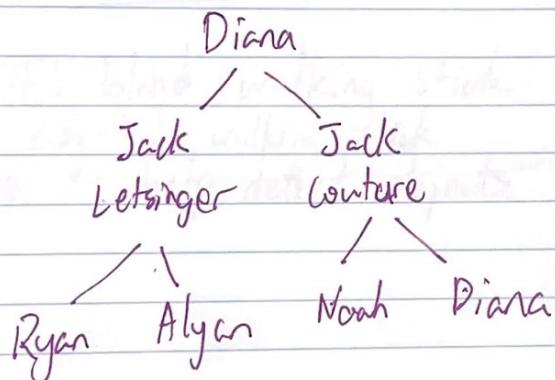
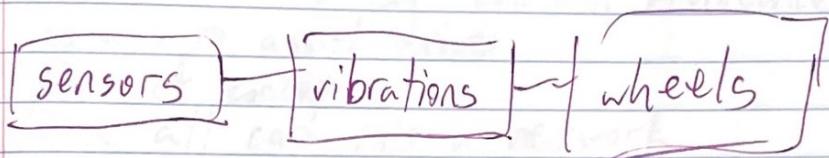


Ryan Wu ryanwu888@gmail.com CSCE 483

GUIDE

Project

- Blind walking stick w/ additional features



8/28

## Brainstorming

9/3

2

MIMIC: Robot Arm

- move heavy items
- AI/ML for more general use

C2C: car to car collision avoidance

- sensors to assist driver
- proof of concept
- link all cars into a network

GLOWDE: blind walking stick

- more assisted walking stick
- sensors to help detect objects

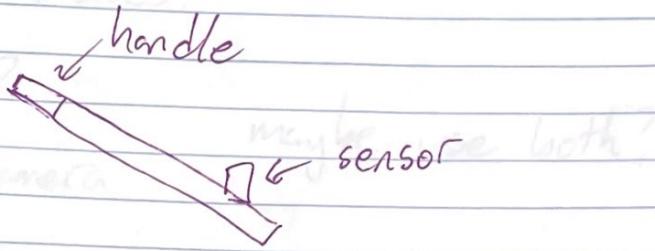
ATLAS: accelerated traffic light Automation System

- increase productivity at traffic lights
- decrease time wasted waiting for no one
- computer vision

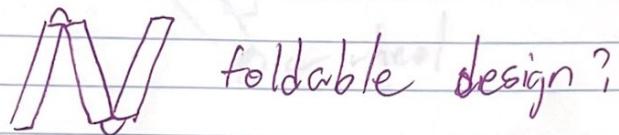
## Early Designs

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3



what kind of sensor?



① hollow inside?

9/5

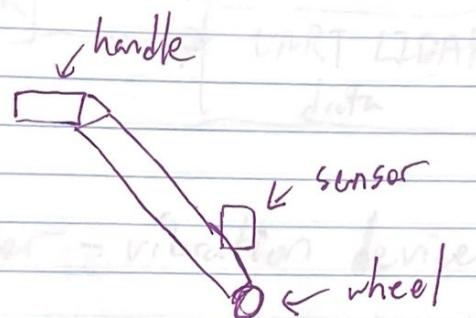
4

Sensor choices?

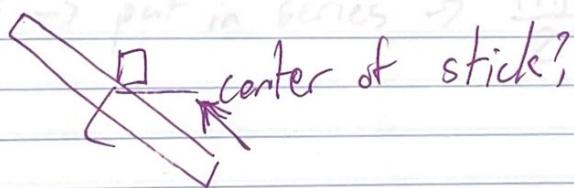
- LIDAR

- Depth Camera

maybe use both?



