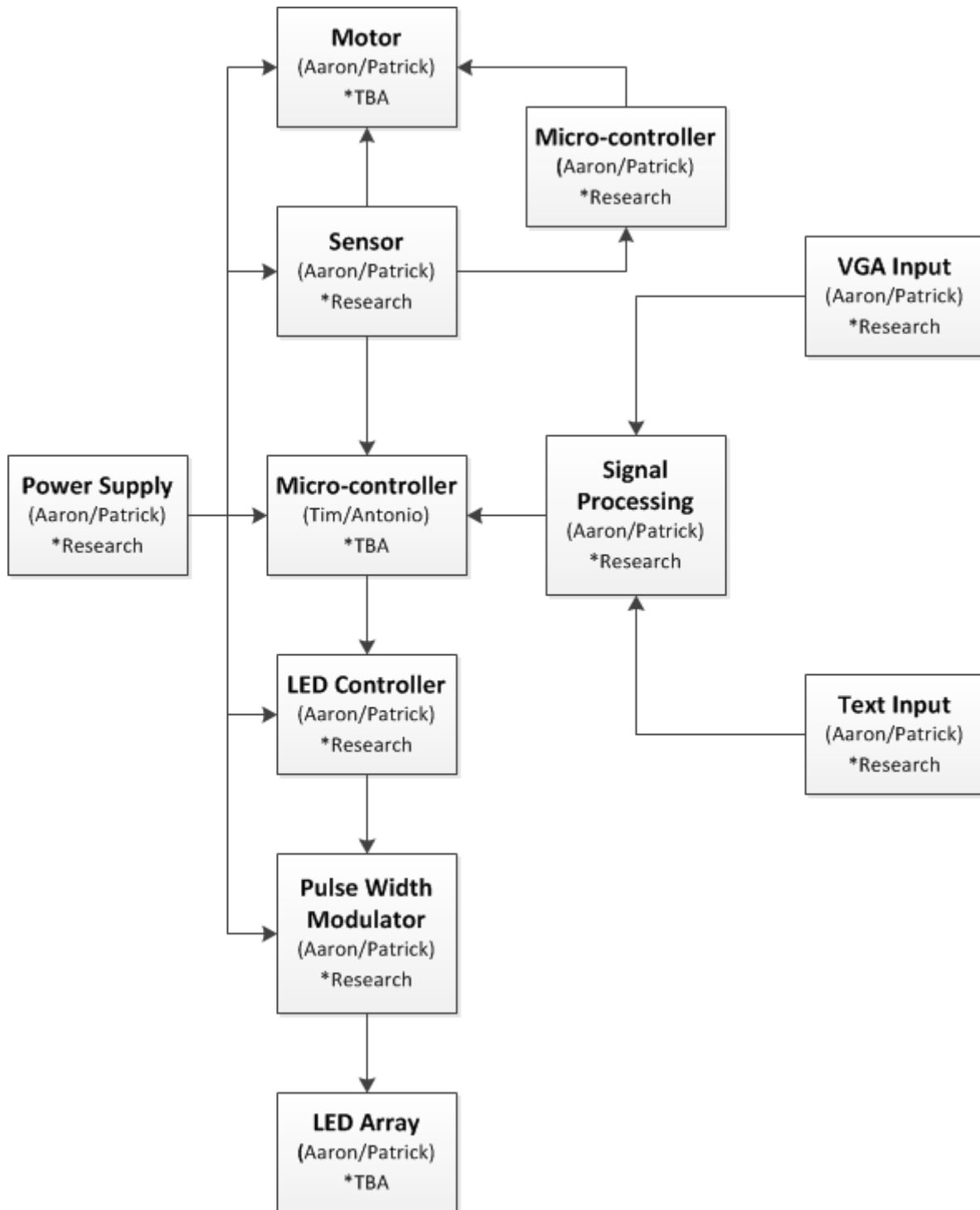
Budget and Finances:

The project cost estimate is between \$1,400 and \$1,600. The project will be proposed for sponsorship to the Navy as a recruitment tool. Otherwise, the project cost will be shared equally between all group members. A detail list is below outlining estimated materials and cost.

| | <u>Est. Qty Req.</u> | <u>Cost (Each)</u> | <u>Ext. Price</u> |
|------------------------|----------------------|--------------------|-------------------|
| LED's | 256 | \$ 2.00 | \$ 512.00 |
| LED's Controller | 256 | \$ 0.75 | \$ 192.00 |
| Motor | 1 | \$ 150.00 | \$ 150.00 |
| Frame | 1 | \$ 125.00 | \$ 125.00 |
| Microcontroller (Main) | 1 | \$ 75.00 | \$ 75.00 |
| PCB Board | 1 | \$ 150.00 | \$ 150.00 |
| Power Supply | 1 | \$ 65.00 | \$ 65.00 |
| Misc. Hardware/Wire | 1 | \$ 250.00 | \$ 250.00 |
| | | <u>Total:</u> | \$ 1,519.00 |

