Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

# Senior Design 1

# Project: Solar powered Smart Lock

Department of Electrical Engineering and Computer Science

University of Central Florida

Dr. Lei Wei

Initial Project and Group Identification Document

- Divide and Conquer –

Group 8:

Faisal Almohamedi, Electrical Engineering, fsl000@knights.ucf.edu

Wikender Alcius, Electrical Engineering, wikenderalcius12@knights.ucf.edu

Mohamed Ait Bella, Computer science, maitbella@knights.ucf.edu

Livenghtston Cius, Electrical Engineering, livenghtstoncius@knights.ucf.edu

**Self-sponsored**

Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Section 2: Project Narrative

Imagine what can happen if you lock yourself out while cooking some delicious meal? Your meal is on the stove, and you know it is on high. There is no way to access the house without a key. Anything could happen, its either the food gets burn or the house gets caught on fire, which would lead to a definitely wrong way. With this Solar Powered Smart Lock, there is no need to worry about that anymore.

This Solar Powered Smart Lock is the best, most advantages and ultimate smart lock. No need for a key if you accidently lock yourself out. No needs to keep replacing batteries every now and then, and no need to worry about getting your house burn, ruin your food, or any thing worse that could happen while you are outside. Since security has a major impact in our daily life, as well as digital smart locks have become an important part of those systems, this is one of the best invention for the future technology. This Smart Lock will be the first in the world to use solar powered source and a rechargeable battery that will be reliable and efficient. This smart lock will be affordable for all the amazing features it will provide to the user, it will also very easy to program, it will be user friendly smart lock. Once it is programed, only the admin will be able to change the combination and mess with it.

This smart lock project is made to help people control their home security more easily using the latest technology as solar power feature and sensing which makes misplace keys not a problem anymore because smart locks gives you the chance to open your door in many different ways such as keypad, facial recognition, telephone application, as well as finger print. Our team hopes that this project will make the home security monitoring much easier and save lots of homeowner the trouble of losing their keys.

Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Section 3: Project Requirements and Specifications

This smart lock will have one camera, which will handle the image processing. Some built-in commands that can be controlled by using a telephone application. A six to eight digit passcode that can be enter using the lock keyboard. With all these great features, Based on the problems people face due to losing or misplacing keys, and also how easy is it to stole a key and make a copy key in the hardware store. We decided to lessen that type of problem in any ways that we can. This Smart Lock will be much better because of its security protocol.

The smart lock will have a digital encryption technology that can't be copied or broken. Also it will be a highly connected intelligent lock that can switch keys and codes in favor of sensors and recognition software. This generation of lock will help the user to carry a digital wireless key stored in his or her smartphone. It will be very convenient and it will lessen the weight carrying around, and the feeling of key lost and no access into the house will be over, since everything will be on the door and the phone.

A raspberry pi will be using as the microcontroller because it has more processing power than any other microcontroller in the market and the fact that we are trying to use image processing in our project in which raspberry pi micro controller can handle the best, it also has capabilities and ports not found on other microcontrollers such as 4 USB port, an audio adapter, Bluetooth and BLE, however the most important bad side of raspberry pi is its power consumption, The Raspberry Pi can consume up to 2.1 amps (only under some circumstances, which amounts to 10.5 watts), resulting in a battery life of only 1 hour which is not good compare to other microcontrollers in the market

Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Section 4: House of Quality Diagram

In order to deliver the best quality product to our customers for our project, there are some marketing requirements and some Engineering Requirement that must be compatible to give a better idea on which approach to take. Moreover, providing the best quality service, to keep the customer happy and satisfied.