Batteries? I have some from past project

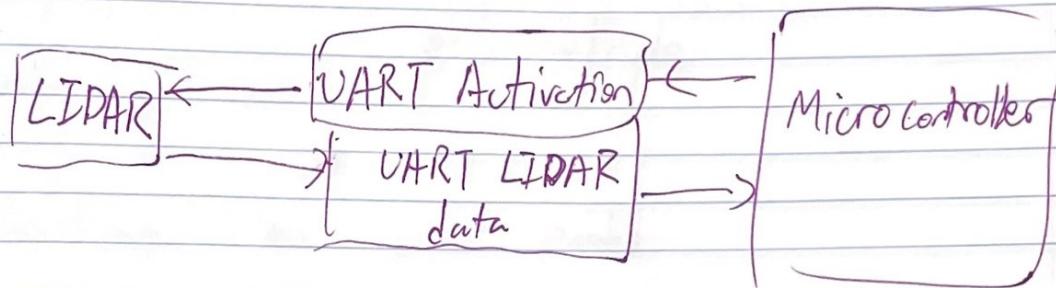


9/10

5

Send vibrations to user

~~Audio~~ user needs environmental audio



Rumbbler - vibration device

Batteries? I have some from past project

2x 11.1 V → put in series →  $\frac{11.1}{2} \approx 5$  V

9/12

6

sensors:

- LIDAR

- Depth Camera

- Infrared Pulses

cons:

expensive

- or multiple

Vibrations / Pulses over audio

- textured rubber handle

lights on cane? ✓

Arduino? RasPI?

Bluetooth? ? maybe ...

CAD printing handle & sensor latch-on

Battery pack - Alt? or my own... (testing)

Cane length: 5.1"

Goals:

9/17

7

detect objects - 2m away

alert user - handle vibrations

↳ different strength/freq at distances

2m, 1m, 0.5m, 0m

should be adjustable [settings]

equipment? on body? - stretch goal

needs to be lightweight

9/19

8

## Design Constraints

- light weight!

- long battery life ~3-4 hrs to start  
↳ rechargeable

- little to no delay ↳ very important

## Ethics

- titanium metal - recyclable + light

- reuse materials from previous years

9/24

9

stretch goals:

Cons:

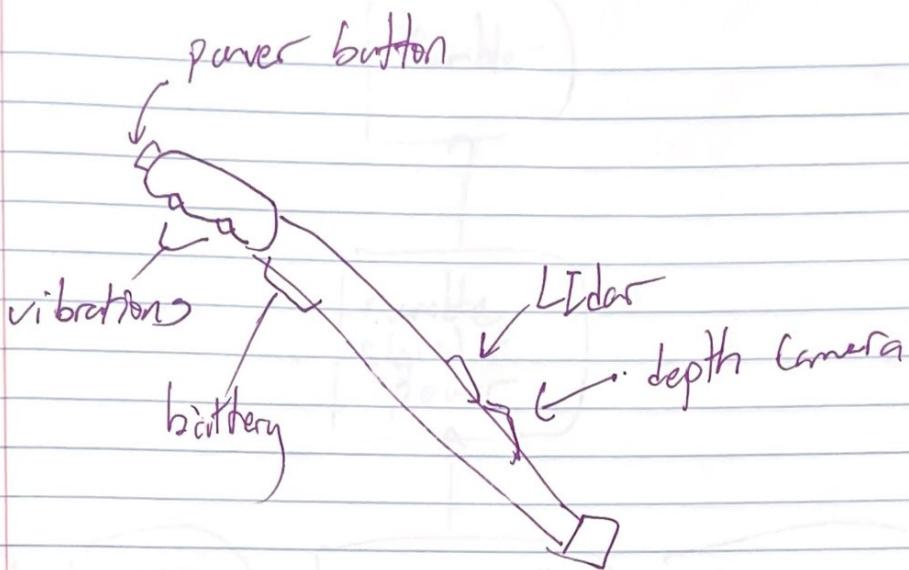
- phone App w/ audio impair user hearing

