UCF Senior Design 1: Smart Mirror

Group 31

Divide and Conquer

Group 31:

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Jonathan Martin	Electrical Engineer

2. Project Narrative Description:

The idea selected for this Senior Design project is a Smart Mirror. Every one of us uses a mirror in the morning before starting the day. It would make sense for there to exist a mirror that would show the user not just how they look before they leave the home, but also useful information. Information such as time, weather that might be encountered in the day, news headlines, and a list of tasks that need to be done in the day. This device would need to be easy to use, as there are already so many other devices someone may use to see this information. Interfacing with this device needs to be literally as simple as looking at a mirror. That is the goal of this design. The mirror would accomplish this with technologies such as facial recognition, in order to display information based on who is currently looking at the mirror, and voice/touch controls in order to give the user choice over how they would like to interact with the device. Generally, touching a mirror with one's hands is a bad idea. It's an easy way to make a mirror dirty, which is why voice commands and facial recognition are a high priority for this project.

Features to demonstrate:

Face Recognition- Can be shown as a method of security or as a requirement to show personalized information depending on the face recognized.

API connectivity (Weather, News, etc.) - Demonstrated by information being updated every time mirror is activated.

Voice Commands- Can be shown to control certain features like LED lighting on the mirror itself

3. Requirements and Specifications:

The smart mirror has numerous specifications we would like to aim for. They are all listed in detail in the table below. Each requirement can be quantified and measured in some way.

Attribute	Description/ Value
Size	18x24 inch display. (30" Monitor)
Weight	~25lb
Connectivity	The mirror will connect to a local 2.4GHz or 5.0 GHz Wi-Fi network as well as the user's phone via Bluetooth 5.0
Physical Connections	The mirror will only require a single external AC 120V 60Hz power connection
Lighting	The mirror will have diffused vanity lights bright enough to light the users face from 2 feet away
Speaker	The speaker will provide a minimum 100% volume output of 65dB from 2 feet away
Touch Functionality	The mirror will have the capability of touch controls. Using IR technology to create a touch screen with a latency of less than 1ms.
Motion Detection	The Mirror will sense when a user approaches and comes out of a low power state. When a user walks away the mirror will wait 30 seconds and then return to a low power state
Low power state	The low power state shall consist of all external modules being powered off, the display, speakers, touch panel, camera, and lighting. Then the Micro-Computer will enter a sleep state till woke by the Micro-Controller. Ideally this will use less than 50% normal operating power.
AC/DC Converter	The AC/DC Converter will take in 120V 60Hz AC power and output 12V DC
Power Distro PCB	The power distribution PCB will take in 12V DC power and output multiple different voltage rails for all powered mirror components
Display	18x24 Inch display with at least 720p resolution.
Micro Computer	A modular Microcomputer. At least 1.2Ghz with support for 2.4 Ghz Wi-Fi and HDMI connectivity. Operating at 5V/2.5A. This controller will control the software and features such as facial recognition and voice commands.
Micro Controller	The micro controller will be able to communicate to the microcomputer via USB, with at least 15 MHz clock speed. It will require 5V to operate. Primarily used to manage low power state.
Camera	1080p camera will be needed for facial detection.
Microphone	Mic must be able to clearly pick up audio from at least 3 feet away.

Figure 1 – Specifications Table

4. Project Block Diagrams:

Responsibilities are divided according to the block diagram below. Having responsibilities illustrated in a block diagram such as this makes it easier for each member to see what role they play in the overall project.