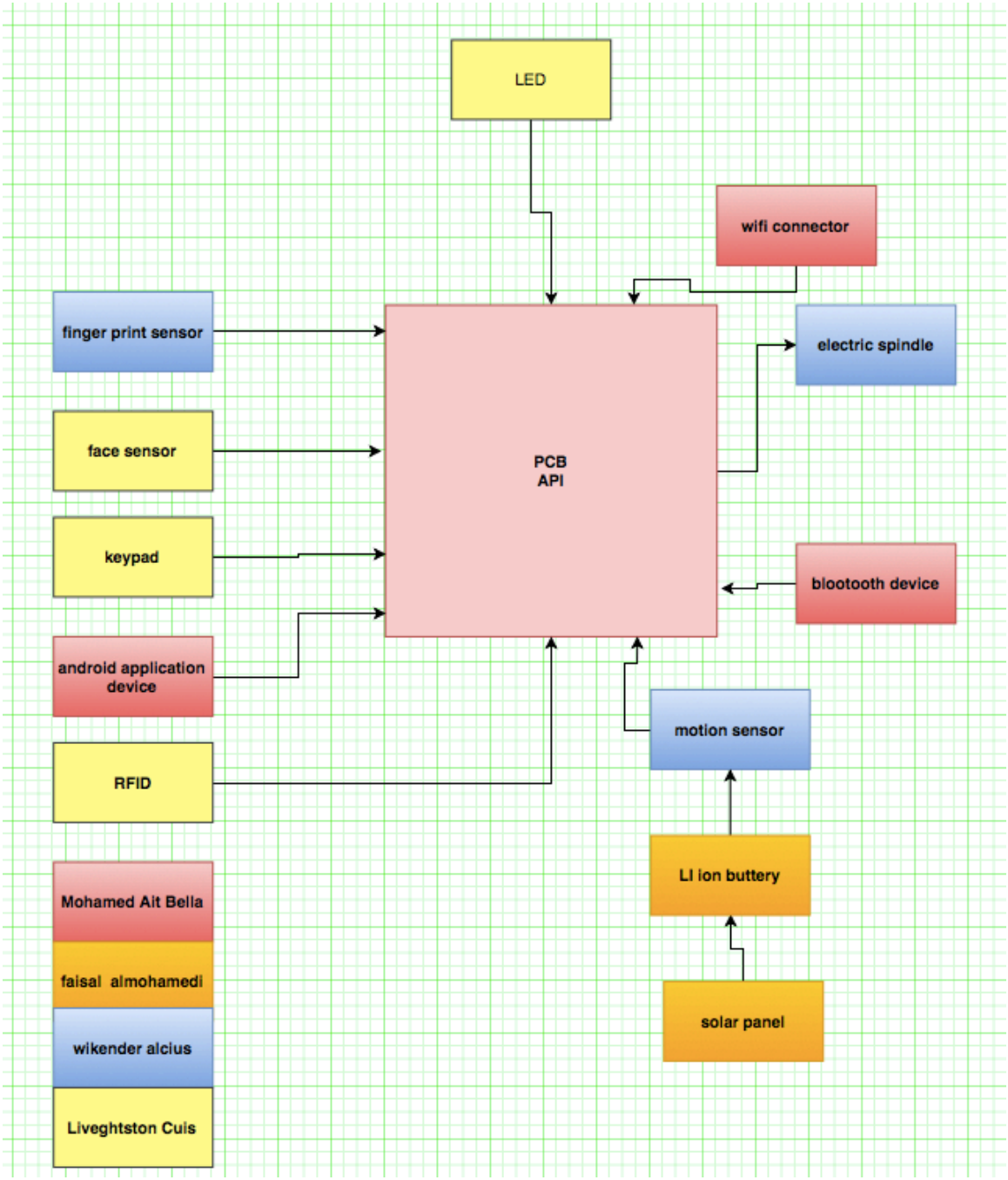
| | | | Engineering Requirements | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Weight | Dimensions | Power Input | Setup Time | Cost | |
| | | | - | - | - | - | - | |
| Marketing Requirements | Durability | + | ↑ | ↓ | | | ↓ | |
| | Low Cost | - | ↑ | ↓ | ↑ | | ↑ | |
| | Easy to Install | + | ↑ | ↑ | ↑ | ↑ | ↑ | |
| | Battery Life | + | ↑ | ↑ | ↓ | | ↓ | |
| | Easy to customize | + | ↑ | ↑ | | ↓ | ↑ | |
| | Easy to use | + | ↑ | ↑ | ↑ | ↑ | ↓ | |
| | Target for Engineer Requirements | | < 10 lbs | 3 x 7.5 inches | 5 V | < 10 mins | < $200 | |

