

# BEACH MULE

The Beach Boys

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# MEET THE TEAM



Team Lead/Power Lead:  
Garrett McLaurin



Assisted Wheels Lead:  
Nick Gray

Controls Lead:  
Saurav Josan

Software Lead:  
Ryli Cruz

Tracking Lead:  
Christian Watson

# MEET JOHNNY

Johnny is a husband, a father, and a pet owner.

He hates going to the beach because he has to carry everything when he gets there.



Johnny  
Age 36  
Male

# PROBLEM

- Hassle of transporting multiple beach items
- No hands-free option
- Physical Challenge of Pushing/Pulling Cart



# SOLUTION

Introducing the Beach Mule, an advanced beach cart used to improve your beach experience

- Auto Pilot Mode
- Assisted Drive Wheels
- Built for All Beach Terrain

***Worry less, relax more***

# TARGET AUDIENCE

- Families
- Those with difficulty lifting/carrying
- Beach cleaning organizations
- Beach Enthusiasts



# DESIGN CONSTRAINTS

# TECHNICAL CONSTRAINTS

Name	Description
Autonomous	Follows the user constantly until user stops
Lift Weight Capacity	Lifting capacity of 120 lbs
Rigidness	Made out of steel material that can handle rough use
Maneuverability	Maintains approximately 3-5 feet from the user
Battery Life	1 hour of constantly running (2x12V batteries)
Follow Speed	2 miles/hour to 3.5 miles/hour

# PRACTICAL CONSTRAINTS

Type	Name	Description
Economic	Cost	Total budget is \$1000.
Sustainability	Reliability	Designed to operate over a three year period without fail. Uses replaceable batteries.
Manufacturability	Size	Physical dimensions are 38" high, 21" wide, and 12" deep. Able to fit into a truck/SUV's trunk.
Health and Safety	Safety	Conforms to IEC 61140 which protects the user from electrical shock.
Environmental	Heat/Water Resistant	Will have a battery that is water resistant and heat resistant up to 50°C (122°F)

# ENGINEERING STANDARDS

## Specific Standard

IP-67

IEC 60086

IEC 60757

## Standard Document

This product meets Ingress Protection Standard 60529 set by the International Electrotechnical Commission [1]

This product meets International Electrotechnical commission 60086 [2]

This product meets International Electrotechnical commission 60757 [3]

