Senior Design 1 Divide And Conquer

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# BreathaLock

## Breathalyzer Remote Keyless Car Entry

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Sponsored by: N/A

**Group 31**

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# 1. Potential Customers

- State or local governments will utilize our device as a probationary or rehabilitation device to help repeat DUI offenders and reduce recidivism.
- Individuals who would like to be responsible drivers but also enjoy “night life”.

# 2. Introduction

While pursuing a college degree and living in a college town every student encounters many challenges outside of the classroom. One of the primary challenges that affect many students and adults around the country is driving under the influence of alcohol. Most adults know that it is an unwise decision to get behind the wheel at an impaired state but despite the fact that legally there are many consequences, both legal and life altering, many adults and teens fail to avoid driving impaired.

Currently there are various ways to avoid this situation: carpooling with a sober driver, using alternate transportation, or waiting till your body processes alcohol enough to be within the legal limit. Some of these are costly, some are inconvenient for various reasons, and some are hard to measure.

We propose to design a device to protect a person from getting into a vehicle at an impaired state or to monitor a person that has already received legal consequence and is on a probationary stage. This device will have the ability to read blood alcohol level, unique biometrics, and keep the user from physically driving their vehicle under the influence of a specified amount of alcohol.

To do these tasks we will implement a battery powered breathalyzer key fob that incorporates multiple features. Primarily this device will block the ability to remotely unlock your motor vehicle until the user blows across a blood alcohol sensor that verifies the user is below specified alcohol level. In addition the device will demand the user applies their finger onto a biometric sensor to verify the affected person is the user and not a sober person in the vicinity to bypass the system. Once these tests are passed the user will be able to unlock their vehicle and continue to use their vehicle completely unaltered.

We expect the device to be very user friendly, easy to use, and accurately read data to protect the person and public from driving under the influence of alcohol.

# 3. Design specification and constraints

- *The system should be no larger than* 3" x 3" x 7". This will guarantee the device is discrete.

- *The system should be no heavier than 1lb.* This will ensure the device is susceptible to travel.

- *Both sensors must operate with a delay of less than 10 seconds.* This ensures practicality of the device as most users are time sensitive.

- *The system must be battery powered within 20V.* This will keep the device operating at low power and able to use standard battery sizes on the market.

- *The system's radio frequency signal must be within 315MHz range.* This is because in the United States, this is the common frequency used in most remote keyless entry systems. Also, this will comply with other devices as some devices are operating at a reserved portion of the spectrum.

- *The system must be able to hang onto a key ring.* This ensures the device is portable.

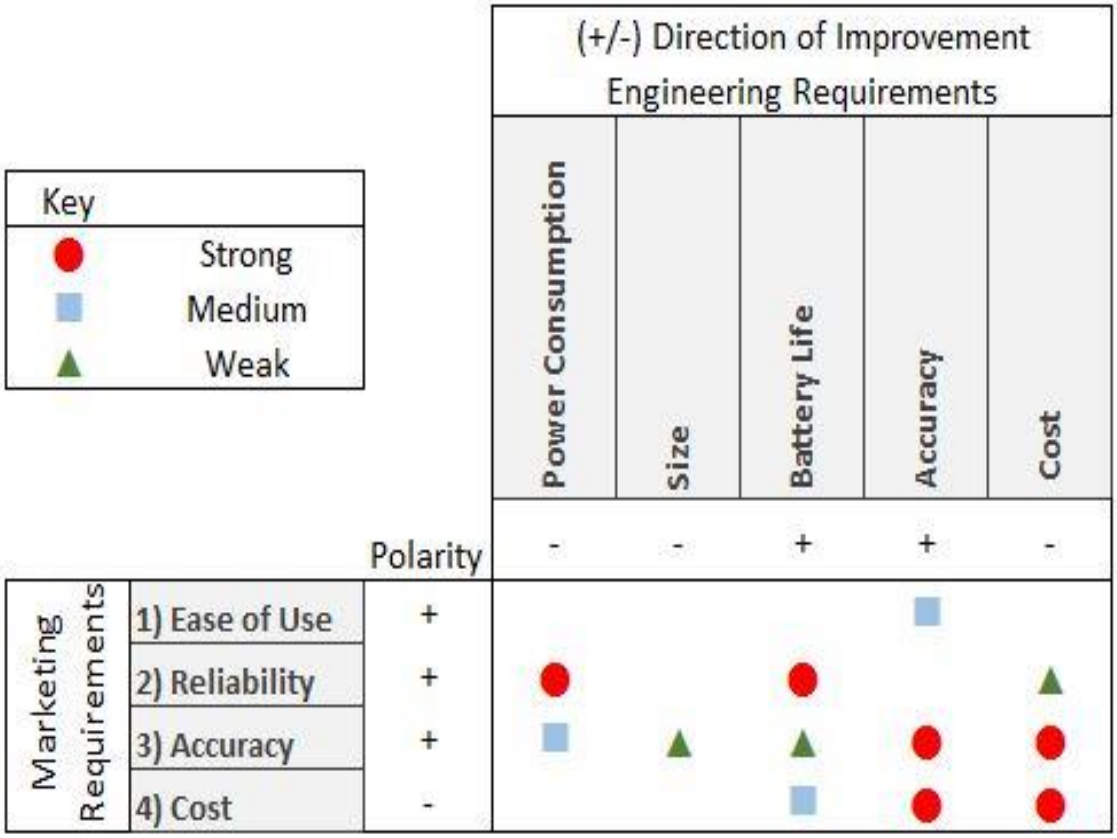
- *The device must be able to store the fingerprint data of registered user.* This will add a level of security among the users and their motor vehicle.

