Engineering Design Notebook

Name: Christine Saw

Group: Sweet Dreams

Project Title: Stun Gun Self Defense Glove

Contact Info: [email] csaw3@gatech.edu [mobile] 770-330-6402

Team Members' Contact Info

Name	Email
Radha Changela	rchangela3@gatech.edu
Hubert Elly	helly3@gatech.edu
Elizabeth Herrejon	eherrejon3@gatech.edu
Lara Kassabian	lkassabian6@gatech.edu
Katie Roberts	kroberts73@gatech.edu
Katie Weatherwax	kweatherwax3@gatech.edu

Table of Contents

Meeting 1

Location: CULC
Date: 1/12/2022
Time: 12:30 PM – 2:30 PM

Attendance

Elizabeth Herrejon, Katie Weatherwax, Katie Roberts, Radha Changela, Hubert Elly, Lara Kassabian, Christine Saw

Action Items

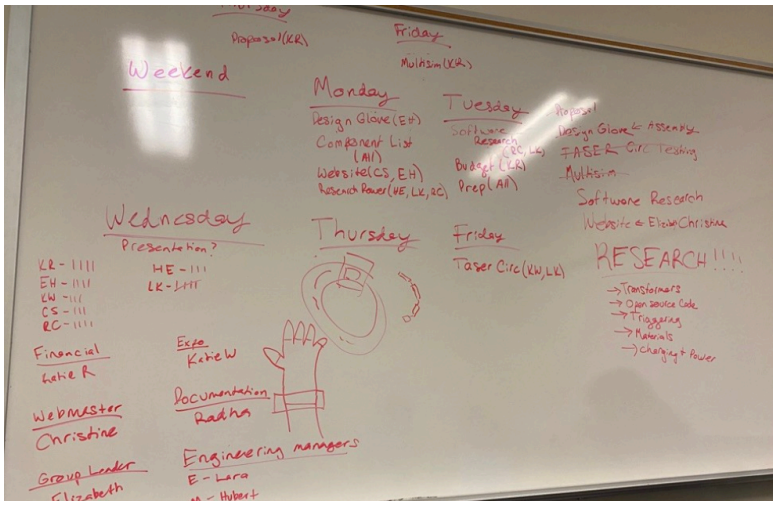
1. Oral presentation availability email |1/12/2022| Elizabeth
2. Weekly update email |1/13/2022| Radha
3. Student continuation form |1/12/2022| Radha
4. Proposal resubmit I1/13/2022I Katie W.
5. Budget I1/18/2022I everyone
6. Research |1/17/2022| everyone *see image below for research topic division
7. Oral Presentation |1/19/2022| everyone

Other Notes

- Finalized leadership role *See image*
- Finalized design
    - Glove design
    - Ring backup, Elizabeth looking into only ring design by 1/17
- GET MORE IMAGES for proposal

To do: (deadline)

1/15 [✓] Add to budget sheet list (1/18)
1/15 [✓] Created slides for oral presentation (1/18)
1/15 [✓] (Elizabeth) Ask for Dr Hasler's availability for oral presentation (1/12)
1/15 [✓] (Radha) Send weekly update email, submit student continuation form (1/12)



Recorded by Christine Saw (1/12/2022) *Witnessed and understood by William Tran 1/30/2022*

Meeting 2

Date: 1/18/2022
Time: 9:00 PM – 9:35 PM

Attendance

Katie Roberts, Radha Changela, Hubert Elly, Lara Kassabian, Christine Saw

Action Items

1. Weekly update email |1/19/2022| Radha
2. Finalize Budget and Materials needed I1/18/2022I everyone
3. Oral Presentation Slides |1/19/2022| everyone

Other Notes

- Lara researched software and finalized microcontroller
- Lara and Katie W. will meet Thursday to build 'shock' circuit
- Hubert researched transformers and found one that conserves space
- Katie R. created simulation of 'shock' circuit
- Katie R. updated project proposal and submitted to Dr. Hasler
- Elizabeth designed glove layout/look and created the personal website
- Radha researched battery recharging and found a circuit
- Christine built the base of proposal power point and will talk to Elizabeth about website (updating)
- Katie W. researched and chose presser sensors and worked on the power point