- SLAM algorithm to hard to realize/implement  
add obstacles into database

belt/bag to carry bulky, less portable  
with the care

9/26

10



weight: less than 1 pound

Microcontroller: Raspberry Pi Pico 2

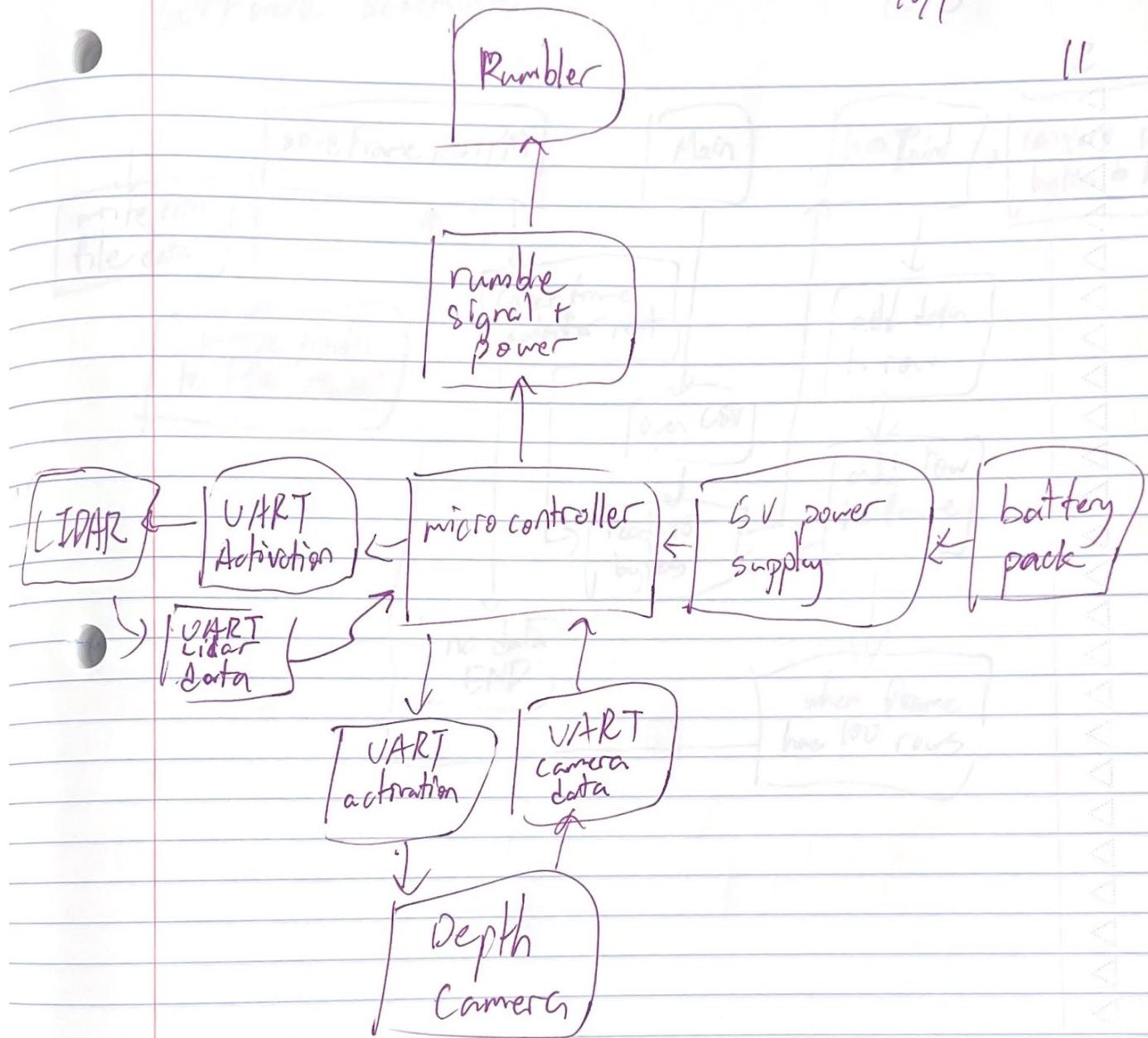
~~Two~~. Sensors: LIDAR & Depth cameras  
slight differences - use both

