



### PROJECT OVERVIEW



ESTEBAN ARIC CHRISTOPHER

OUR PRODUCT IS AN AUTONOMOUS ROBOT DESIGNED TO COMPETE IN SUMO AND WEIGHTED TRACTOR PULL EVENTS.

### REQUIREMENTS

BILL OF MATERIALS UNDER \$50	BOM AT \$34.74
TOW OBJECT OVER 1KG	MAX TOWED: 14KG
TOTAL DIMENSIONS UNDER 24x17cm	BOT AT 24x17cm
TOTAL MASS UNDER 1200g	BOT AT 1060g
>1HR BATTERY LIFE	1HR 18MIN

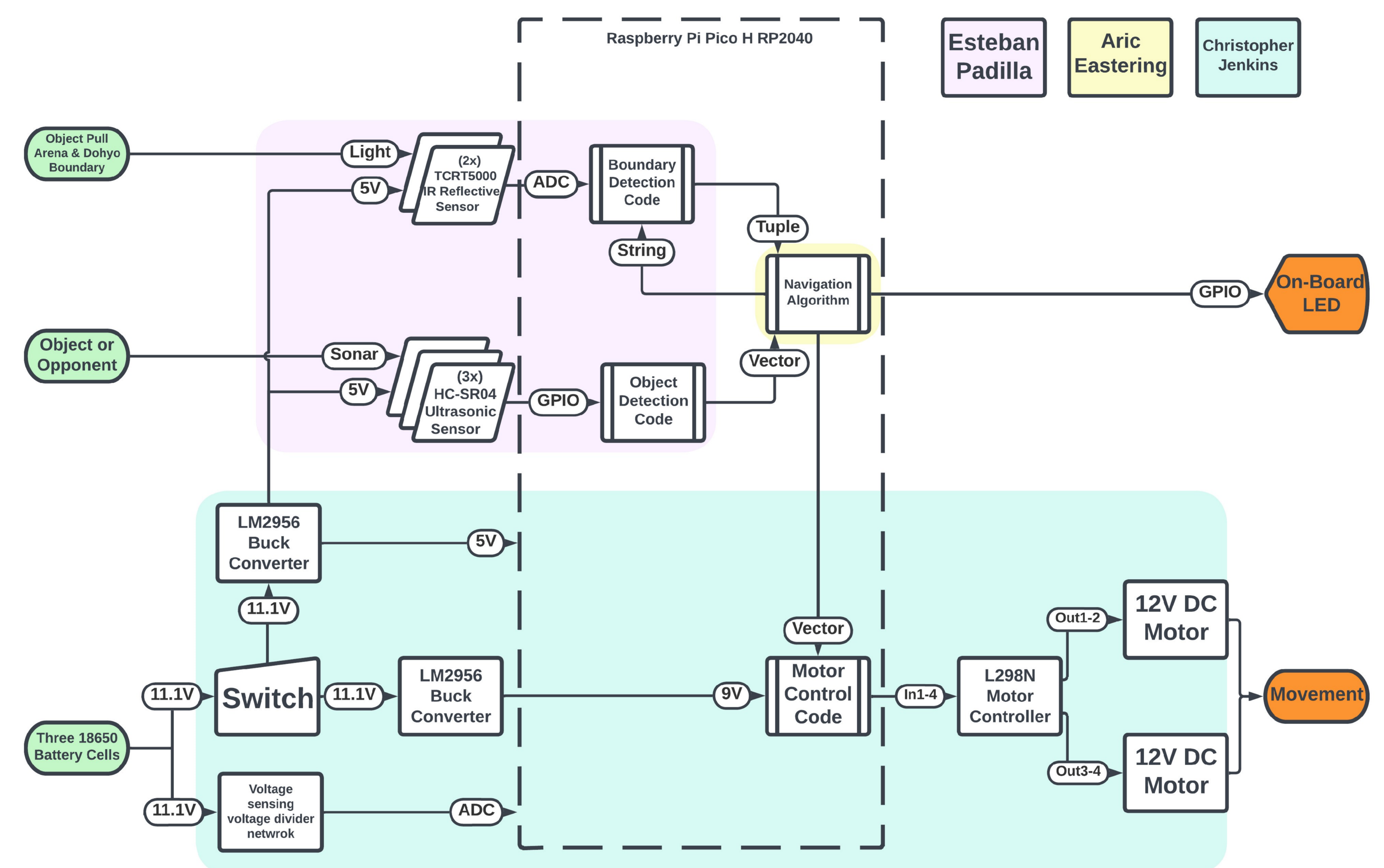
### POWER BUDGET

INPUT POWER	4 WH
RASPBERRY PI PICO H	697 mW
HC-SR04 ULTRASONIC	88 mW
TCRT5000 INFRARED	152 mW
12v MOTORS	2 W
BMS	3 mW

### MAJOR D2 CHANGES

- UPGRADED TO 2x 12v 100RPM DC MOTORS
- UPGRADED TO 3x 18650 CELL BATTERY PACK
- OBJECT DETECTION SPURIOUS SIGNAL FILTERING
- 3D PRINTED ARMOR, MOUNTS AND ENCLOSURES
- CUSTOM LASER CUT CHASSIS
- IMPLEMENTED MULTITHREADING
- 3D PRINTED NEW 3-PIECE 4MM D-SHAFT RIMS
- ADDED SECOND BUCK CONVERTER FOR MOTORS
- SIMPLIFIED AND COMPACTIFIED WIRING CIRCUITS
- MAXIMIZED WEIGHT TO CLASS LIMIT

### TOP LEVEL BLOCK DIAGRAM



### NAVIGATION TEST RESULTS

NAVIGATION (ARIC EASTERLING)

TIME TO ACQUIRE OPPONENT (AVG)	6 SECONDS
TIME TO PUSH OPPONENT (AVG)	6.2 SECONDS
TIME TO COMPLETE PULL FIELD (AVG)	18.5 SECONDS
TIME TO COMPLETE SEARCH ALGORITHM (AVG)	56 SECONDS

