



# Smart Pitcher





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# Outline

- ▶ Introduction
- ▶ Current Market
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- ▶ High Level Overview
- ▶ Business Case
- ▶ Timelines
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- ▶ Learnings
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# Introduction

- ▶ It is an innovative pitching machine that can track an athlete's movement
- ▶ It enables athletes to be in control of the shooting time
- ▶ It is easy to use, fast, reliable, and safe
- ▶ It maximizes the efficiency in training sessions
- ▶ Eliminates the need for human pitcher

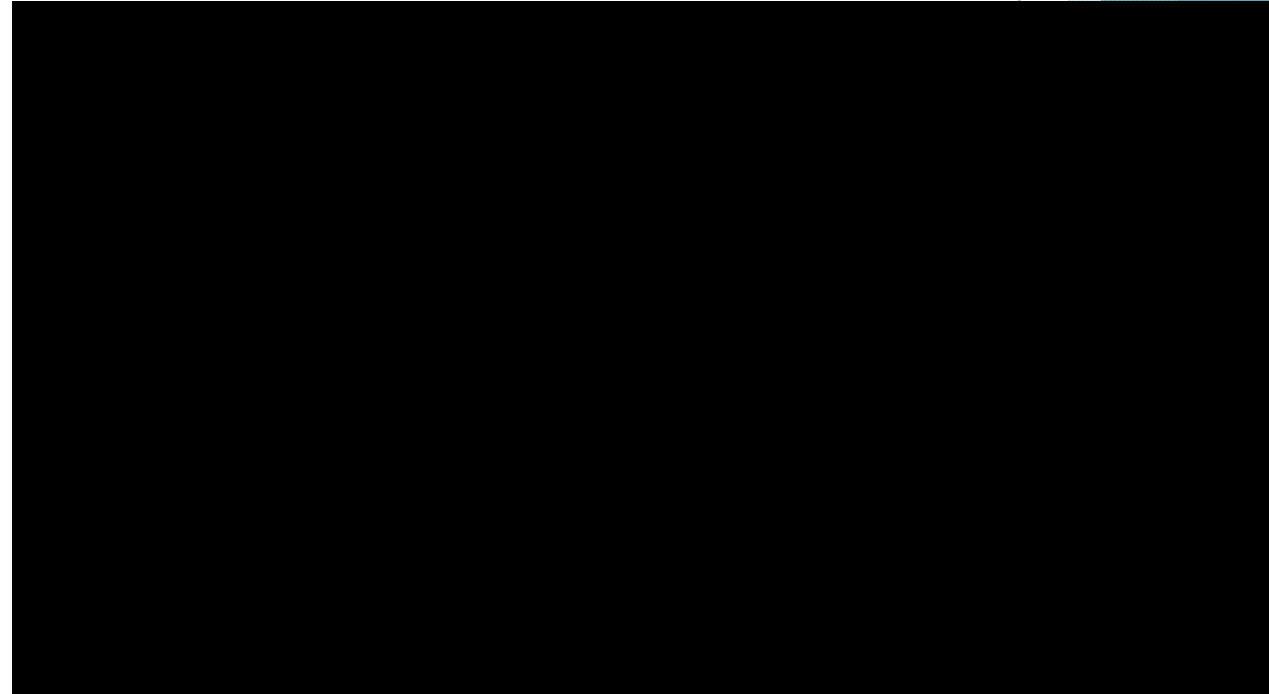


# Current Market

## Shoot-Away Gun 8000 Series

- \$6000
- Heavy Load
- Basketball
- Pre-set Features

[1]



# Current Market

JUGS Super baseball

- \$2200.00
- 82 lbs
- Softball & Baseball
- Can make a curve ball

[2]