To do: (deadline)

1/24 [✓] (Me) Add content to oral presentation slides (1/25)
1/22 [✓] (Elizabeth) Create webpage for project (1/22)
1/24 [✓] (Lara, Katie W) Build shock circuit (1/22)
1/24 [✓] (Lara) Research software and finalize microcontroller (1/22)
1/24 [✓] (Hubert) Research transformers (1/22)
1/25 [✓] (Katie R) Build simulation of shock circuit (1/19)

Recorded by Christine Saw (1/18/2022) *Witnessed and understood by William Tran 1/30/2022*

Meeting 3

Date: 1/19/2022
Time: 12:30 PM – 1:50 PM

Attendance

Katie Roberts
Katie Weatherwax
Elizabeth Herrejon (virtual)
Radha Changela
Hubert Elly
Lara Kassabian
Christine Saw

Action Items

1. Weekly update email |1/19/2022| Radha
2. Build Shock Circuit |1/21/2022| Lara and Katie W.
3. Practice Oral Presentation |1/26/2022| everyone
4. Research how to build a transformer |1/26/2022| Hubert
5. Pseudocode |1/26/2022| Radha and Christine
6. Research Bluetooth and GPS Circuit |1/26/2022| Katie R.
7. Researching Pressure Sensor connecting to circuit |1/26/2022| Katie R.
8. Glove Layout |1/26/2022| Elizabeth

Other Notes

- Finished up budget and made budget summary
- Updated Gantt Chart
- Finalized Proposal Slides

To do:

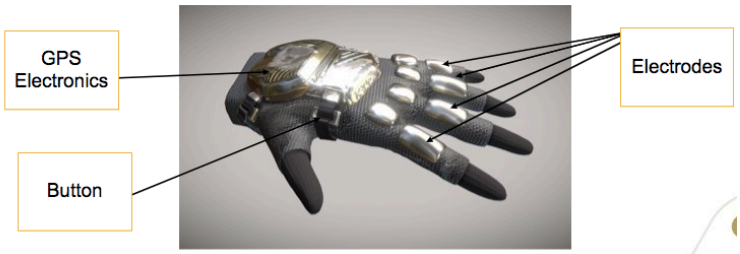
1/24 [✓] Research into open source code for microcontroller (1/24)
1/22 [✓] Get started on pseudo code (1/30)
1/25 [✓] (Katie R) Research pressure sensor connected to circuit (1/24)
1/23 [✓] (Hubert) Research into transformer build setup (1/24)
1/25 [✓] (Elizabeth) Design glove layout (1/24)

Recorded by Christine Saw (1/19/2022) *Witnessed and understood by William Tran 1/30/2022*

Project Design

Project Overview

- Self-defense wearable to protect user in dangerous situations
  - Primary client is women, can be expanded in future
  - Electrodes dispense shock on contact
  - GPS location sent to emergency contacts



Transformer steps up the voltage from 12 V to 7.58kV (oper circuit value).

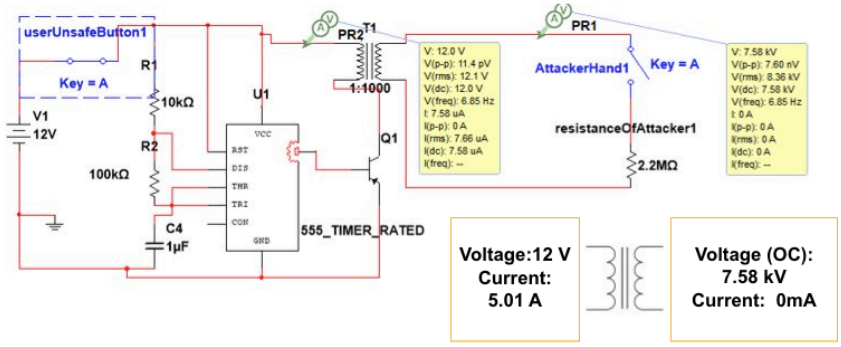


Fig 1. *Transformer voltage prior to discharge*

When contact is made with the attacker the circuit is completed bringing the voltage down and causing current to discharge