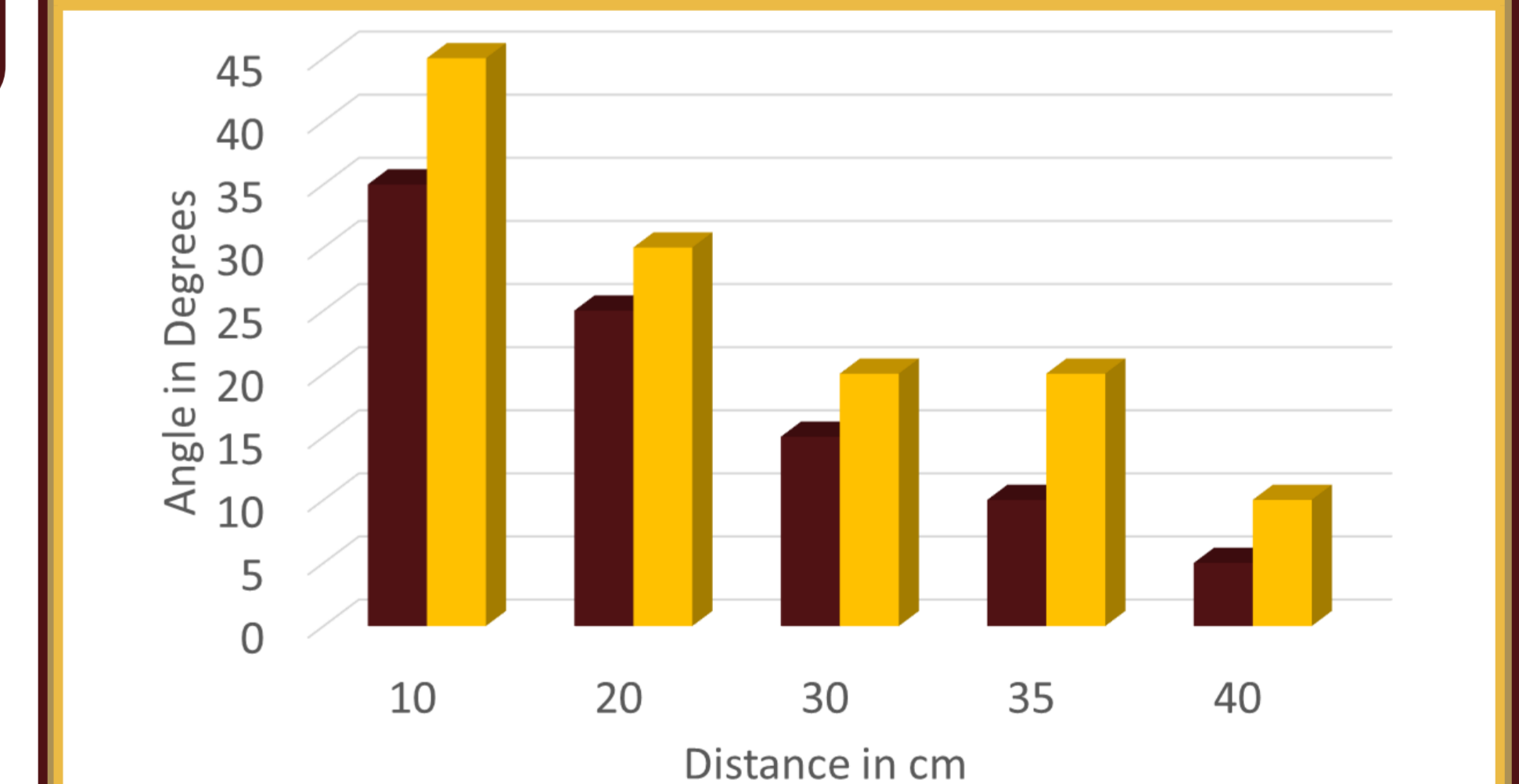
THEORETICAL PATTERN      ACTUAL PATTERN

### SENSOR TEST