- *The device must incorporate a sanitary breathalyzer.* This will guarantee an operable device in terms the health of the user.

- *When a lock signal is sent, the automotive should be locked.*

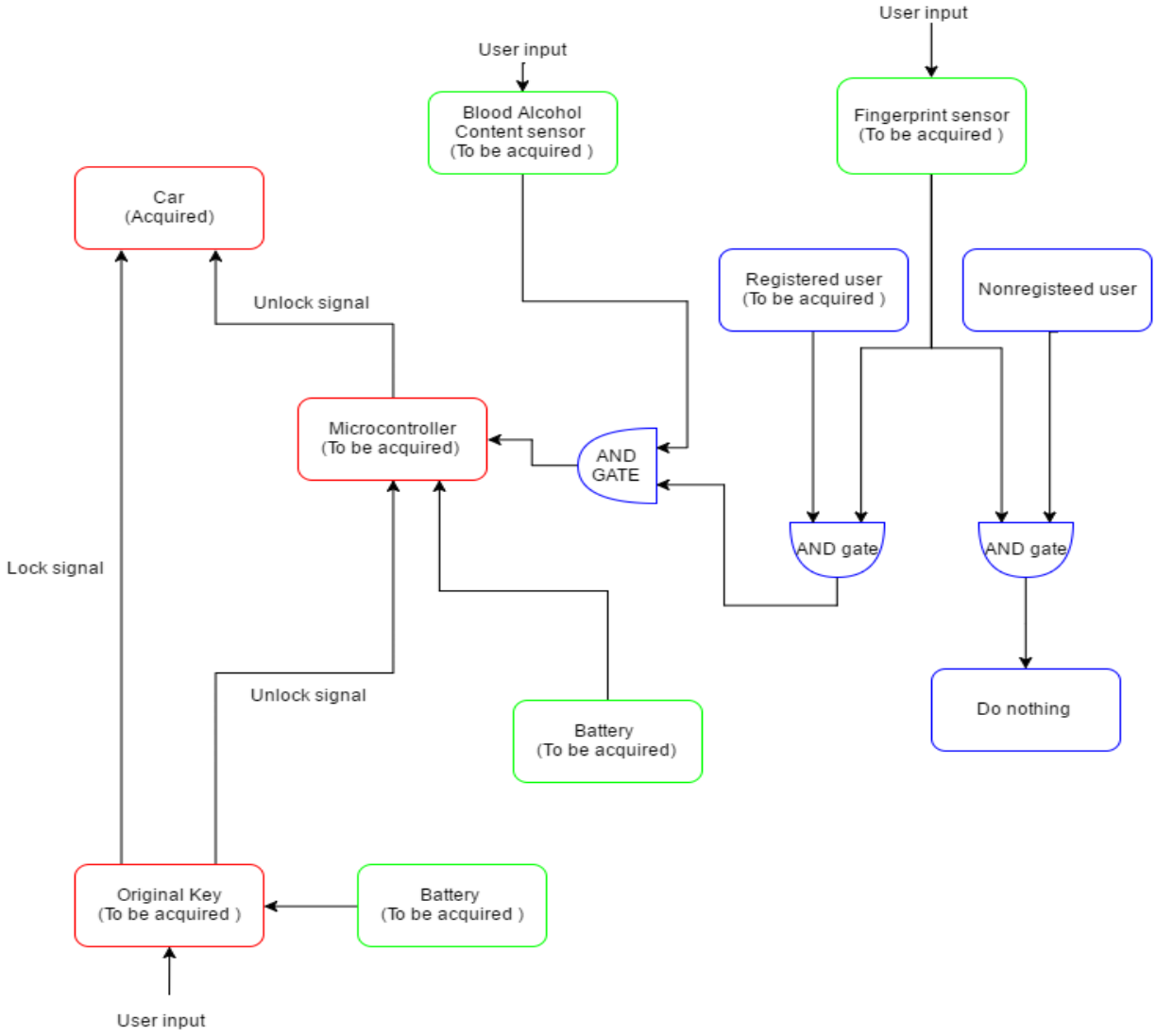
- *When a blood alcohol content is at .08 or above, the device must not be able to transmit an unlock signal.* In the state of Florida, a blood alcohol content is .08 or above is considered illegal, thus the device must obstruct the user to enter a motor vehicle.