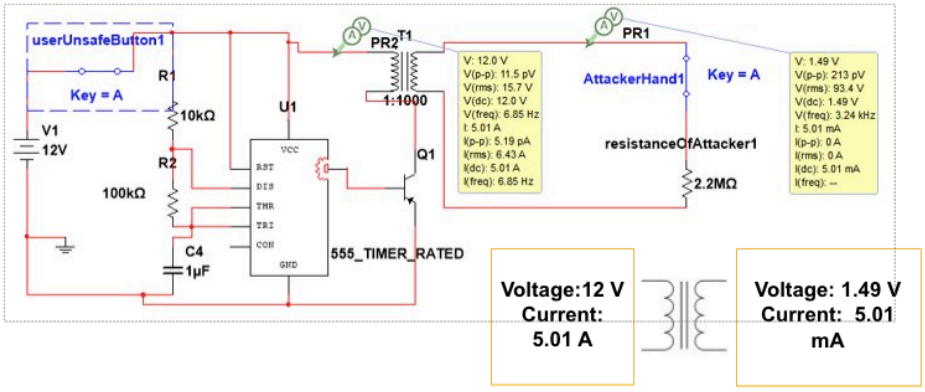


Fig 2. *Transformer at activated AttackerHand1 Output*

Recorded by Christine Saw (1/19/2022) *Witnessed and understood by William Tran 1/30/2022*

Meeting 4

Date: 1/24/2022
Time: 6:00 PM – 7:15 PM

Attendance

Katie Roberts, Katie Weatherwax, Elizabeth Herrejon, Radha Changela, Hubert Elly, Lara Kassabian, Christine Saw

Action Items

1. Practice Proposal
2. Continue/finish assigned tasks from previous meeting

Other Notes

- Went through proposal slides and discussed comments
- Removed transformer slide
    - Will be using new turns ratio that exist
    - We will not have to make our own
- Break up design requirements slide into 2
- Update text Alert picture
    - Fix typo and add link/ mention live tracking location
- Divided up slides
- Lara and Katie W. gave update with testing
    - Took resistor measurement

To do:

1/25
[ ] Practice technical design requirements slides (1/26)
[ ] (Katie R) Research pressure sensor connected to circuit (2/2)
[ ] (Hubert) Research into transformer build setup (2/2)
[ ] (Elizabeth) Design glove layout (2/2)

Recorded by Christine Saw (1/24/2022) *Witnessed and understood by William Tran 1/30/2022*

Meeting 5

Date: 1/26/2022

Time: 12:30 PM – 2:20 PM

Attendance

Katie Roberts
Katie Weatherwax
Radha Changela
Lara Kassabian
Christine Saw
Elizabeth Herrejon (joined at 1:30)
Hubert Elly (joined at 1:30)

Action Items

1. Practice Proposal |2/2/2022| All
2. Schedule Proposal date/time and logo design |1/28/2022| Elizabeth
3. Finalize Stun Gun Circuit |2/2/2022| Katie R.
4. Software Pseudocode |2/2/2022| Christine and Radha
5. Design PCBs |2/23/2022| Lara
6. "Question Quarterback" and Finalize Proposal Slides |2/2/2022| Katie W.
7. Research Flexible PCB |2/2/2022| Katie W. and Hubert

Other Notes

- Edited Proposal with feedback from Dr. Hasler
- Decided to use lipo battery charger form sparkfun instead of assembling our own PCB
- Edited slide 7
    - Break into 2 as per Dr. Hasler's suggestion
- Recorded resistance of our bodies
- Decide to have switch to turn stun gun on and off
    - Push button and pressure sensor will trigger SMS message

Meeting 6

Date: 2/2/2022

Time: 12:30 PM – 1:00 PM

Attendance

Katie Roberts
Katie Weatherwax
Radha Changela
Lara Kassabian
Christine Saw
Elizabeth Herrejon
Hubert Elly

Agenda Items

1. Discussion
    a. Practice Presentation

Action Items

1. Finalize Stun Gun Circuit |2/9/2022| Katie R.
2. Software Pseudocode |2/9/2022| Christine and Radha
3. Design PCBs |2/23/2022| Lara
4. Research Flexible PCB |2/9/2022| Katie W. and Hubert
5. Breakdown Animation |2/16/2022| Elizabeth