Vibrations: Rumbler - haptic feedback in the probed direction

# Hardware schematic

10/13

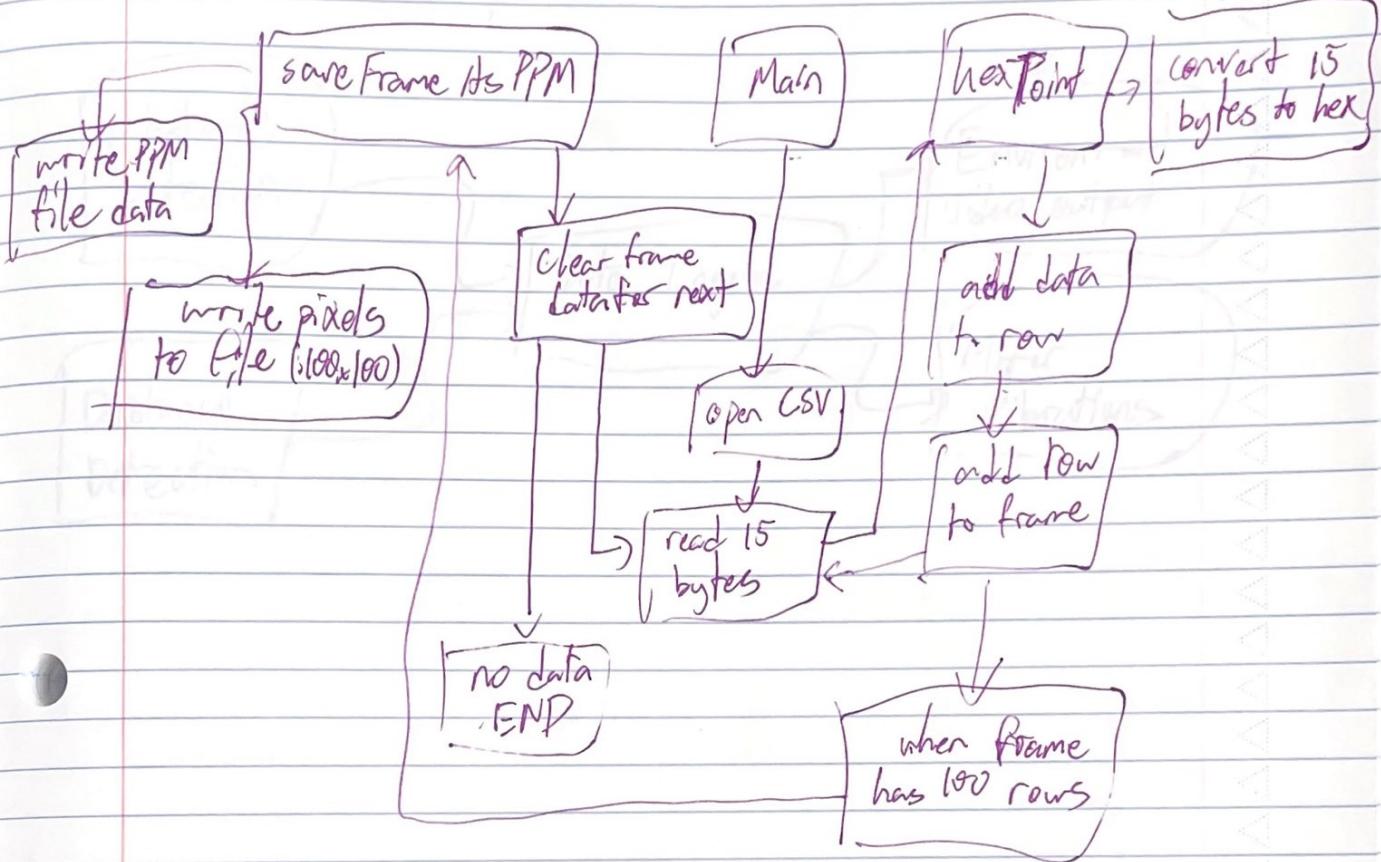
11



# Software schematic

10/3

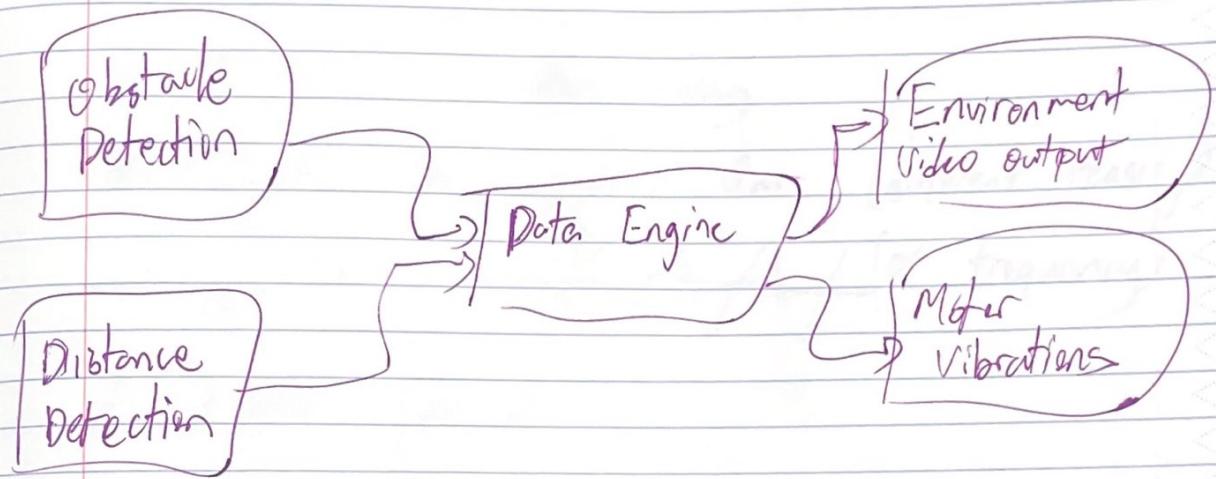
12



10/8/10

13

## High level Components



10/10

14

## Specifications (specifics)

detect up to 2 meters away

Alert at 2m, 1m, 0.5m, 0m (different intensity)