## Legend

- + Positive polarity
- - Negative polarity
- ↑ Positive correlation
- ↓ Negative correlation

Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Section 5: Project Block Diagram and Illustrations



Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Project Block Diagram Status:

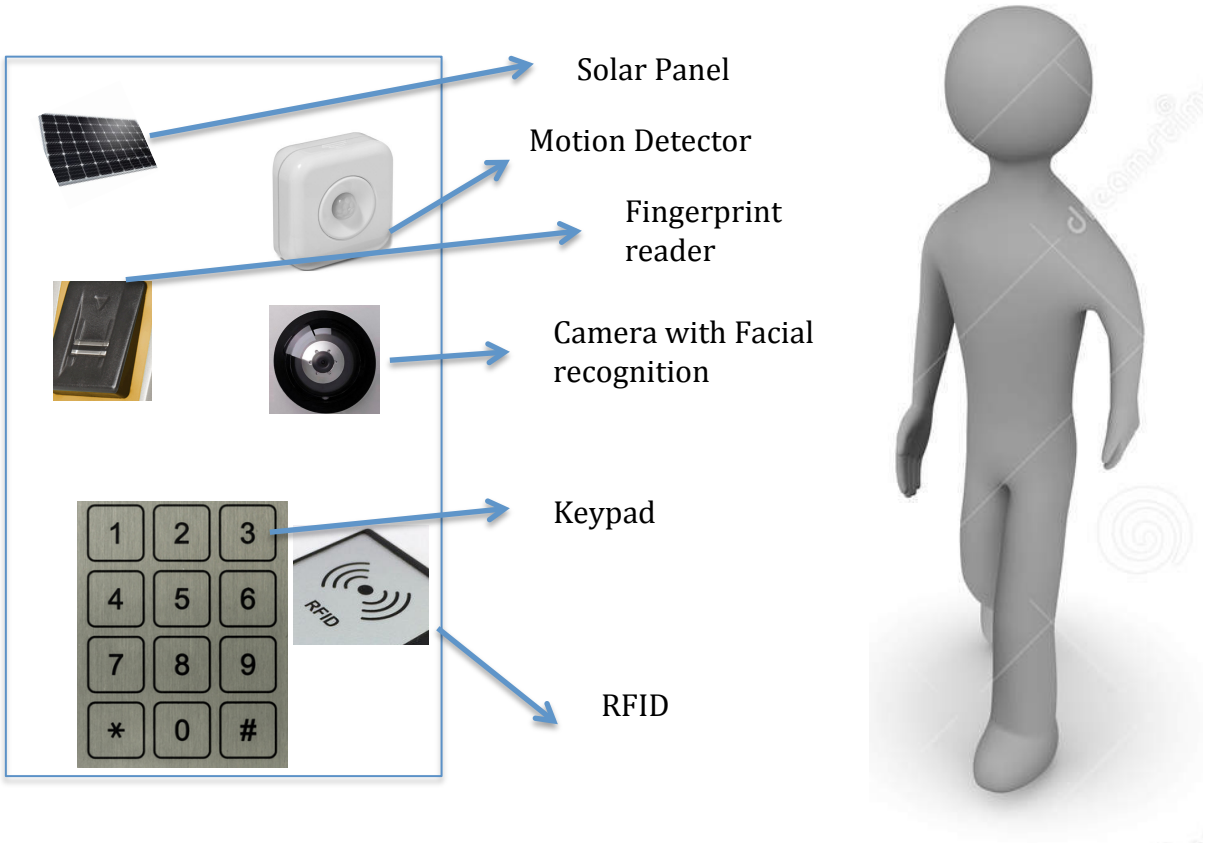
- Each block is currently being researched
- All the blocks are currently I design process
- None of the blocks have been purchased or acquired
- None of the blocks are being prototyped

## Block Diagram Illustration:

The motion sensor will activate the microcontroller once someone is at the door.