RESULTS

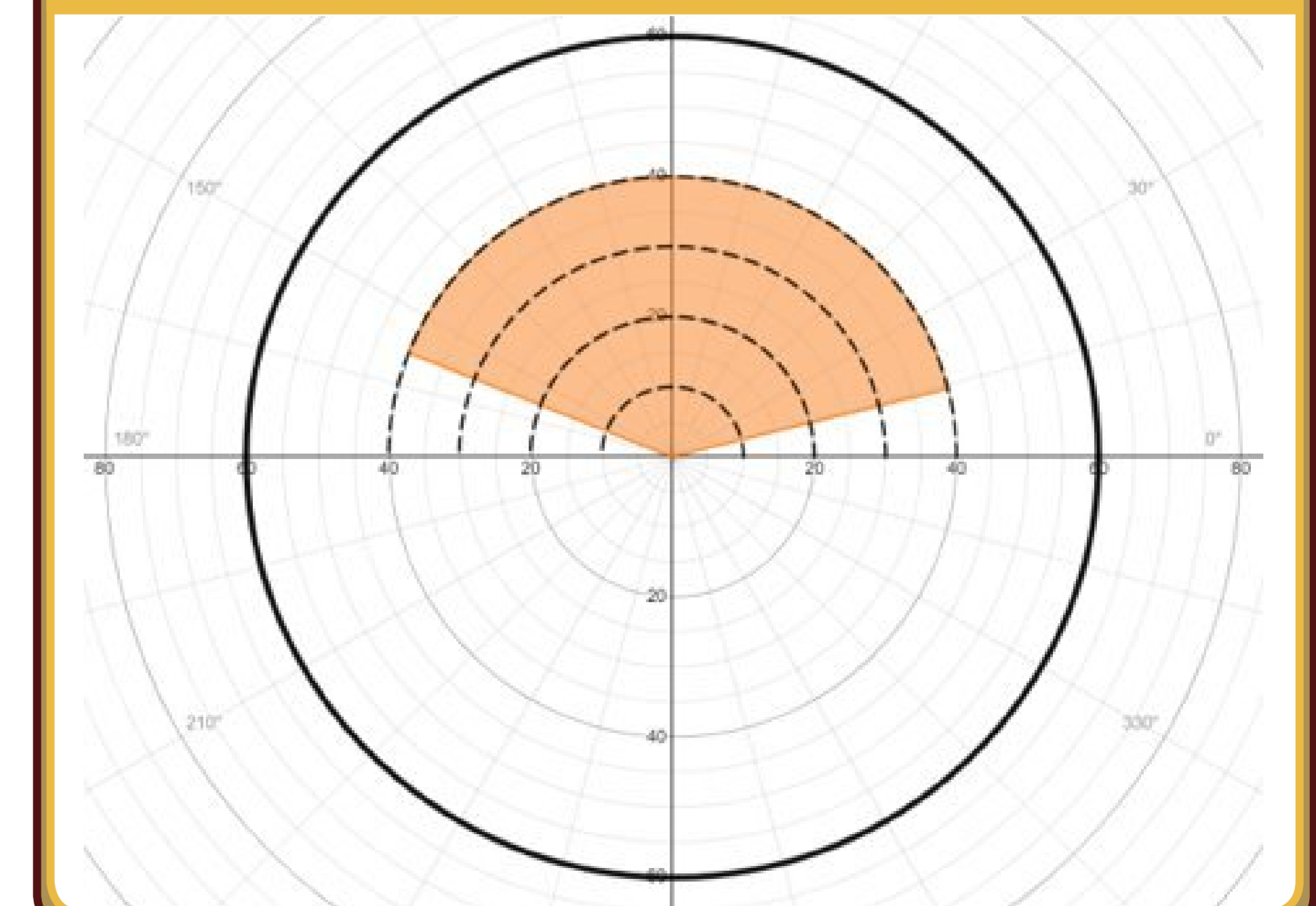
OBJECT & BOUNDARY DETECTION (ESTEBAN PADILLA)