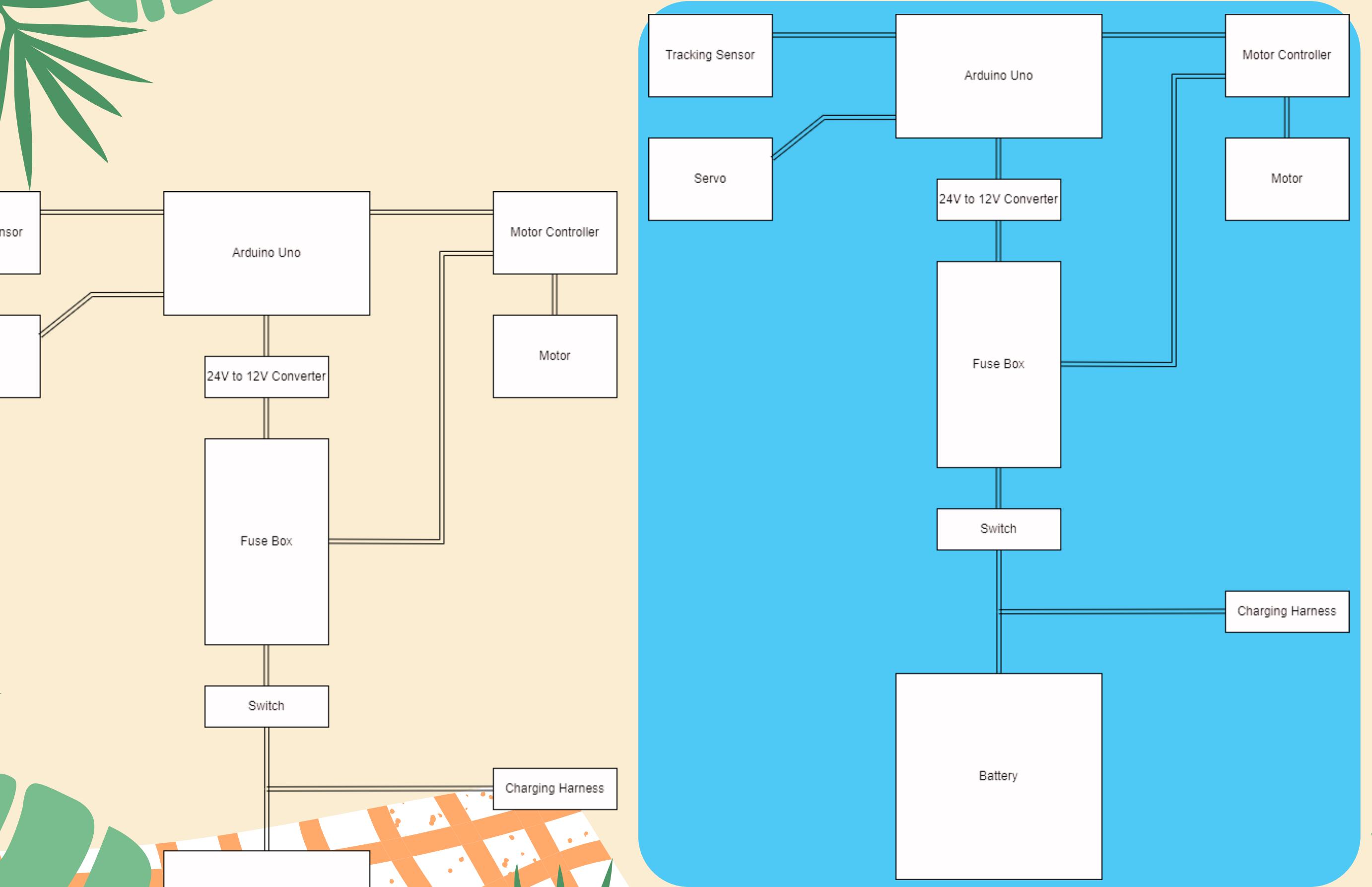
## Specification

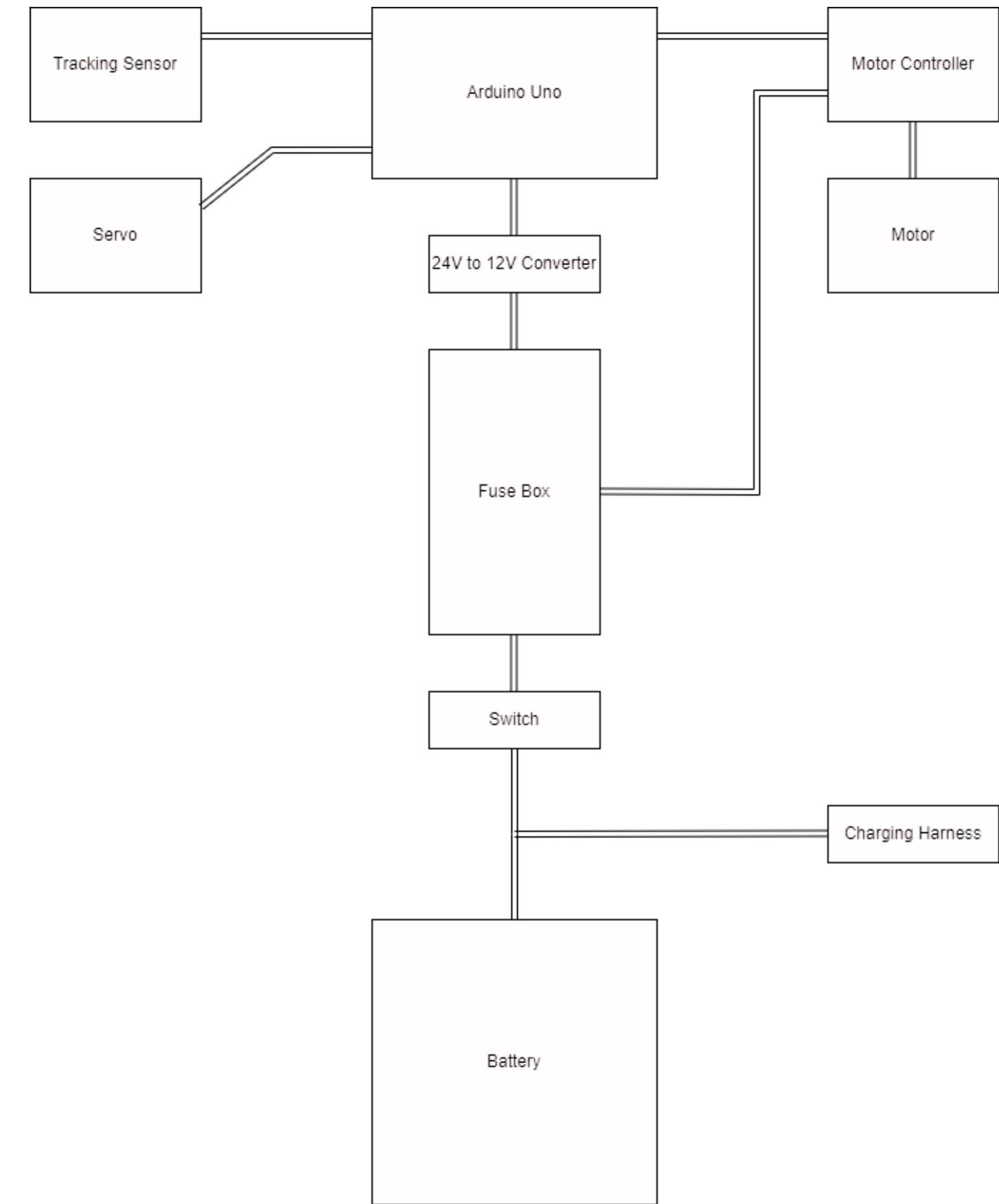
Beach Mule is sand-tight, immersible up to 1m in water

Beach Mule has interchangeable batteries

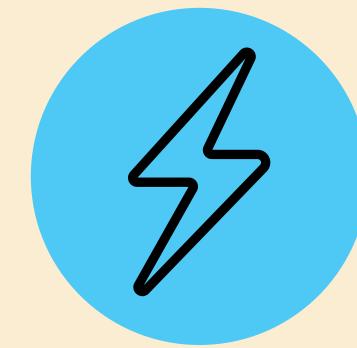
Beach Mule has color coordinated wiring for power.

