Smart Mirror

Team MyrR

Why Choose a Smart Mirror

- Convenient day-to-day use
- Day planner/calendar
- Weather forecast
- Voice Recognition
- Music Player with speaker system
- Easy smart phone connection via Bluetooth
- Development cost is approx. $400.

Smart Mirror’s Components

- **Smart Mirror consists of:**
  - Raspberry Pi 3 B+
  - phone application
  - LCD screen
  - dielectric glass material
  - LED lights
  - speakers
  - USB sound card and microphone
  - wooden casing for the mirror

Qualitative Goals for Smart Mirror

- Enough memory to hold all apps (10GB storage)
- Access speed and scheduling of applications (<1s)
- Speakers have a sensitivity of 80 decibels/2.83 volts
- Dielectric glass is at most 30% transparent
- Voice input has at least 90% accuracy
- User’s phone is able to connect to the mirror in range of 50 ft

Software Design Approach

- Enable Windows IoT, Linux, or Windows OS for Raspberry Pi
- Import Google Music, Google Calendar, clock widget, and Memos for Raspberry Pi
- Setup local server to store voice commands (SQL server)
- Enable Google Assistant or Voice Dictation software to process voice input
- Use Angular or PHP to create phone application

Hardware Elements

Raspberry Pi 3B+

Processor	Broadcom BCM2837B0, Cortex®-A53 (Arm®v8) 64-bit SoC @ 1.4 GHz
Communication	2.4 GHz and 5 GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
RAM	1 GB SDRAM
GPU	250MHz VideoCore IV
Memory Storage	10 GB
Input Voltage	5V/2.5A DC

Mirror Enclosure

Outer Frame Dimensions	38" x 26" x 2"
Mirror Dimensions	3' x 2' x 0.12"

LCD Screen

Dimensions	121.11 x 95.24mm
Resolution	800 x 480

Speaker

Dimensions	1.1" diameter
Output Power	2W
Weight	29 grams

Speaker Amplifier

Dimensions	41 x 13mm
Operating Voltage	5-12 V
Variable Resistor Size	10K ohms

Dielectric Mirror

Transparency	30% transparent
Dimensions	18" x 24" x 1/4"

LEDs

Dimensions	16.4' (150 LEDs)
Input Voltage	12 V
Connector	3-pin JST-SM

Plan for Smart Mirror Power

- 120v AC to 5v DC for Raspberry Pi
- Potential 120v AC to 12v DC for LEDs
- Battery Backup for 5V Raspberry Pi, 12V LEDS/Speaker Amplifier circuit
- Keep wiring within the shadow box of mirror enclosure

Cost Analysis

- Hardware totaling $330
- At 20 units per year, $2000 per unit, a profit of $2,600 would be made after all necessary costs.

Project cost Analysis			
Engineering time:	$70,000 a year, $35 an hour		
	Jessey (80 hours)		$2,800
	Brennon (100 hours)		$3,500
	Khoa (100 hours)		$3,500
	Daniel (80 hours)		$2,800
	TOTAL		$12,600
Parts:	Shadow box materials/extra wiring		$180
	Raspberry Pi 3 B+		$40
	LCD		$50
	Power supply		$20
	Programmable LEDs		$30
	Speakers w/ parts		$10
	Total		$330
Total Cost to Make:	Parts		$310
	Production (build box, wire, load firmware) - 12 hours		$420
	Test time - 6 hours		$210
	Total		$940
Units sold (over 5 yrs)	unit cost		$2,000
	Units sold per year		20
	Total earnings on sold products		$40,000
All expenses:	marketing (5%)		$2,000.00
	Tool cost/maintenance (5%)		$2,000.00
	Worker Benefits (5%)		$2,000.00
			$6,000.00
	Engineering time		$12,600
	Total cost to make units sold		$18,800
			$31,400
	Total		$37,400
Final Profit			$2,600.00

Risk Assessment and Concerns

- Hardware is relatively straightforward with concern on the battery backup aspect
- Software concerns lie on creating OS/application and debugging
- Voice Recognition is a strong concern currently (lack of team help)
- Final assembly and testing are both very high concerns because of potential unforeseen setbacks

Task Name	Task Lead	Risk Level
Planning, Presentations, Documentation	All	Low
Technical Review Paper	All	Low
Final Project Proposal	All	Low
Parts Ordering	All	Low
PDR Presentation	All	Low
Final Project Review/Presentation	All	Medium
Final Project Demonstration	All	Medium
Final Project Report	All	Low
Hardware	JS, DY	Medium
Model using CAD	JS, DY	Medium
Build the box	JS, DY	Medium
Complete power, I/O, wiring	JS, DY	Medium
Final assembly	JS, DY	High
Software	BF, KP	High
Research Platform	BF, KP	Low
Code main Raspberry Pi features	BF, KP	Medium
Code extra features	BF, KP	High
Debug Raspberry Pi	BF, KP	High
Test Raspberry Pi	BF, KP	Medium

Project Schedule

Team Myr R

Project Start Date 11/10/2019 (Sunday) Display Week 1

TASK	START	END	DAYS	% DONE	WORK DAYS	Predecessor (Based on row number)
Final Project Proposal	Mon 11/11/19	Sun 11/17/19	7	0%	5	
List hardware goods	Mon 11/18/19	Mon 11/18/19	1	0%	1	8
List software goods	Mon 11/18/19	Mon 11/18/19	1	0%	1	8
Make sure all goods are correct	Tue 11/26/19	Tue 11/26/19	1	0%	1	9, 10
Research platform	Wed 11/27/19	Tue 12/03/19	7	0%	5	11
Final Project Review and Oral presentation	Mon 1/06/20	Fri 1/10/20	5	0%	5	8
Purchase goods	Mon 1/13/20	Sun 1/19/20	7	0%	5	11
Code main Rasperry Pi features	Mon 1/20/20	Tue 2/18/20	30	0%	22	14
Code extra features	Wed 2/19/20	Thu 3/19/20	30	0%	22	15
Debug Raspberry Pi	Wed 2/19/20	Thu 3/19/20	30	0%	22	15
Test Raspberry Pi	Wed 2/19/20	Thu 3/19/20	30	0%	22	18
Model using CAD	Mon 1/20/20	Thu 1/23/20	4	0%	4	14
Build the box	Fri 1/24/20	Mon 1/27/20	4	0%	2	19
Complete power, I/O the wiring	Tue 1/28/20	Wed 1/29/20	2	0%	2	14
Final Assembly	Fri 3/20/20	Thu 3/26/20	7	0%	5	18, 20, 21
Test for extended period	Fri 3/27/20	Thu 4/02/20	7	0%	5	22
Final project oral presentation	Mon 4/13/20	Sun 4/19/20	7	0%	5	23
Final Project demonstration	Mon 4/13/20	Sun 4/19/20	7	0%	5	23
Design Expo	Thu 4/23/20	Thu 4/23/20	1	0%	1	24, 25

Project Status

- Currently, the Oral Presentation today is the last step before ordering parts and beginning the software programming.
- The building of the enclosure and wiring will be done simultaneously with the software. We plan on everything coming together for the final assembly, debugging and testing.
- The main concern for progress moving forward is the unexpected lack of “manpower” going onward. We are in close contact with Dr. Frazier about that.