To do:

2/9 [✓] Further develop pseudocode (2/9)
2/4 [✓] Practice technical design requirements slide (2/5)

Recorded by Christine Saw (2/2/2022) *Witnessed and understood by William Tran 2/23/2022*

Meeting 7

Date: 2/9/2022

Time: 12:30 PM – 1:30 PM

Attendance

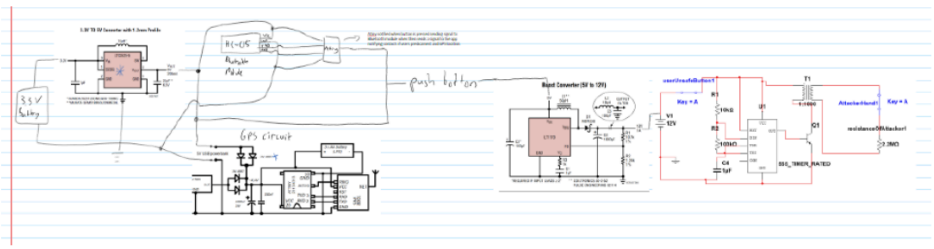
Katie Roberts
Katie Weatherwax
Radha Changela
Lara Kassabian (virtual)
Christine Saw
Elizabeth Herrejon (virtual)
Hubert Elly (virtual)

Action Items

1. PCBs Design layout (Meet with Katies) |2/16/2022| Lara
2. Continue working on app and animation |2/16/2022| Elizabeth
3. Pseudocode |2/16/2022| Christine
4. Fitbit open-source code research |2/16/2022| Radha and Hubert
5. SIM Chip research |2/16/2022| Radha
6. Final Report Outline and app research |2/16/2022| Katie W.
7. Bluetooth research and finalizes circuits |2/16/2022| Katie R.

Other Notes

- Software
  - Christine broke down pseudo code into sections
  - Radha looked into connecting sim chip to microcontroller
- Flexible PCB
  - Katie W. found a company that's makes them
  - They must approve our time, but it will take about 21 days of ordering
  - OSH park website
  - Hubert looked up flexible breadboard as another option
    - Will buy for testing
- Website and App integration
  - Elizabeth made flow diagram for app (user side)
  - Look up fitbit open source to get hoe glove will integrate with app
- PCBs
  - Lara designed PCB, and it about 1sq inch for stun gun circuit
  - Also made a block diagram for electrical system
- Katie R.



Recorded by Christine Saw (2/9/2022) *Witnessed and understood by William Tran 2/23/2022*

Meeting 8

Date: 2/16/2022
Time: 12:30 PM – 2:00 PM

Attendance

Katie Roberts, Katie Weatherwax, Radha Changela, Lara Kassabian, Christine Saw, Elizabeth Herrejon (virtual), Hubert Elly

Action Items

1. PCBs Design layout |2/23/2022| Lara
2. Continue working on app and update website |2/23/2022| Elizabeth
3. Pseudocode block diagram |2/23/2022| Christine
4. Fitbit open-source code research |2/23/2022| Radha and Hubert
5. Research Brain stuff and PCB coverings |2/23/2022| Katie W.
6. Bluetooth research |2/23/2022| Katie R.

Other Notes

- Updates:
  - Katie W.
    - Need to do more research on voltage to brain (brain damage)
    - Sent app research to Elizabeth
  - Lara
    - Continue layouts
  - Battery Charger is here
  - Design notebooks due on 25th (first round)
  - Email Hasler about update presentation and notebook submission
  - Radha
    - Has layout of SIM chip hook up
    - Still doing research on fitbit opensource code
  - Hubert
    - Still doing research on fitbit opensource code
  - Elizabeth
    - Writing update email to Hasler
    - App design and integration/layout
  - Chrstine
    - Needs parts to continue pseudocode
  - Katie R.
    - Finalized circuit schematic
    - Order more parts

To do:

2/21 [ ] Work on pseudocode block diagram (2/23)

Recorded by Christine Saw (2/16/2022) *Witnessed and understood by William Tran 2/23/2022*