AT MOST 2 pounds

Duration: 3-4 hours

feedback delay < 0.5 seconds

10/15

15

Results of sensor feedback: ✓

We can use python bc delay is still within 0,5 seconds

~10-23 ms worst case scenario: 50ms < 500ms

(12)

Testing vibration motor sensitivity... ✓

- very easy to feel ✅

✗ 4 should be more than enough for the user

Cons

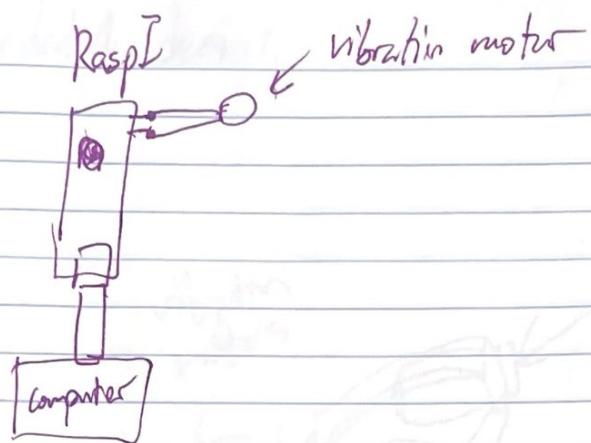
- bad wires...