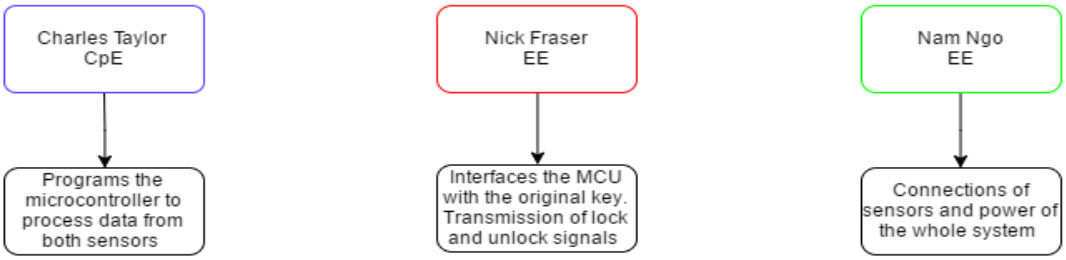
# 4. Trade off table



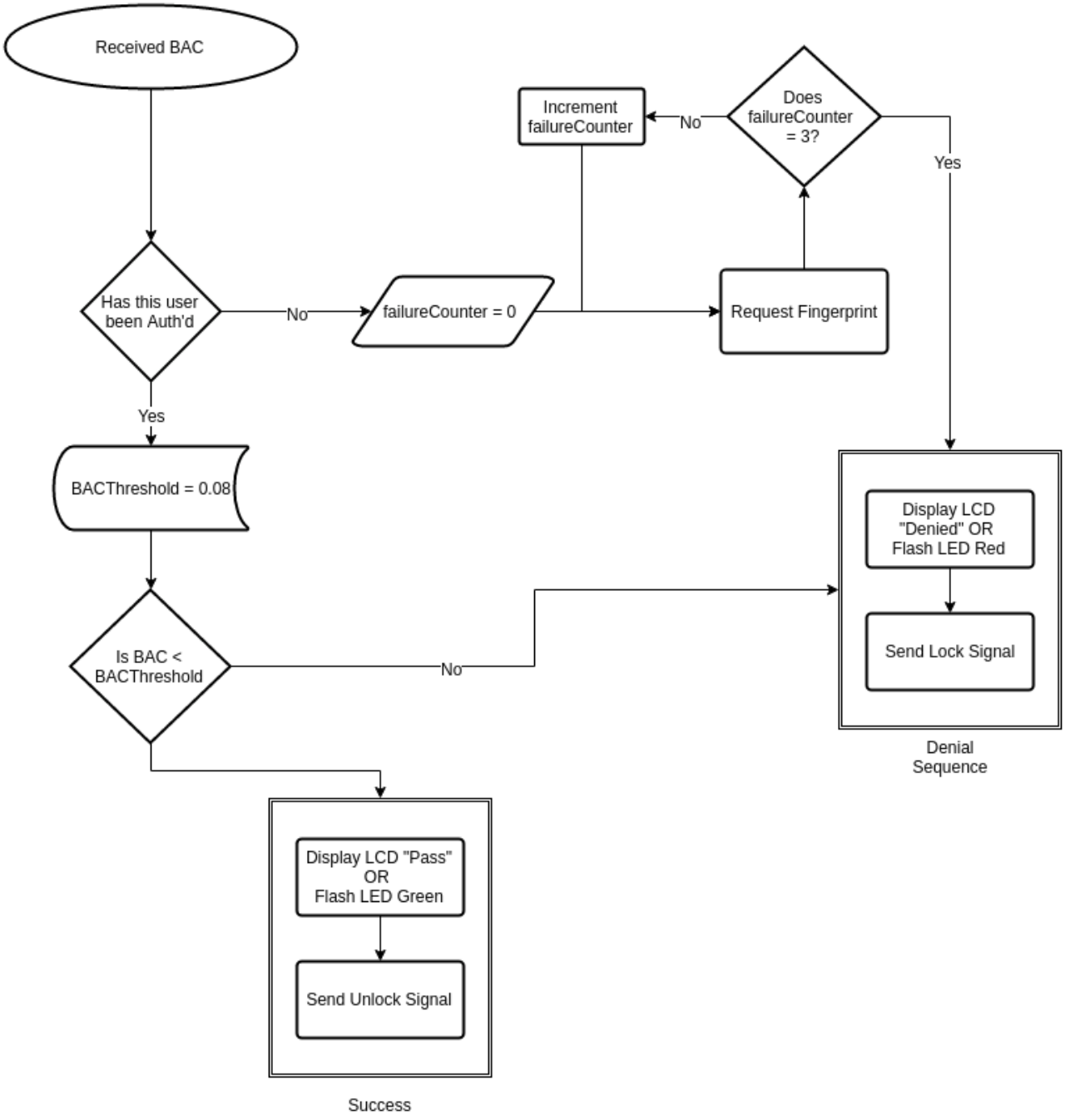
# 5. Block Diagrams

## 5.1 Hardware Diagram