The person has many options to unlock the door:

- Using a card with RFID.
- Using facial recognition.
- Using a keypad to enter a passcode.
- Using his fingerprint.
- Using an app on a phone.



Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Section 6: Estimated Project budget and financing

Below is the table of some of the lowest prices that we found on the Internet, in order to make our project as cheap as possible.

| Equipment | Cost | Website |
|---|---|---|
| **Electric Door Sprinkle** | $ 11 | https://www.amazon.com/Central-Actuator-FC-280PC-22125-Spindle-Locking/dp/B00BYD0QVK/ref=sr_1_3/144-3805266-3841350?ie=UTF8&qid=1528411402&sr=8-3&keywords=electric+door+spindle |
| **Image Processing Camera (Pixy Cam)** | $ 39 | Motor-Pixy-CMUcam5/dp/B00IVOEN1Y/ref=sr_1_2?ie=UTF8&qid=1528412301&sr=8- |
| **RFID** | $19 | https://www.amazon.com/OSOYOO-Security-Mega2560-Learning- |
| **Biometrics Sensor** | $27 | iDOO-Bio-metric-Password-Free-Encryption/dp/B074M6ZCT5/ref=sr_1_9?s=electronics&ie=UTF8&qid=1528413553&sr=1- |
| **Motion Sensor** | $10 | Detector-Infrared-Sensor-System/dp/B075RZH5GR/ref=sr_1_3?s=electronics&ie=UTF8&qid=1528413807&sr=1- |
| **LEDs** | Included in RFID kit | |
| **PCB** | $35 | https://forums.anandtech.com/threads/pcb-printing-how-much.1905688/ |
| **Rasberry Pi** | $36 | RASPBERRYPI3-MODB-1GB-Model-Motherboard/dp/B01CD5VC92/ref=sr_1_4?s=electronics&ie=UTF8&qid=1528414544&sr=1-4&keywords=raspberry+pi |
| **Keypad** | $0 | |
| **Batteries** | $11 | https://www.amazon.com/10000mah-TONV-Portable-External-Li-polymer/dp/B078TFHXVY/ref=sr_1_5?s=electronics&ie=UTF8&qid=1528414850&sr=1- |
| **Total** | $188 | |

Wikender Alcius
Livenston Analdo Cius
Mohamed Ait Bella
Faisal Almohamedi

## Section 7: Initial Project milestone for both semesters

- Each block is currently being searched
- None of the blocks have been purchased or acquired
- All blocks are currently in design process
- None of the blocks are being prototyped

| **Senior design 1** | | |
|---|---|---|
| **description** | **duration** | **dates** |
| brainstorming | 1 weeks | May14 - may 21 |
| Project selection | 1 week | May22 - may 29 |
| Divide and conquer | | Jun 29 |
| Research and documentation | 4 weeks | Jun 7- July 7 |
| Table of contents | | July 7 |
| writing | 1 week | Jun28– July5 |
| Senior design 1 draft | | |
| Research and design | 1 weeks | July6 |
| Finalizing the paper | 1weeks | July13 |
| Final document | | July 20 |
| **Senior design 2** | | |
| **description** | **duration** | **dates** |
| Build prototype | 4 weeks | August 21 -September 21 |
| Testing & redesign | 2 weeks | September 21-october 5 |
| Finalize prototype | 2weeks | October 5-octeber 20 |
| Peer presentation | | TBA |
| Final report | | TBA |
| Final presentation | | TBA |