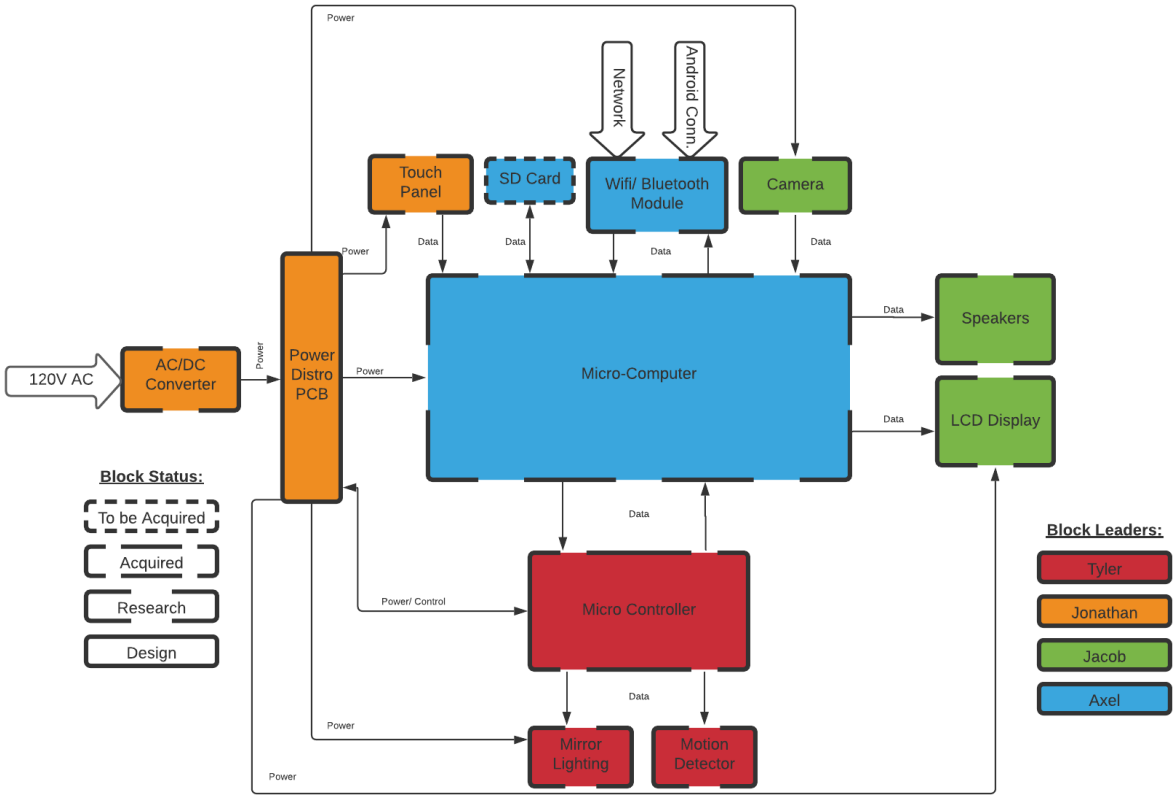

Figure 2: Block Diagram

5. Project Budget/Financing:

This project is not sponsored. The group will be fully funding the project. We aim to keep costs under or around $400, roughly $100 per person. Estimated cost of each item are shown below.

Part	Quantity	Estimated Price	Total Estimated Cost
Micro-Computer	1	$35	$35
Micro-Controller	1	$20	Free(Already owned)
HDMI 30I inch Display	1	$100	$100
Camera	1	$20	$20
32GB SD Card	1	$10	$10
IR Motion Detector	1	$5	$5
Micro HDMI to HDMI Cable	1	$8	$8
White LED Vanity Lights	1	$15	$15
LED Light Diffuser	1	$15	$15
2x4x8 For Frame	2	$4	$8
One Way Acrylic Panel	1	$40	$40
Wood Stain	1	$5	$5
AC/DC Power Converter	1	$30	$30
Power Distro PCB	1	$15	$15
Speaker(s)	1 or 2	$15	$15
IR Touch Panel(optional)	1	$200	$200
		Total:	$456

Figure 3: Budget Table

6. Project Milestones:

It is important that goals are reached in a project within a given date. This allows everything to run smoothly and keep the development process on track for success. An approximate schedule of milestones is shown in the table below.