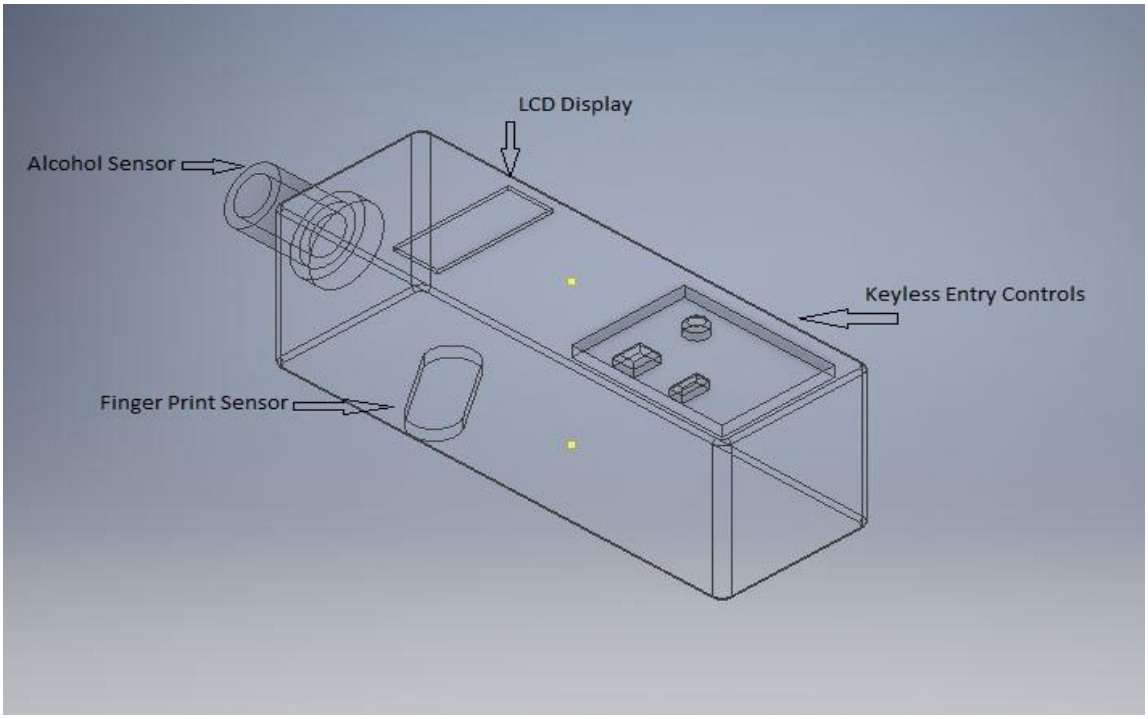


## 5.2 Software Diagram



## 5.3 3D Sketch




# 6. Project Budget

Extra quantities are considered to account for the case of broken parts.