Meeting 9

Date: 2/23/2022
Time: 12:30 PM – 1:30 PM

Attendance

Katie Roberts
Katie Weatherwax
Radha Changela
Lara Kassabian
Christine Saw
Hubert Elly

1. PCBs Design layout |3/2/2022| Lara
2. Continue working on app and update website |3/2/2022| Elizabeth
3. Setting up micro controller |3/2/2022| Christine
4. Research Bluetooth data to app |3/2/2022| Radha
5. Research Mirco controller to Bluetooth |3/2/2022| Hubert
6. Taking apart stun gun circuit |3/2/2022| Katie W.
7. Layouts with Lara |3/2/2022| Katie R.

- Updates:
    - Hubert and Radha went over open-source app
        - Broke it up into two parts for Bluetooth to
    - Lara designed PCB for boost converter, <1sq inch
    - More parts came in!
    - Katie W. looked up brain damage at high voltage
        - We are fine!
    - Katie R. ordered more parts
        - Will be working with Lara
    - Christine finalized pseudocodes and block diagram

To do:

3/5 [ ] Setup ATTiny85 microcontroller (3/2)
3/3 [ ] (Hubert) Research ATtiny85 setup (3/2)
3/4 [ ] (Lara) Work on PCB design (3/2)

Recorded by Christine Saw (2/23/2022) *Witnessed and understood by William Tran 2/23/2022*

Meeting 10

Date: 3/2/2022
Time: 12.30pm-2.30pm
People: Katie W, Katie R, Radha, Christine, Hubert, Lara, Elizabeth (virtual)

- Hubert and myself met to discuss microcontroller and design
- Radha researched about connecting Bluetooth to an app
- Lara finished designing PCB layouts, still working on boost converter layout
- Lara, Katie W took stun gun circuit apart to look at circuit
- Getting a locker at the Hive

Lara:

3/6 [ ] Finalize boost converter layout - 3/9
3/7 [ ] Submit stun gun PCB for printing - 3/9

Elizabeth:

3/11 [ ] Work on app – 3/9

Christine, Hubert:

3/5 [ ] Research ATTiny microcontroller – 3/9

Radha:

3/5 [ ] Research sending GPS coordinates via SMS to people – 3/9

Katie W, Lara:

3/3 [ ] Look into surface mount soldering on PCB – 3/9

Katie R:

3/2 [ ] Order thru-hole parts for breadboard

Recorded by Christine Saw (3/2/2022) *Witnessed and understood by William Tran 4/16/2022*

Meeting 11

Date: 3/9/2022
Time: 12.30-1.20pm
People: Katie R, Katie W, Radha, Lara, Christine, Hubert, Elizabeth (virtual)

- Elizabeth recruited test subjects, powerpoint template for oral presentation complete
- Katie W working on expo timeline and requirements
- Lara working on resigning stun gun circuit with capacitor bank
- Radha looking into phone numbers for sending emergency SMS to

Elizabeth:

3/16 [ ] Email Dr Hasler about oral presentation 3/16

Christine, Hubert:

3/9 [ ] Test ATTiny 3/16

Radha:

3/14 [ ] Add multiple phone numbers to receive SMS -3/16

Katie R, Lara:

3/10 [ ] Work on stun gun schematic 3/16

Katie R

3/9 [ ] Order new parts

Katie W

3/10 [ ] Pickup studs from senior design order, test ASAP

Recorded by Christine Saw (3/9/2022) *Witnessed and understood by William Tran 4/16/2022*

Meeting 12

Date: 3/16/2022
Time: 12.30pm – 1.30pm
People: Katie R, Katie W, Radha, Lara, Christine, Hubert

- new parts and metal studs have been ordered

Elizabeth:
3/17 [ ] Work on app 3/20

Hubert:
3/16 [ ] Software ATTIny testing 3/20

Lara:
3/16 [ ] Breakout boards for testing circuit 3/20

Katie W:
3/20 [ ] Work on powerpoint and poster

ATTiny notes:

Installing ATtiny board manager
https://create.arduino.cc/projecthub/arjun/programming-attiny85-with-arduino-uno-afb829

Step 3: very crucial
https://makersportal.com/blog/2019/9/21/attiny85-internet-of-things-bluetooth-arduino-board