Q ← vibration motor

R ← wires; Too thin

10/17

16



- using thonny to run code to turn GPIO pins  
on/off

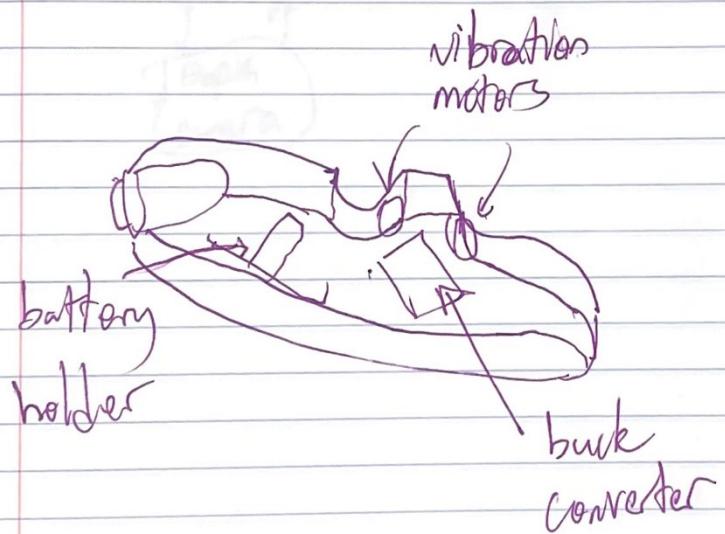
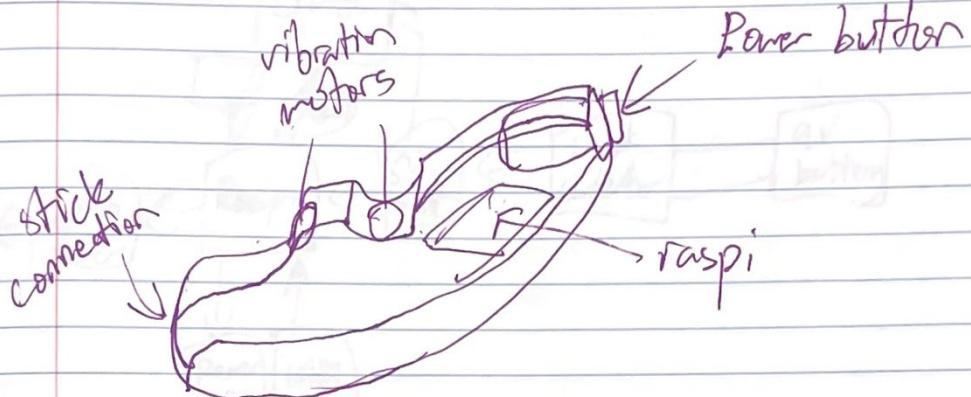
[Test successful] but... wires broke off

need to heat shrink wires to avoid bending (hopefully enough)