# DESIGN DIAGRAM

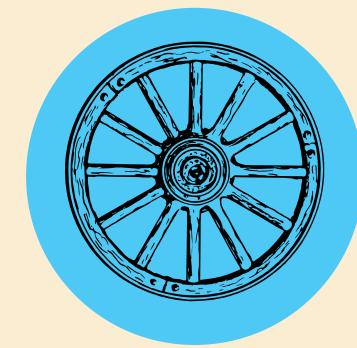




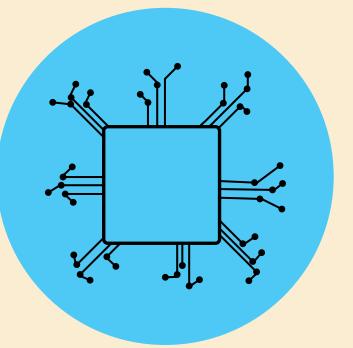
# SUBSYSTEMS



Power



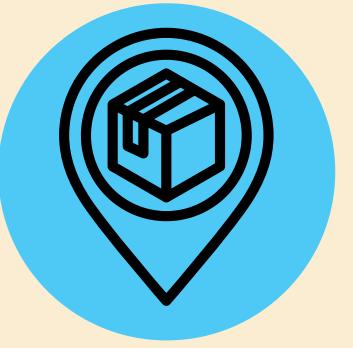
Assisted  
Wheels



Controls



Hardware  
and  
Software



Tracking

# POWER

- 2x12V batteries to produce 24V 22ah
- Estimated hour of continuous run time
- 12 terminal 12V-32V fuse box
- 24V to 12V/5A (60W) DC converter



[4]

# ASSISTED WHEELS

- 10 inch pneumatic tires
- 500W 24V DC Brushed motor
- Motor controller
- 70kg/cm servo motor



[5]



[6]

# CONTROLS

1. Weider Buttons
  - 16mm 6A/125V
2. Taiss Toggle Switches
  - 6A/125V
3. Breadboard



[7]



[8]

# HARDWARE AND SOFTWARE

Arduino Uno

## 1. Motor Driver

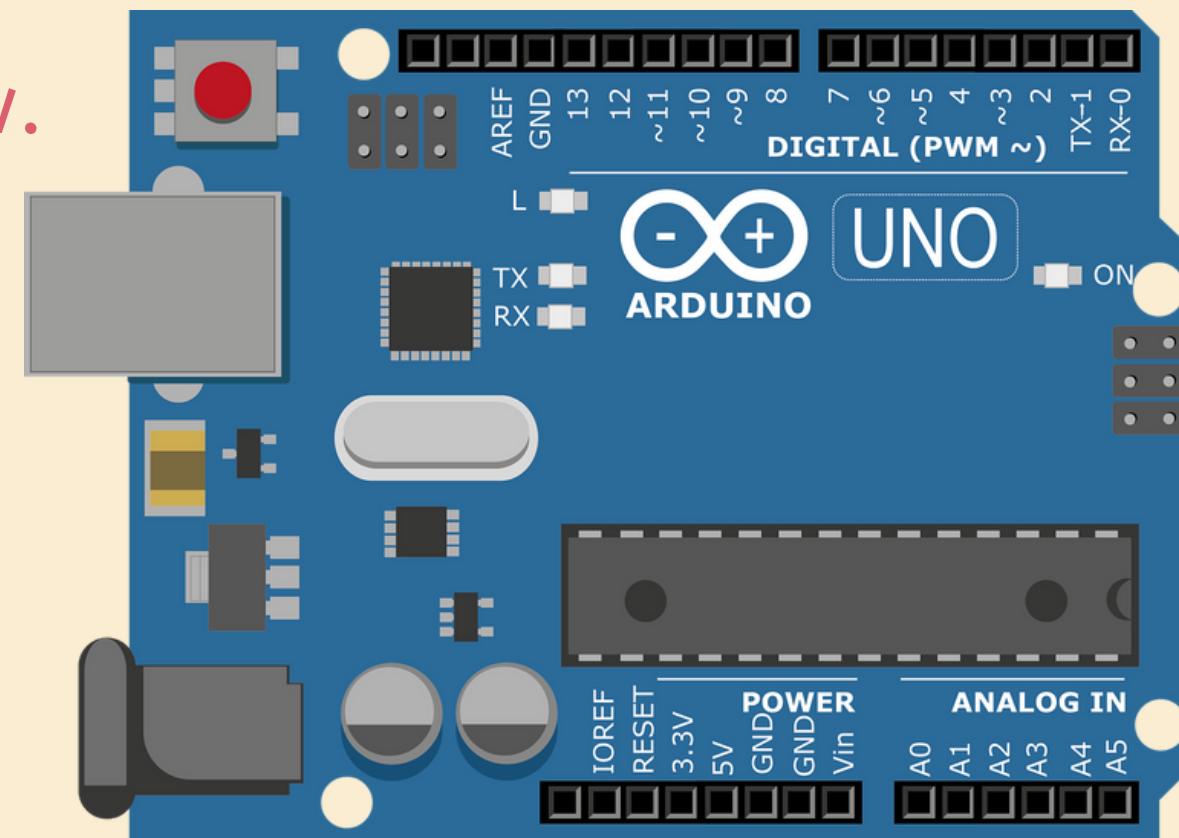
- Controls the motor RPM and current draw.