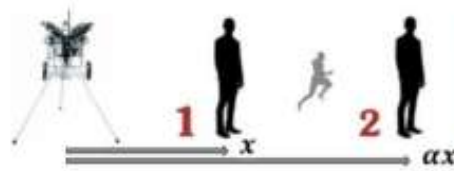


# Market Gap

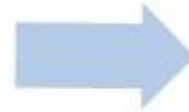
| Brand               |  |  |  |  |  |
|---------------------|---|---|--|---|---|
| Image               |  |  |  |  |  |
| Cost (US \$)        | \$750   | \$2200  | \$6000   | \$600   | \$1300  |
| Warranty (Years)    | 1 yr  | 5 yrs   | 5 yrs  | 1 yrs   | TBD   |
| Speed or Distance   | 10 - 70 MPH   | 20 - 104 MPH  | 15 - 35 Feet   | 15 - 60 MPH   | TBD   |
| Curves              | ✓   | ✓   | ✗  | ✗   | ✓   |
| Auto-feed           | ✗   | ✗   | ✓  | ✓   | ✓   |
| Horizontal Rotation | ✗   | ✗   | ✓  | ✗   | ✓   |
| Motion Tracking     | ✗   | ✗   | ✗  | ✗   | ✓   |

# High-level Overview of Smartpitcher

## Motor Speed control

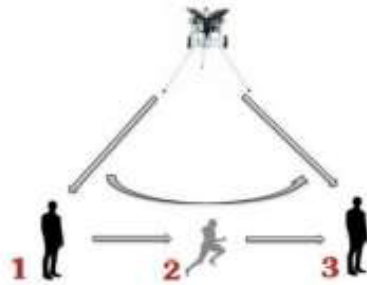


Sensors



Microcontroller  
with motor driver

## Motion tracking system



Camera



Motion tracking  
software with  
servo motor

## Loading mechanism



Bluetooth  
trigger



Linear gear with  
servo motor

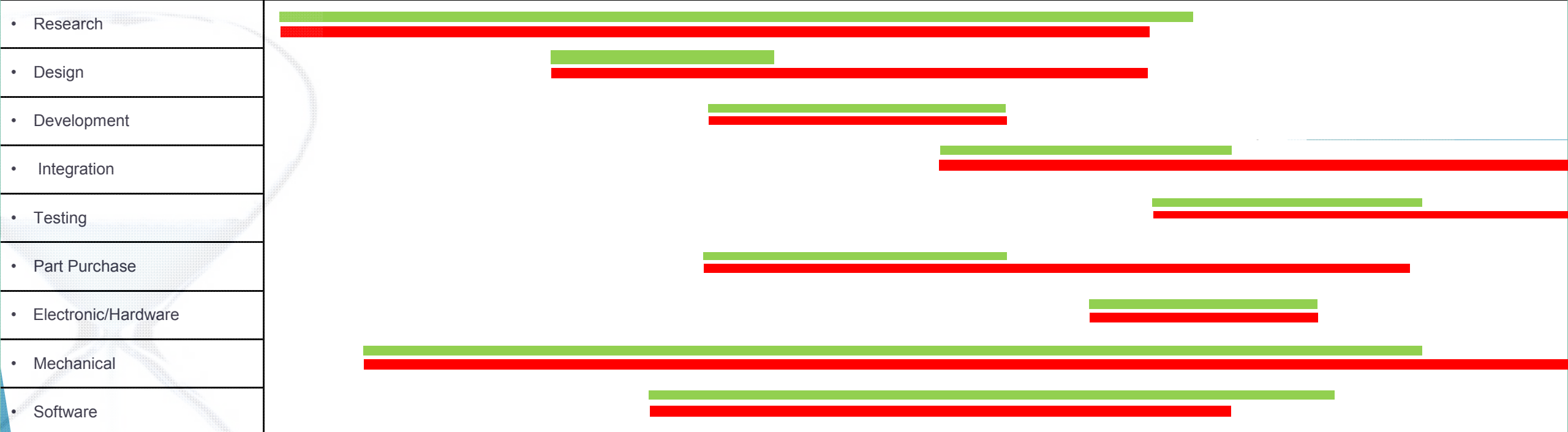


# Business Case

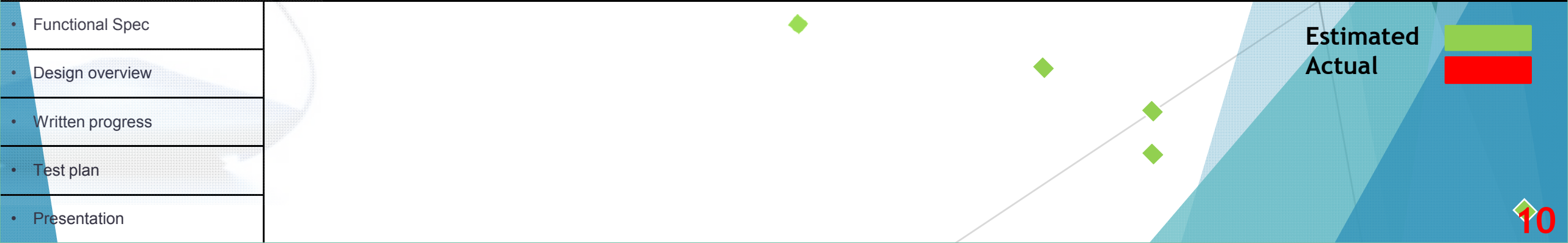
- ▶ Proof-of-concept prototype
- ▶ Cost of the prototype ~ \$700
- ▶ Desired selling cost
  - ▶ Cost of the prototype + Development + Labour = ~\$1300
- ▶ Future plan
  - ▶ Potential Cooperative Enterprise Company
  - ▶ Zooka, Jugs soccer, Shoot-away
  - ▶ Company that will be able to pursue our project

| Month | January |   |   | February |   |   |   | March |   |   |   | April |   |
|-------|---------|---|---|----------|---|---|---|-------|---|---|---|-------|---|
| Weeks | 2       | 3 | 4 | 1        | 2 | 3 | 4 | 1     | 2 | 3 | 4 | 1     | 2 |