Updated design

10/22

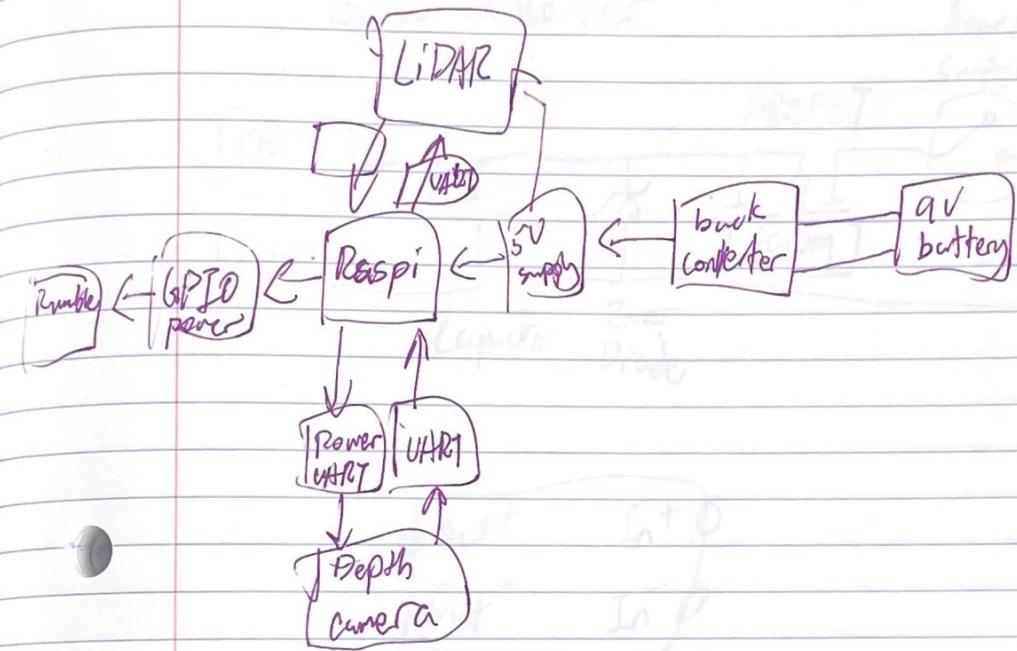
17



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18

## Updated diagram

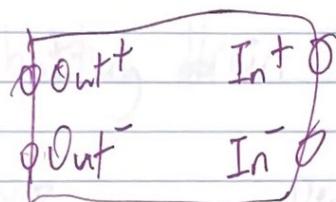
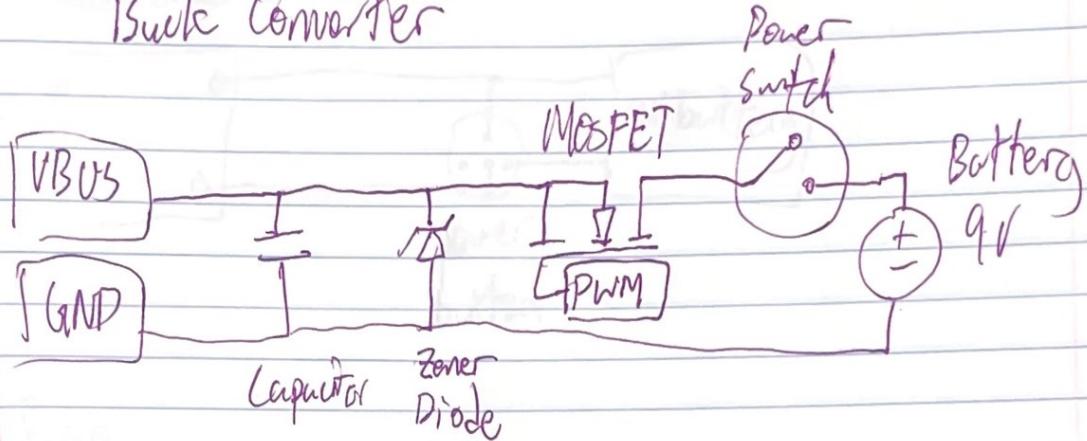