## 2. Tracking System

- Follows the user.

## 3. Servo

- Gives the cart the ability to turn.



# TRACKING

## ULTRASONIC SENSOR DISTANCE US-100

### 1. Detection Distance

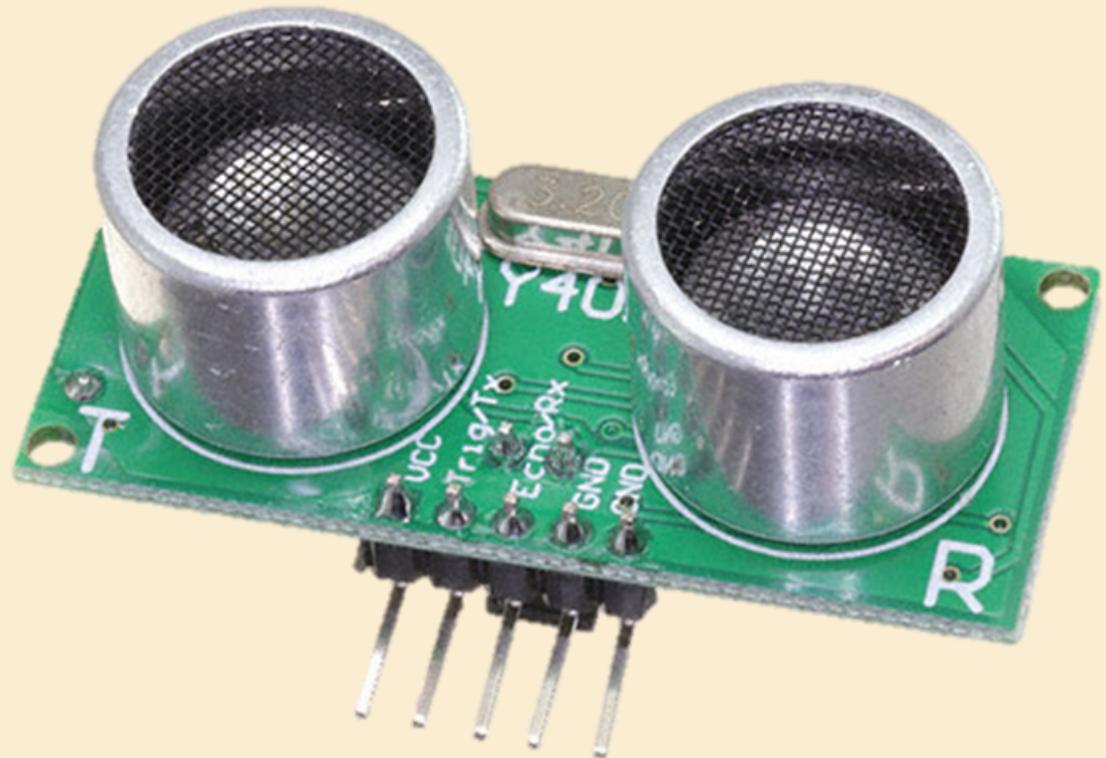
- 2cm – 450 cm

### 2. Power and Logic Voltage/Current

- DC 2.4V~5.5V/2mA