**Tasks**



**Deliverable**



Estimated   
Actual 

# Budget

Funding received from ESSEF - \$415.00

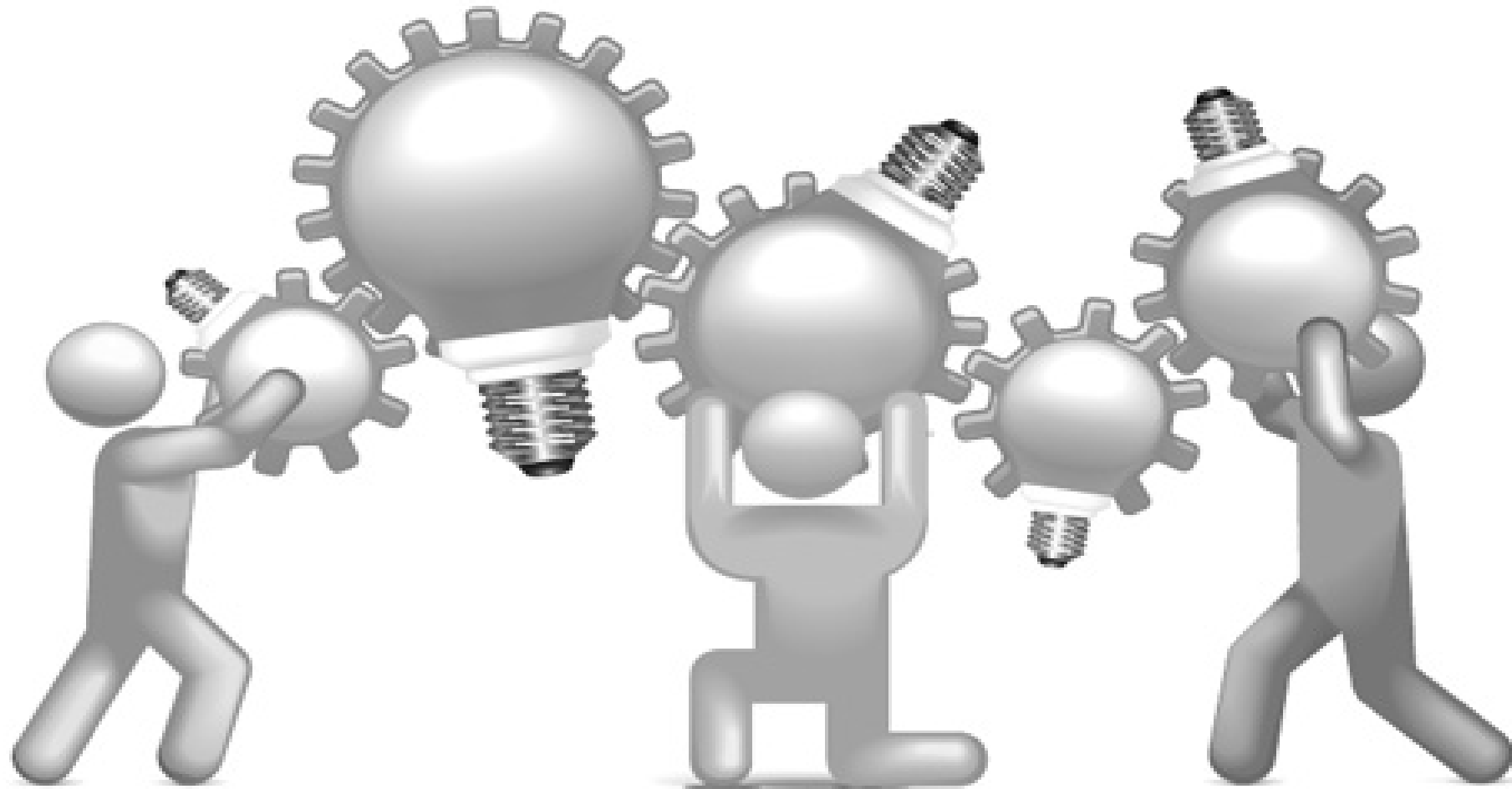


| Equipment List      | Estimated Cost | Used Components  | Expenditure                |
|---------------------|----------------|--|----------------------------|
| Microprocessor      | \$150          | OSEPP™ 201 Arduino Basic Starter Kit   | \$100.00                   |
| Motor x2            | \$160          | Arduino UNO R3 MEGA 2560   | \$15.00                    |
| Motion Sensor       | \$15           | USB 2.0 A-B M/M 6 ft cable   | \$9.86                     |
| Touch Switch Sensor | \$20           | Gear Motor 12V 500 RPM x2  | \$31.50                    |
| Infrared Sensor x2  | \$30           | Alligator Test Leads 30 mm   | \$7.97                     |
| Ranger Sensor       | \$90           | RS-775 Motor 7000rpm 12V 76.13oz-in x2   | \$39.98                    |
| Motion Tracker      | \$70           | Universal Mounting Hub - 5mm Aluminum (M3 screws x 2) + (4-40 screws)                                      | \$28.80                    |
| Motor Controller x2 | \$80           | Pololu Motor Driver Shield VNH5019   | \$60.00                    |
| Wheel               | \$10           | Battery, Rechargeable SLA, Lead Acid, 12V, 4Ah   | \$16.95                    |
| Others              | \$100          | ATLAS MTD 6" PLASTIC WHEEL (AT-0062) x3  | \$26.85                    |
|                     |                | Roborealm Software   | \$70.54                    |
|                     |                | Webcam   | \$20.00                    |
|                     |                | Digital Servo Motor  | \$31.00                    |
