ECE 441 Fall 2021

WEEK #2 GROUP MEETING LOG

Lab Session: 2

Group Number: 2

Instructor: Dr. Jafar Saniie

Due Date: 01-26-2022

Acknowledgment: I acknowledge all of the work (including figures and codes) belongs to me and/or persons who are referenced.

Member 1: Alan Palayil

Member 2: Fabian Garcia

Member 3: Gabriel Gutierrez

[TBD]

**Project Ideas:**

* Home Assistant and Automation:
  + Smart Mirror to display stats
  + Integrate Platforms like Google & Amazon (Create one platform)
  + Smart plugs and Switches
  + Sensors to automate actuation
    - Motion, Light, etc
* Renewable energy
  + Smart solar panels (adjust their axis for maximum solar irradiance)
* Medical devices
  + Smart Wheelchair
  + Interactive Smart Healthcare Robot Companion
    - Track the medications
    - Like Vector or Cosmo
* Smart Lock:
  + Randomize Keypad to increase security
  + 3D Face Recognition
  + Fingerprint scanner
  + App Connected
  + NFC/RFID
  + Regular Key access
  + Integration with door mat and pressure sensors

**Project Goal:**

* App integration (Using platforms like IFTT, FireFly, etc.)
* Bluetooth
* Beneficial to an individual or group of people

**Standards used in Project:**

Not applicable during this stage of the project

**System Constraints:**

Budget (TBD)

**Prior Knowledge Acquired Critical to Design Project:**

ECE 100, ECE 211, ECE 213, ECE 218, ECE 242, ECE 307, ECE 308, ECE 311, ECE 319, ECE 407, ECE 411, ECE 436, ECE 438, ECE 485, CS 115, CS 116, CS 330, CS 350, CS 351, CS 450

Note: Courses will be explained once a final project is chosen.

Meeting 1

| Date | 1/24/2022 |
| --- | --- |
| Start Time | 1:00 PM |
| Duration | 2 hours |
| Attendance | All attended |

1. **Agenda**

For this first meeting as a group, we each did a personal Introduction, and we verified and finalized our meeting schedule shown below. As a group, we came up with possible project ideas, shown previously such as a smart mirror or a medical device that can assist people with disabilities. We also talked about the limitations, such as the cost. Finally, we talked about the expectations we have for one another.

1. **Tasks**

| **1 - Idea development** | | |
| --- | --- | --- |
| **Task** | **Assigned to** | **Due Date** |
| Find 2 project cost  (6 total) | Everyone | 01-24-2022 |
| Come up with new project ideas | Everyone | 01-24-2022 |
|  |  |  |

1. **Work Distribution**

| **Alan Palayil** | Look into Home automation and assistant, find the pricing for the components. Software and sensors are required to design the system. Possible constraints. |
| --- | --- |
| **Fabian Garcia** | Do some more research on Smart Locks and possible variations of the concept. Come up with a rough estimate for pricing of the various components and a complete prototype. Any possible constraints. |
| **Gabriel Gutierrez** | Research more into the smart mirror and smart solar panel. Find out possible constraints when it comes to designing and developing these systems. |

1. **Progress and Milestones**

This meeting helped as a stepping stone to the start of our project. A consistent schedule was made and a general list of possible routes and ideas have been listed and presented to the group.

1. **Next Steps**

For our upcoming meeting on January 25, 2022, at 10 PM we would like to dwindle our project ideas after doing some research and figuring out which ones are within our budget and meet our criteria.

Meeting 2

| Date | 1/25/2022 |
| --- | --- |
| Start Time | 10:00 PM |
| Duration | 2 hours |
| Attendance | All attended |

1. **Agenda**

* Narrow down topics to at most 3.
* Discuss budget constraints and the most feasible idea
* Talk about the next steps

As a team, we were able to narrow down our project ideas to the Smart mirror (maybe include automation, window shutters, and lock as a complete system) and the irradiance-dependent solar panel.

Discuss the following project topics:

**Smart mirror - Gabriel (Through the Speculum)**

A smart mirror is a screen overlapped by a two-way glass that acts also acts as a mirror. The following items are needed:

* Raspberry pi/ Raspbian
* LCD screen (discuss reusing old screens)
* Addons: Microphone, camera, voice face detection (discuss what’s possible)

A smart mirror has various uses, for it can control smart objects around your house such as lights, speakers, and anything that can be automated.



If Amazon voice assistant needs to be implemented, Amazon Alexa Alexa Skills Kit must be installed onto the raspberry pi; however, to be more versatile google voice assistant can also be installed. *Discussing* the overall goal would be beneficial when it comes to determining the cost of this device.