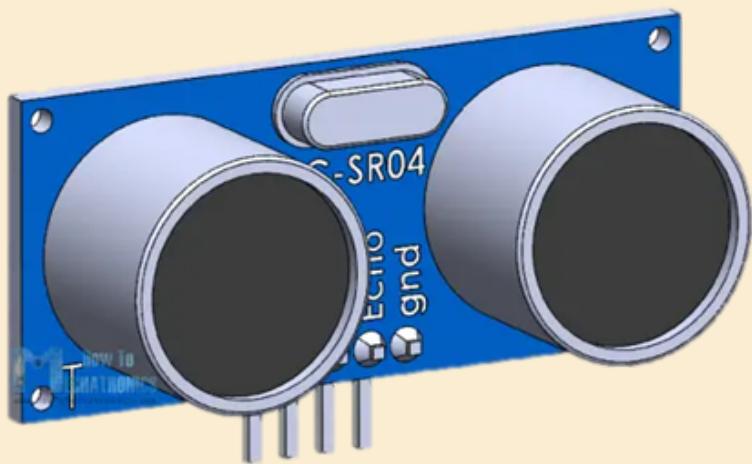
### 3. Dimensions

- 45 x 20mm

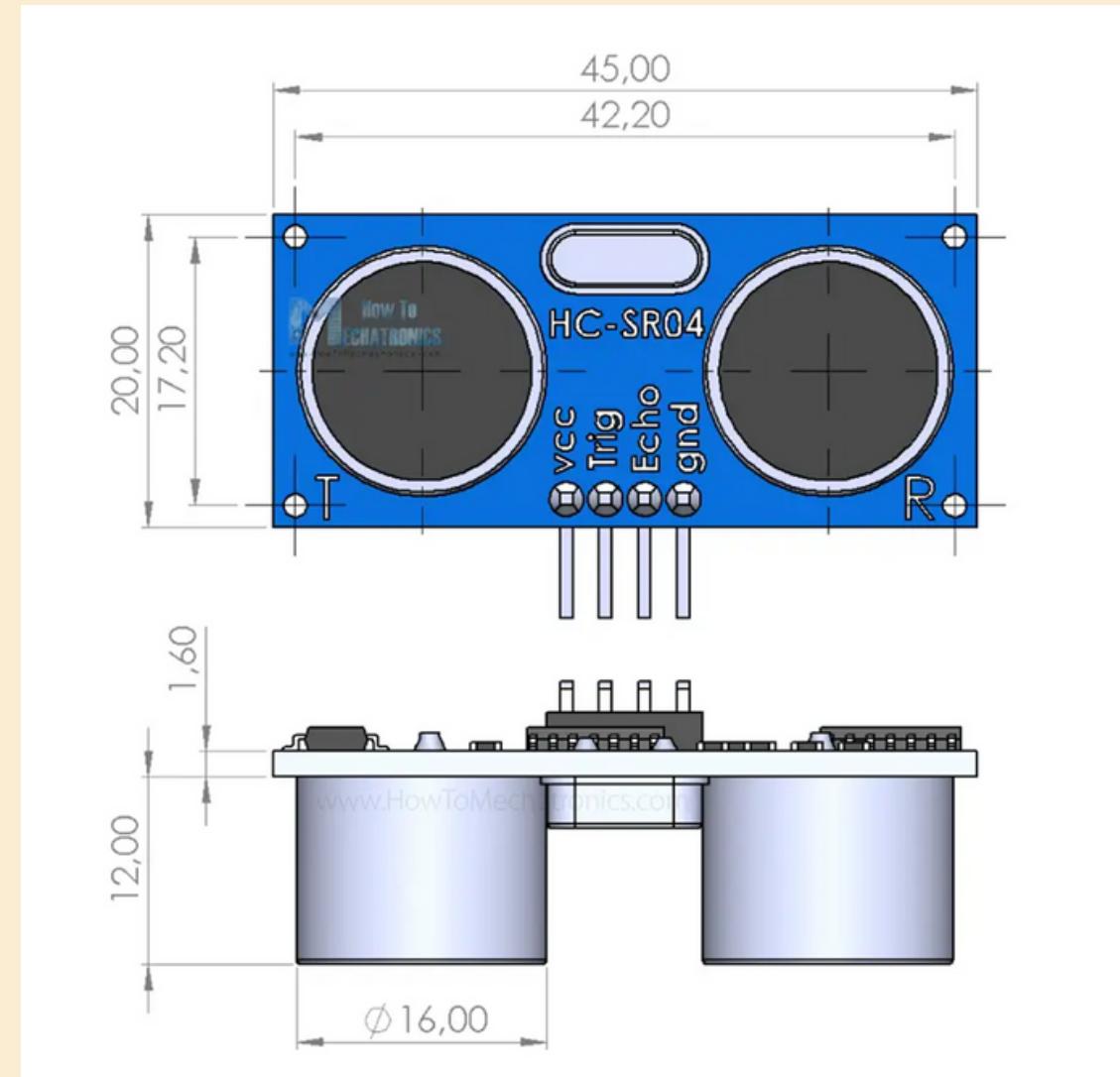
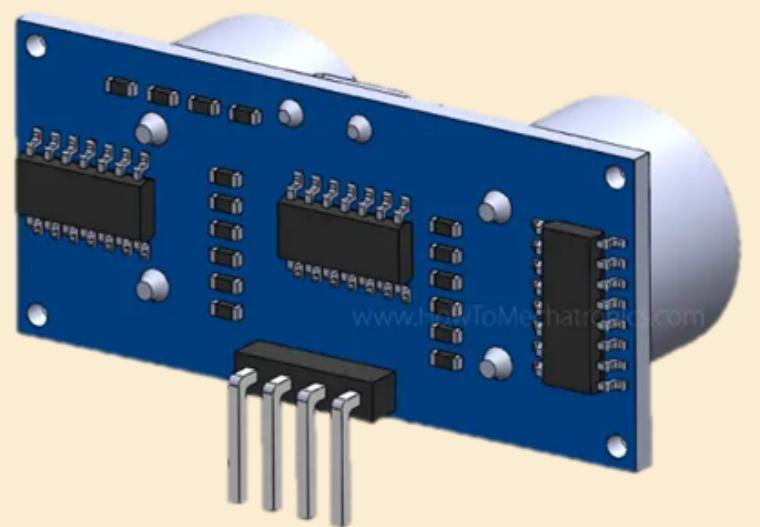