Block Diagrams:

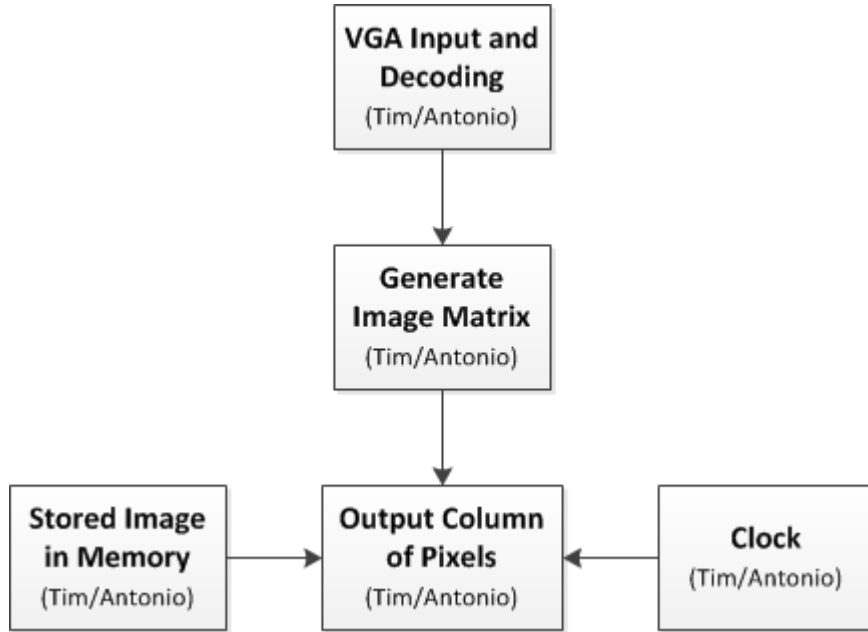
Hardware Diagram



Hardware block diagram legend:

| Component | Member | *Status | Description |
|-----------------------------|---------------|----------------|---|
| Power Supply | Aaron/Patrick | Research | Powers the motor and electrical components |
| Motor | Aaron/Patrick | To be acquired | A motor spinning at 30 rps |
| Sensor | Aaron/Patrick | Research | Gives rotational feedback to the Micro Contr. |
| Micro Controller | Aaron/Patrick | Research | Used to calibrate/control the RMP of the motor |
| Micro Controller | Aaron/Patrick | To be acquired | Processes VGA signal/Gives output to LEDs |
| LED Controller | Aaron/Patrick | Research | Recieves image information from the main micro-controller to be displayed. |
| PWM - Pulse Width Modulator | Aaron/Patrick | Research | Used to control the current going to an LED which determines the RGB value that is displayed. |
| LED Array | Aaron/Patrick | To be acquired | A vertical array of 256 RGB LEDs |
| VGA Input | Aaron/Patrick | Research | VGA format input |
| Signal Process | Aaron/Patrick | Research | Converting signals to a format understandable to the micro-controller |
| Text Input | Aaron/Patrick | Research | A means of inputting text to be displayed |

Software Diagram



Software block diagram legend:

| Component | Member | Status | Description |
|--------------------------|----------|----------|--|
| VGA Input and Decoding: | Tim/Tony | Research | Processing of the VGA data stream |
| Generate Image Matrix: | Tim/Tony | Research | Creating the current image to output |
| Stored Image In Memory: | Tim/Tony | Research | Preprocessed Images stored in memory |
| Output Column of Pixels: | Tim/Tony | Research | Output a single column of pixels |
| Clock: | Tim/Tony | Research | Precise frequency for outputting each column |

Schedule and Milestones:

| | <u>Start Date</u> | <u>Duration (Days)</u> | <u>Finish Date</u> |
|---|-------------------|------------------------|--------------------|
| <u>Project Research:</u> | 05/27/12 | 32 | 06/28/12 |
| <u>Project Design:</u> | 06/14/12 | 35 | 07/19/12 |
| <u>Senior Design 1 Documentation Draft:</u> | 06/28/12 | 21 | 07/19/12 |
| <u>Senior Design 1 Documentation Final:</u> | 07/19/12 | 14 | 08/02/12 |
| <u>Prototype Fabrication:</u> | 08/13/12 | 14 | 08/27/12 |
| <u>Design Review:</u> | 08/27/12 | 14 | 09/10/12 |
| <u>Senior Design 2 Documentation Draft:</u> | 09/10/12 | 44 | 10/24/12 |
| <u>Project Fabrication:</u> | 09/10/12 | 44 | 10/24/12 |
| <u>Testing:</u> | 10/29/12 | 18 | 11/16/12 |
| <u>Senior Design 2 Documentation Final:</u> | 11/16/12 | 14 | 11/30/12 |