10/29

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circuit diagram

## Buck Converter

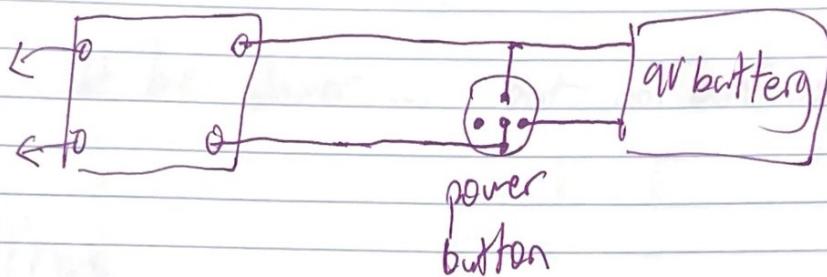


10/31

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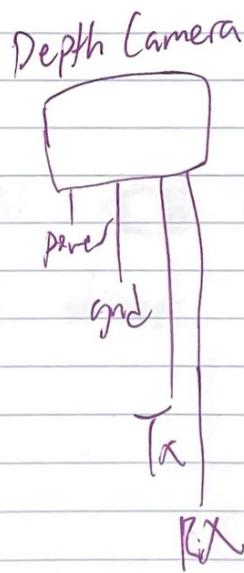
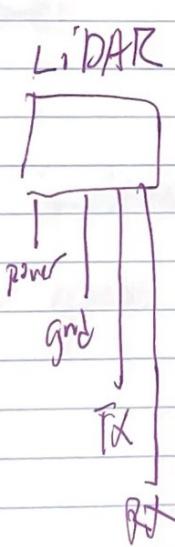
## Power button or diagram pinout

buck converter



- Pros  
- light off

↳ less battery drain



11/5

21

[Python] or C++ ?,

might be slower... but not an issue

Pros

- easy access to libraries

- easy implementation

Cons

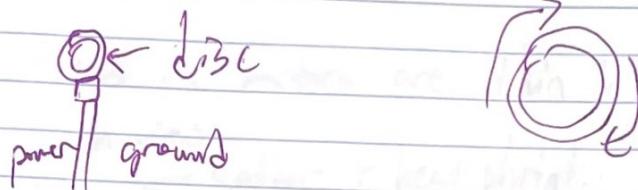
- slower

Can implement AI/ML instead to read data  
and guess type of object

11/7

22

vibration motor



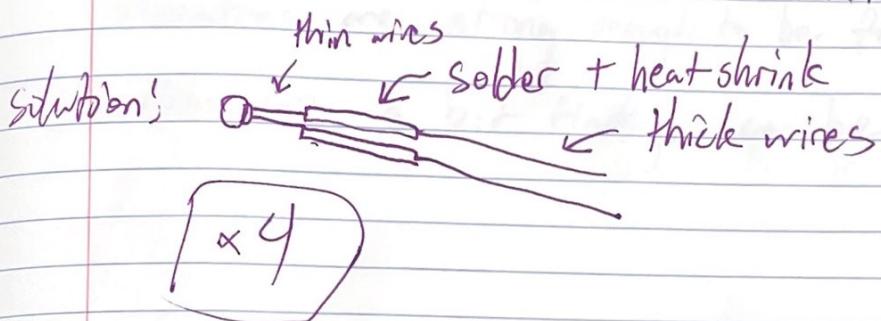
uses magnetism to cause vibrations

Folded all parts together no backboard needed  
and the whole - heart

11/12 23

## wired vibration motors

Bsue! wires on motors are thin & frag!



Connected all parts together.. no breadboard needed.  
Works off-the-board

1/14 24

Today, we put everything in the case and closed it... it works!

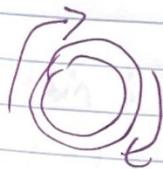
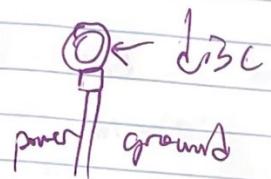
Vibrations are strong enough to be felt

wires are a bit finicky,.. can be fixed.

11/7

22

vibration motor



uses magnetism to cause vibrations

11/12

23

wired vibration motors

Bsue! wires on motors are thin & frail

thin wires



Connected all parts together.. no breadboard needed,  
works off-the-board

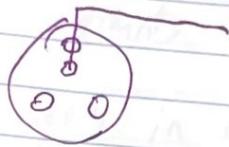
1/14 24

Today, we put everything in the case and closed it... it works!

Vibrations are strong enough to be felt

wires are a bit frayed... can be fixed.

battery



11/19 25

Had to resolder  
battery connection  
to power button  
bc it wasn't working...



13yue! Computer connection to power → current backflow  
fix: use a different computer

11/21 26

The product is finished. It works as intended based on the constraints that we decided on.

We put wires in a cable case and ziptied it to the side