|                     |                | Bluetooth Shield v2 (for Arduino)  | \$42.24                    |
|                     |                | LEGO Red Housing 2 x 15 x 3m F/gear Rack   | \$3.02                     |
|                     |                | LEGO Dark Stone Gray Gear with 24 Teeth  | \$0.45                     |
|                     |                | LEGO Dark Stone Gray Rack 14 x 2m with groove  | \$12.29                    |
|                     |                | Power Functions XL-Motor   | \$11.49                    |
|                     |                | Power Functions Battery Box  | \$8.49                     |
|                     |                | DRV8833 Dual Motor Driver Carrier  | \$26.23                    |
|                     |                | Platform Developments (including Nuts & Bolts + Wooden Boards + Plastic Boards + Super Glue + Tennis Ball) | \$61.96                    |
|                     |                | <b>Others (products = refunded + shipping cost = not refunded)</b>   | \$187.22                   |
| <b>Total Cost</b>   | <b>\$725</b>   | <b>Total Cost</b>  | <b>\$811.84 (-\$86.84)</b> |
|                     |                |  | <b>12</b>                  |

# Limitations

- ▶ Pan and tilting platform
- ▶ Choosing a servo motor
- ▶ Using a laptop and 3<sup>rd</sup> party software application
- ▶ Possible replacement - raspberry pi
- ▶ Ultrasonic sensor not reliable when operating a noisy machine
- ▶ Possible replacement sensor - GPS sensor or a much reliable ultrasonic sensor
- ▶ Using an Android Device and 3<sup>rd</sup> party app
- ▶ LEGO XL Motor
- ▶ Loading Mechanism for multiple balls