Num	Task	Start	End	Status	Member(s)
	Senior Design 1				
1	Ideas	8/30	9/3	Complete	All
2	Project Selection	9/6	9/10	Complete	All
	Project Report				
3	Initial Documentation	9/13	9/17	Complete	All
4	First Draft	9/27	10/8	In Progress	All
5	Final 60 Page Initial Report	10/11	11/5	In Progress	All
6	Final 100 Page Initial Report	11/8	11/19		All
	Research and Design				
7	Research Micro-Computer	9/20	9/24	Complete	Axel
8	Research Touch Panel	9/20	9/24	Complete	Jonathan
9	Research Display(s)/ Peripherals	9/20	9/24	Complete	Jacob
10	Research Power Delivery	9/27	10/1	In Progress	Jonathan
11	Research Motion Detection	9/20	9/24	Complete	Tyler
12	Research Android Connectivity	9/27	10/1	In Progress	Axel
13	Research Micro Controller	9/27	10/1	In Progress	Tyler
14	Research Facial Recognition	10/4	10/8		Axel
15	Research External Info API's	10/4	10/8		Jacob
16	Design Power Distro	10/4	10/8		Jonathan
17	Design Micro Controller Circuit	10/4	10/8		Tyler
18	Obtain Computer and Controller	10/4	10/8		All
19	Program/ Integrate Micro-Computer	10/11	10/29		Axel/ Jacob
20	Program/ Integrate Micro-Controller	10/11	10/29		Tyler/ Jonathan
21	Integrate Controller & Comp.	11/1	11/5		All
	Prepare For SD 2				
22	Final Preparation	11/8	11/26		All
23	Order Materials	11/29	12/3		All

Figure 4: Project Timeline

7. House of Quality (HOQ)

The house of quality is an important step in the product development process. The table illustrates the needs and wants of the customer, along with the requirements set by the engineers, and relates them. Some customer wants may not coincide with what the engineers want. And vice versa. A HOQ for our product is shown below.

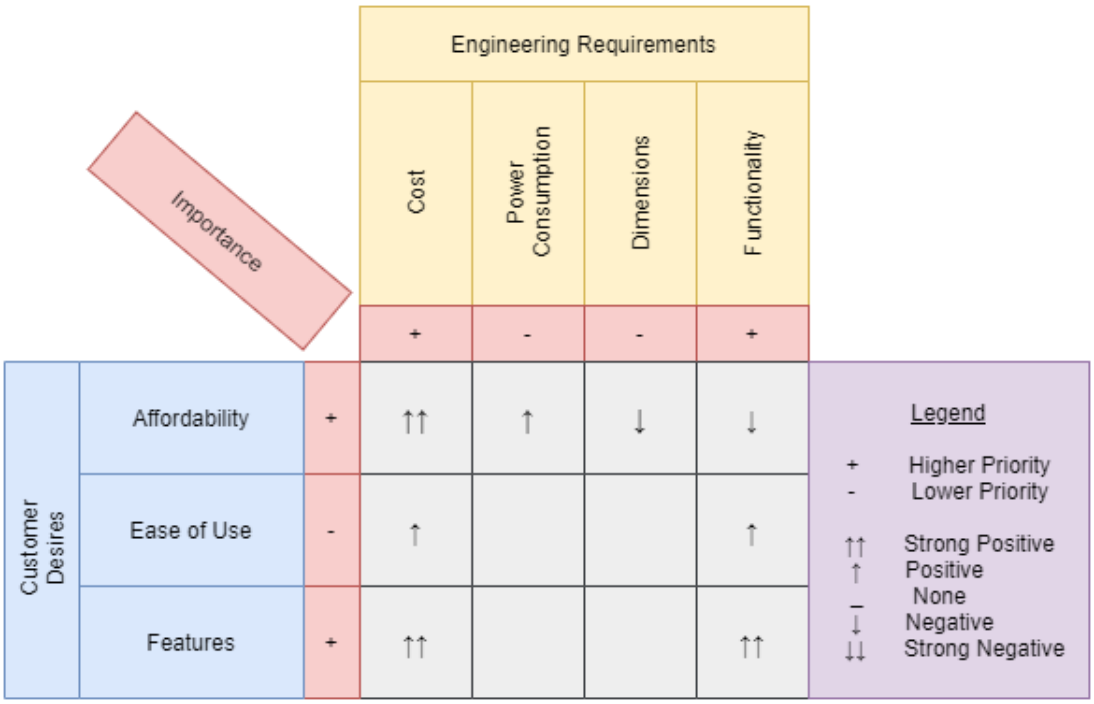

Figure 5: House of Quality