[9]

# TRACKING



[10]



[11]

# TRACKING

DSD TECH HM-10 Bluetooth 4.0

## 1. Detection Distance

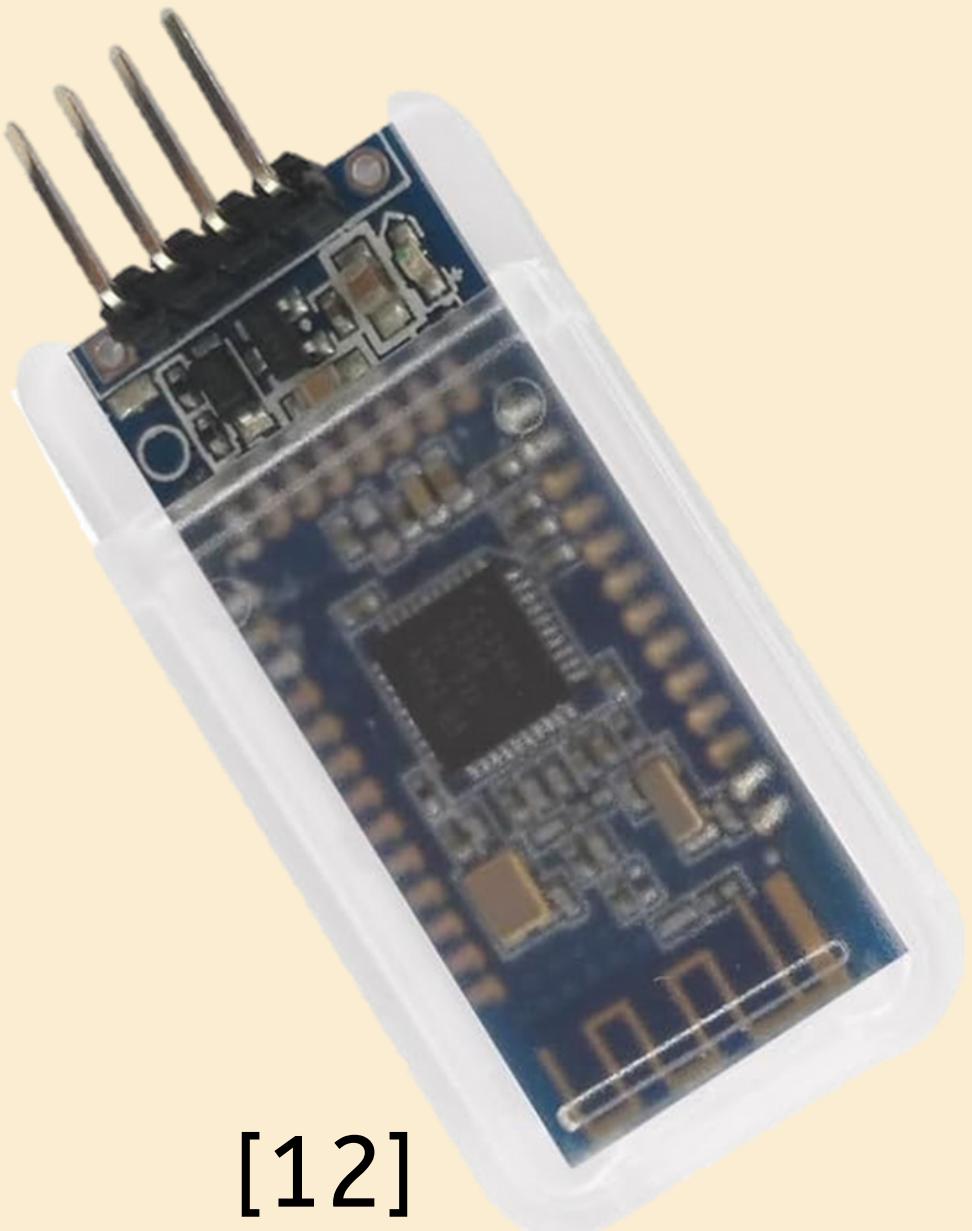
- 10 m

## 2. Power and Logic Voltage/Current

- 3.6 – 6 V, draws 10 mA

## 3. Bluetooth Compatibility

- iPhone 4- later



[12]

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[HTTPS://WWW.AMAZON.COM/WEIDEER-MOMENTARY-SELF-RESET-PRE-SOLDERED-R13-507-5-X/DP/B08SQQWJ5X/REF=SR\\_1\\_4CRID=1AGCCB8DF91PK&KEYWORDS=ARDUINO%2BBUTTONS&QID=1696602290&SPREFIX=ARDUINO%2BBUTTONS%2CAPS%2C109&SR=8-4&TH=1](https://www.amazon.com/WEIDEER-MOMENTARY-SELF-RESET-PRE-SOLDERED-R13-507-5-X/dp/B08SQQWJ5X/ref=sr_1_4?rid=1AGCCB8DF91PK&keywords=ARDUINO%2BBUTTONS&qid=1696602290&sprefix=ARDUINO%2BBUTTONS%2CAPS%2C109&sr=8-4&th=1) (ACCESSED OCT. 06, 2023).
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**THANK YOU**