**Irradiance dependent solar panel - Gabriel**

It is important to *discuss* how interested every group member is in renewable energy sources.

The general goal is to have solar panels that follow the sun's path for optimal solar to energy sources. The panels can be controlled by a 2-axis servo monitor. With the following two routes being taken:

1. Have a preprogrammed path that mimics that of the sun.
2. Have light sensors detecting the direction of most intensity (can be useful when clouds are blocking the sun
   * A 2-axis image can be made with each pixel representing the light intensity of the sky.
   * Would need to discuss the feasibility and cost.

Image processing techniques would have to be used

| Sky (source: Shutterstock) | Light sensor intensity values representation |
| --- | --- |

From looking at the second figure, the solar panels would adjust to face the highest intensity values (sun)

**Smart Locks-Fabian**

A smart lock can have a variety of implementations and unlocking features depending on the needs and ease of access. Most commonly smart locks can be seen having some sort of number pad, as well as access through a mobile device.

Components:

* General Mechanical Lock
* Raspberry Pi
* Mobile App
* Options for methods of unlock
  + Fingerprint scanner
  + Facial Recognition (IR camera)
  + Pressure sensors
  + Touchscreen Display

Depending on the approach we take and how we want the lock to be used, we can decide on a single method of unlocking or combine a few of the options to make the smart lock more flexible. Regardless of the method being used, the smart lock will include a mobile unlock and will be included with a traditional key lock in case the electronics fail or the battery loses charge. The desired route will be discussed to proceed with a cost estimate.

**Smart Window Shutters-Fabian**

This concept would combine curtains, and window shutters to allow both the amount of air and light in a room to be controlled. Similar to how electronic curtains can be deployed, the shutters would be able to be controlled remotely from one's phone or manually adjusted.

Components:

* Servos to control the blades
* Raspberry Pi
* Breadboard Kit
* Arduino

This idea would replace a windowpane and line the windows instead of a mesh material and a glass pane. It would allow for more flexibility and easier control over generally manual tasks. Multiple would be able to be linked together or portions will be allowed to work independently.

**Home Automation Set-Up with Assistant-Alan**

A smart speaker with an in-built display (TBD) to control the devices at home using both Google voice assistant and Amazon Alexa platforms to increase the connectivity. Smart relays and sensors to make the room (space) automated.

The following parts will be required:

* Microcontroller (ESP8266) for sending and receiving signals from relays and sensors.
* Sensors like temperature, motion, light sensors increase the accuracy of data from the internet.
* Relays to actuate the switches (existing) remotely.
* Raspberry Pi for the Smart assistant with speakers. (TBD)

The system can be used for setting up a complete smart home that can remotely and manually control the switches in the room, set room temperature, etc. Making a platform to control and monitor the states of the switches. The overall price when excluding the Pi comes to around 80 bucks.

**Interactive Medical Assistant- Alan**

Making an interactive robot to monitor family members, show medication reminders, home security. The robot can have real-time video surveillance and call features using raspberry pi and Arduino.

* Raspberry Pi for main computing.
* Arduino for controlling the movement of the robot.
* Sensors to help the robot move around
* Camera module for real-time video

1. **Tasks**

| **1 - Idea development** | | |
| --- | --- | --- |
| **Task** | **Assigned to** | **Due Date** |
| Further Research on Chosen Project Ideas | Everyone | 1/27 |
| Budget | Everyone | 1/29 or 2/5 |

1. **Work Distribution**

| **Alan Palayil** | Researched on home automation and medical interactive AI robot.  Will work on the research for the voice assistant, sensors and relays. |
| --- | --- |
|  | |
| **Fabian Garcia** | Worked on research for Smart Locks and the Smart Window  Shutters. Will work on research for possible touchscreen integration and user interface |
|  | |
| **Gabriel Gutierrez** | Worked on researching the smart mirror and smart solar panel.  Future research involves looking into Arduino and raspberry pi communication for idea #1.  Will work on finding 2-axis solar panel projects that are being worked on right now. |
|  | |

1. **Progress and Milestones**

We have narrowed down our design choices to two. Entry-level research

and discussion on both topics have been done as well. We also started a spreadsheet to keep track of our sources.

1. **Next Steps**

After discussing with the TA this upcoming Thursday, 27th. We will be meeting as a group on Monday the 31st from 1:00-3:00 PM. Research and budgeting have also been added to the task list. Each member of the group has also been assigned their research, which will be done by the next meeting. This will help us know what direction to take our overall project and research.