COLOR PRECISION	97.7%
MAX DETECTION DISTANCE	40 CENTIMETERS
ULTRASONIC SENSOR FoV	155 DEGREES

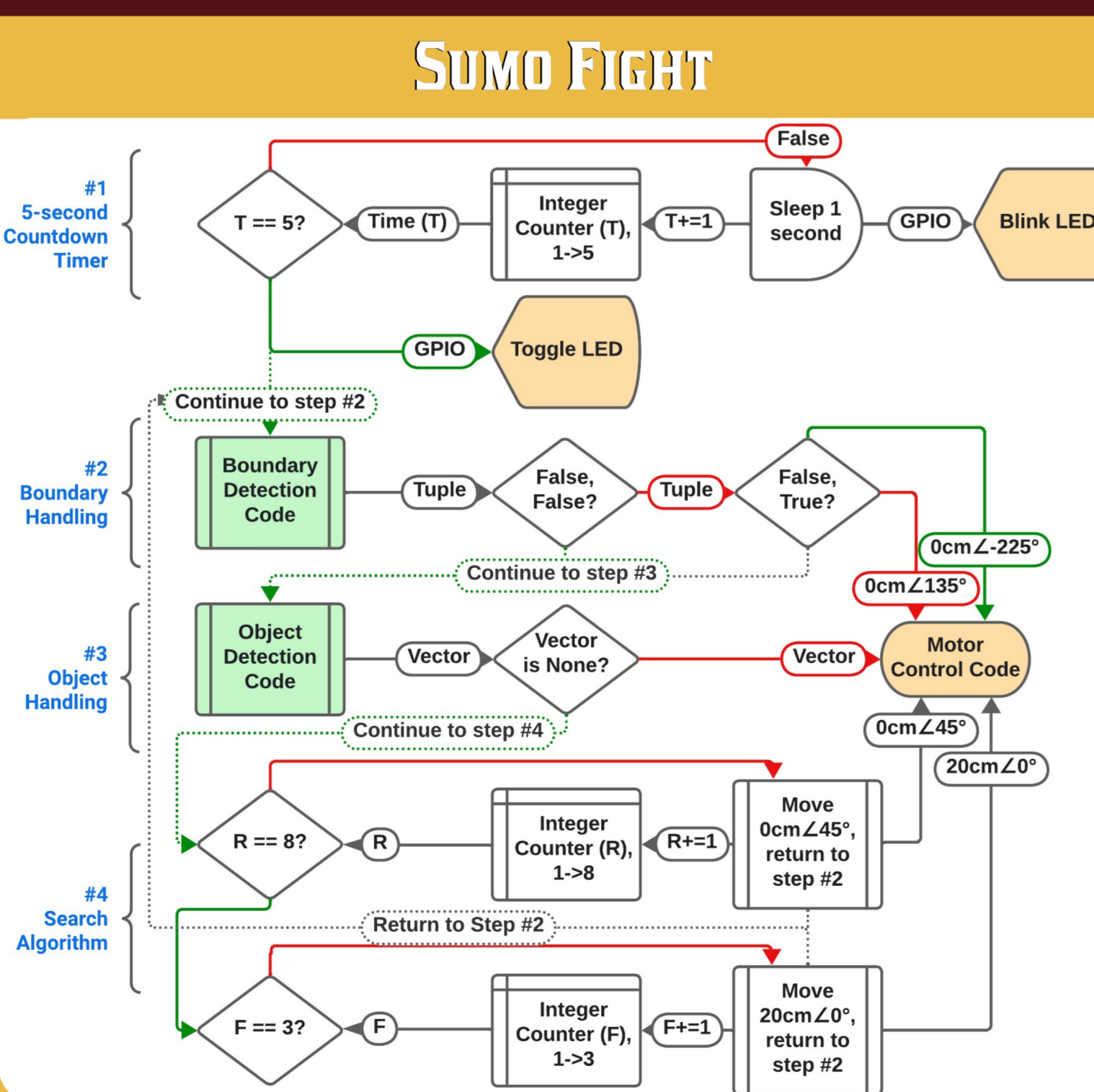
### MAX ANGLE REFLECTIVITY



### OBJECT DETECTION FIELD-OF-VIEW



### NAV FLOWCHARTS



### SPECIAL THANKS

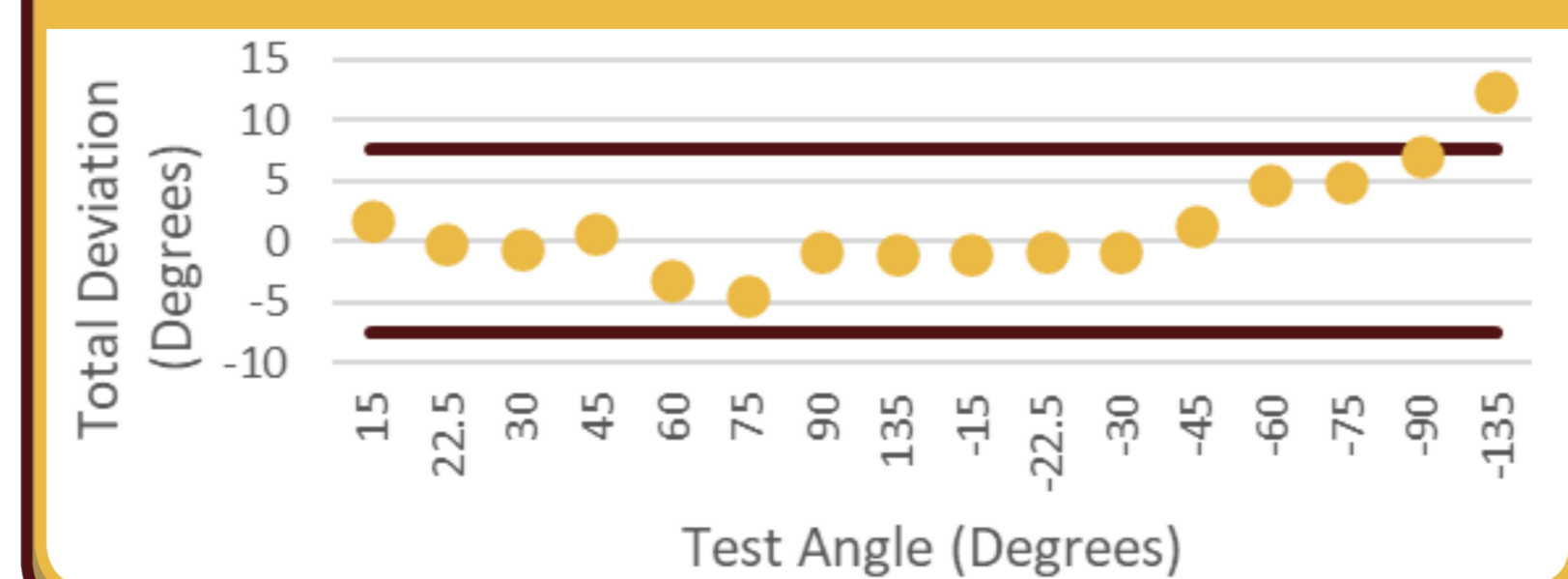
TO OUR SPONSOR, FAWZI BEHMANN  
TO OUR FACULTY ADVISOR, JEFFREY STEVENS

### MOTOR TEST RESULTS

MOTOR CONTROL (CHRISTOPHER JENKINS)

<15cm STRAIGHT LINE DEVIATION(AVG)	6.3cm
>200% TORQUE INCREASE	>291%
RPM OFFSET(AVG RPM)	RIGHT: 68 LEFT: 87.75
MOTOR DRIVER EFFICIENCY	76.4%
AVERAGE ANGLE DEVIATION(DEGREES)	<13

### AVERAGE ANGLE DEVIATION



### POWER TEST RESULTS

POWER (CHRISTOPHER JENKINS)

<60mV BUCK VOLTAGE DROP	PASS
LOW-POWER SHUTDOWN AT <9.6V	PASS
9V BUCK EFFICIENCY	EXPECTED: 73%, ACTUAL: 76.18%
5V BUCK EFFICIENCY	EXPECTED: 73%, ACTUAL: 67.07%

### BUCK CONVERTED VOLTAGE DROP