Instructions to upload code to ATtiny85

First, ensure your Arduino IDE has the ATtiny board manager:
(Installing ATtiny board manager
https://create.arduino.cc/projecthub/arjun/programming-attiny85-with-arduino-uno-afb829)

1. Setup wiring like step 4 https://makersportal.com/blog/2019/9/21/attiny85-internet-of-things-bluetooth-arduino-board
2. Go to Arduino IDE, open code/sketch file
3. Check parameters under Tools is correct:
    - board, ATTiny25/45/85
    - processor, ATTiny85
    - clock, Internal 8 MHz
    - port, Arduino Uno
    - programmer – Arduino as ISP
4. Have your code ready. Upload code using **programmer** to ATtiny
5. Once code is uploaded, rewire ATtiny according to what setup needs

Bluetooth tutorials - want to try them out to make sure Bluetooth works

https://www.hackster.io/ROBINTHOMAS/attiny85-84-with-bluetooth-579ea0

https://makersportal.com/blog/2019/9/21/attiny85-internet-of-things-bluetooth-arduino-board

https://maker.pro/arduino/projects/attiny8584-with-bluetooth

Recorded by Christine Saw (3/16/2022) *Witnessed and understood by William Tran 4/16/2022*

Meeting 13

Date: 3/30/2022
Time: 12.30pm – 2.00pm
People: Katie W, Radha, Christine, Hubert, Elizabeth

Hubert, Christine:
3/30 [ ] Work on adding Bluetooth to ATTiny 4/6

Elizabeth, Radha:
4/1 [ ] Work on app 4/6

Katie W:
3/30 [ ] Assign roles for poster and powerpoint 4/6

Katie W, Lara:
4/4 [ ] test stun gun boards

Recorded by Christine Saw (3/30/2022) *Witnessed and understood by William Tran 4/16/2022*

Meeting 14

Date: 4/6/2022
Time: 12.30pm – 2.00pm
People: Katie W, Katie R, Radha, Christine, Hubert, Elizabeth, Lara

- video needs to be done on 22nd before expo

Hubert, Christine:
4/6 [ ] Software testing 4/13

Katie R, Lara:
4/12 [ ] Further circuit testing 4/13

Katie W, Radha:
4/11 [ ] Poster and powerpoint 4/13

Elizabeth, Radha:
4/10 [ ] App testing

Recorded by Christine Saw (4/6/2022) *Witnessed and understood by William Tran 4/16/2022*

Meeting 15

Date: 4/13/2022
Time: 12.30pm – 2.00pm
People: Katie W, Katie R, Radha, Christine, Hubert, Lara

Hubert, Christine
4/13 [ ] Test if Bluetooth connection works 4/20

Katie W, Radha
4/15 [ ] Poster and powerpoint

Elizabeth, Radha
4/13 [ ] App connection with Bluetooth 4/20

Katie W
4/20 [ ] Sew glove 4/20

Katie R, Lara:
4/15 [ ] Finalize breakout boards and circuitry

Recorded by Christine Saw (4/13/2022) *Witnessed and understood by William Tran 4/16/2022*

Meeting 16

Date: 4/20/2022
Time: 12.30pm-2.30pm
People: Katie W, Katie R, Radha, Christine, Hubert, Lara

- Expo 4/26 – everyone be prepared

EXPO SCHEDULE
4-8pm
setup 1-2pm
be at our tent at 3.40pm
presentation to judges 7-8 mins, 2 mins for questions (10 mins total)
t-shirt and food vouchers when checked in
table cloth 6' x 30"
clean up - after 8pm
table W8

- Record video 4/22 at 12pm

Our glove also comes with Bluetooth. We integrated a Bluetooth module into a separate circuit as seen in the first image below from the left.. It was intended to be connected to the user's mobile device through our mobile app. A Bluetooth signal is first sent to the app when triggered by a button on the glove.

- Finish glove prototype ASAP
- Stun gun circuit simulation discharges 20kV, real life circuit untested

- After replacing BJT with MOSFET, circuit discharges 40kV

Recorded by Christine Saw (4/20/2022) *Witnessed and understood by William Tran 4/25/2022*