# Learnings



# Acknowledgements

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TA, School of Engineering Science, SFU
- ▶ Gary Shum  
Lab Technician, School of Engineering Science SFU
- ▶ Engineering Science Student  
Endowment Fund (ESSEF)
- ▶ Lees Electronics
- ▶ RP Electronics

# Questions

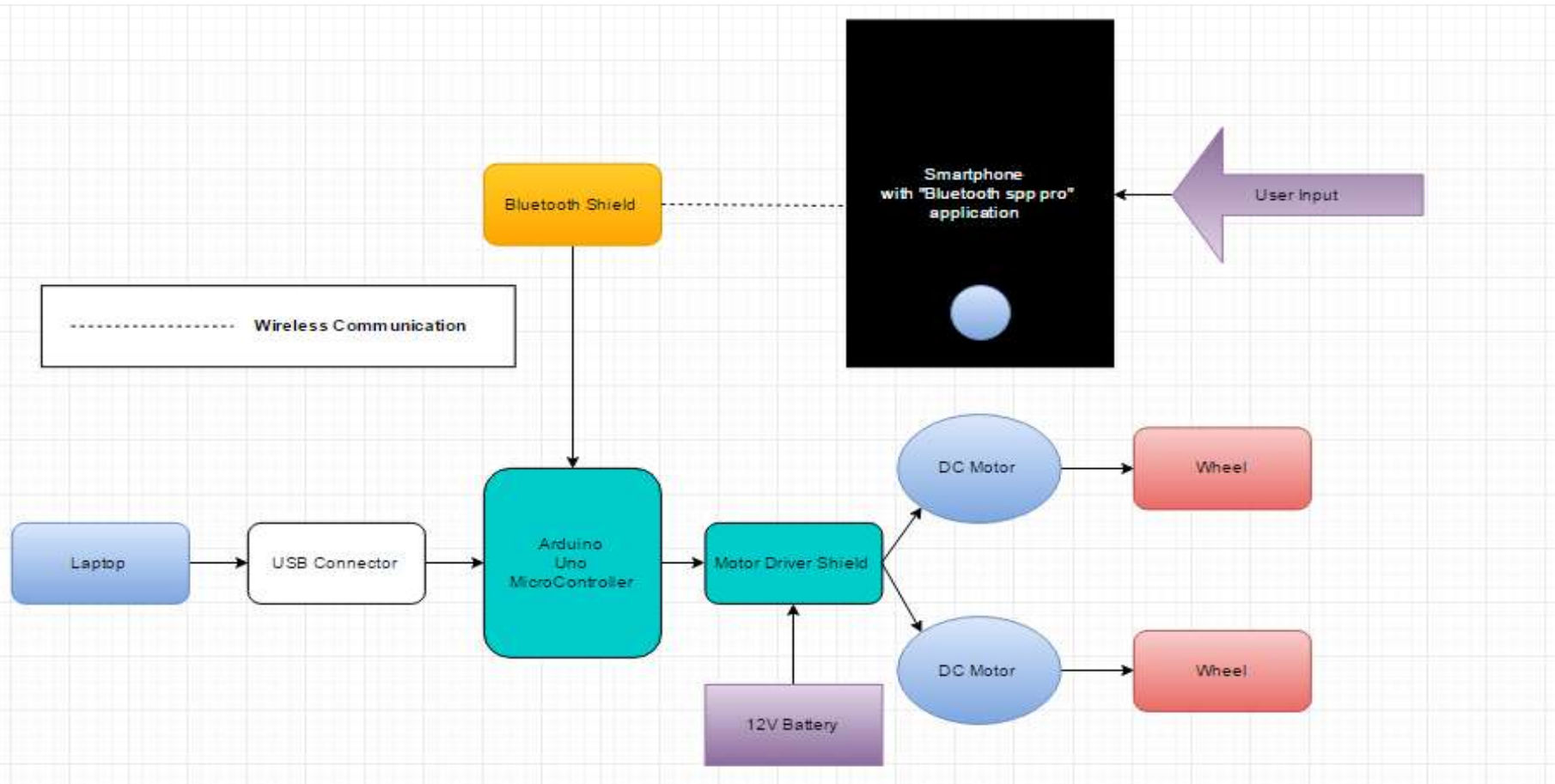




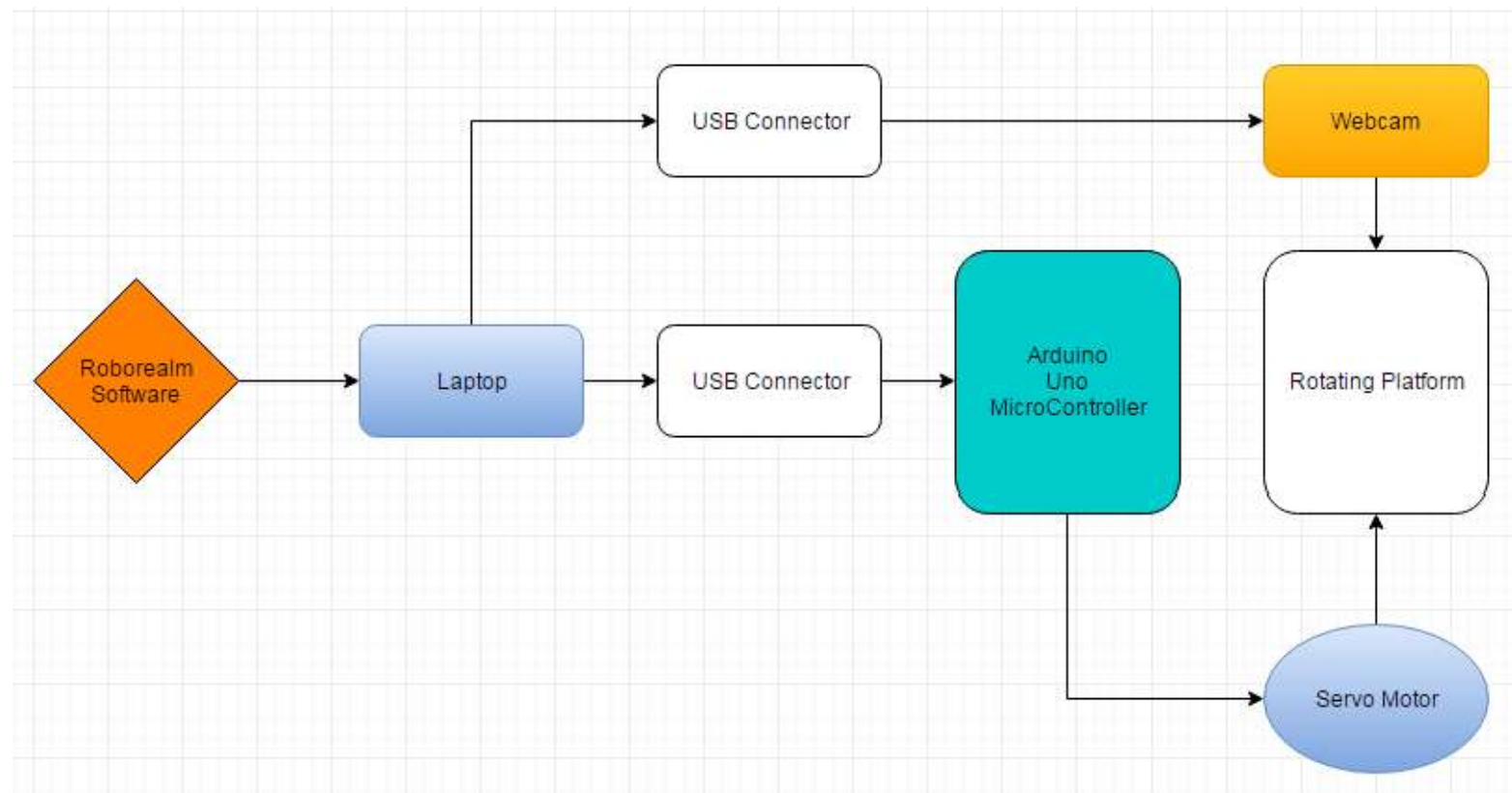
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# Block Diagram Overview of “Motor Speed Control”



# Block Diagram Overview of “Motion Tracking System”



# Block Diagram Overview of “Automated Ball Loading Mechanism”