| **Part** | **Quantity** | **Cost** | **Total** |
|---|---|---|---|
| Microcontroller | 2 | $10-$20 | $20-$40 |
| Fingerprint Sensor | 2 | $30-$45 | $60-$90 |
| Blood alcohol Sensor | 2 | $30-$45 | $60-$90 |
| Battery | 6 | $3-$5 | $6-$10 |
| Programmable Key fob | 2 | $20-$30 | $40-$60 |
| PCB | 3 | $20-$30 | $60-$90 |
| Breathalyzer | 1 | $20 | $20 |
| **Estimated Grand Total** | | | $266-$400 |

# 7. Project Milestones

| **Fall 2016, EEL 4914: Senior design 1** | |
|---|---|
| **Date** | |
| 9-9 | Initial project document- Divide and Conquer due |
| 9-10 to 9-24 | Research design concepts and available parts on the market |
| 9-25 to 9-29 | Write updated Divide and Conquer paper |
| 9-30 | Update Divide and Conquer files due |
| 10-1 to 10-28 | Individual research, begin prototyping design and code development |
| 10-29 to 11-3 | Write table of contents |
| 11-4 | Table of Contents Submission due |
| 11-5 to 11-10 | Write initial draft |
| 11-11 | Current of senior design 1 documentation due |
| 11-12 to 11-28 | Finish prototyping design and code |
| 11-29 to 12-5 | Write final documentation |
| 12-6-16 | Final document due and order parts |

| **Spring 2017, EEL 4915L: Senior design 2** | |
|---|---|
| **Date** | |
| 1-9 to 1-20 | Class begins, start building prototype |
| 1-21 to 3-27 | Test prototype |
| 3-28 to 4-4 | Order PCB |
| 4-5 to 4-21 | Troubleshoot and finalize design |
| 4-22 to 5-02 | Prepare final documentation and presentation |

# 8. Decision Matrix

| | Factor 1 | | Factor 2 | | Factor 3 | | Factor 4 | |
|---|---|---|---|---|---|---|---|---|
| | Feasibility | | Educational Goals | | Public Service | | Personal Interest | |
| | Weight (%) | 30% | Weight (%) | 40% | Weight (%) | 20% | Weight (%) | 10% |
| **Project** | **Rank (1-5)** | **Wtd Rank** | **Rank (1-5)** | **Wtd Rank** | **Rank (1-5)** | **Wtd Rank** | **Rank (1-5)** | **Wtd Rank** |
| Solar Powered WIFI Repea | 3 | 0.9 | 1 | 0.4 | 1 | 0.2 | 1 | 0.1 |
| Smart Gun Lock | 3 | 0.9 | 4 | 1.6 | 4 | 0.8 | 5 | 0.5 |
| Breathalyzer Car Lock | 4 | 1.2 | 5 | 2 | 5 | 1 | 5 | 0.5 |
| IoT Home Security | 3 | 0.9 | 3 | 1.2 | 3 | 0.6 | 3 | 0.3 |
| **Notes** | ***Feasibility*** *was important as we wanted to ensure we had the skill-set to acheive the goal in mind. Also how much foresight we put into our concepts and plans contributed to this score as well* | | *Compatibility for our* ***educational goals*** *was one of the more important deciding factors as we wanted to be able to evenly distribute the work and effectively learn within our relevant domains.* | | ***Public Service*** *was highly important to us we wanted to build/develop a system which benefited people.* | | ***Personal Interest*** *was a deciding factor for very obvious reasons we wanted to work on a project that interested us.* | |

The results obtained from this were as follows:

| Project | Total | Wtd Total |
|---|---|---|
| Solar Powered WIFI Repeater | 6 | 1.6 |
| Smart Gun Lock | 16 | 3.8 |
| Breathalyzer Car Lock | 19 | 4.7 |
| IoT Home Security | 12 | 3 |

We felt that our current project the **Breathalyzer Car Lock** met all of our decision factors best for the following reasons:

**Feasibility:**
The Breathalyzer key fob fit well within our scope of knowledge from our experience gain from our academic and personal careers
**Educational Goals:**
This device met our personal requirement for fulfilling all of our educational desires (Electrical Engineering and Computer Engineering). By placing a heavy emphasis on software and electronic requirements
**Public Service:**
We felt that the Breathalyzer was a great solution to a life altering problem.
**Personal Interest:**
We felt as college students this project was very important to us and future college students.