No Name (Tentative) Senior Design Project

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OBJECTIVE

THIS SENIOR DESIGN PROJECT SEEKS TO INNOVATE AND INTEGRATE THE USE OF SEMI-AUTONOMY INTO THE SPORT OF COMBAT ROBOTICS TO FURTHER GROW AND CULTIVATE A NEW CLASS IN THE SPORT.

INTRODUCTION

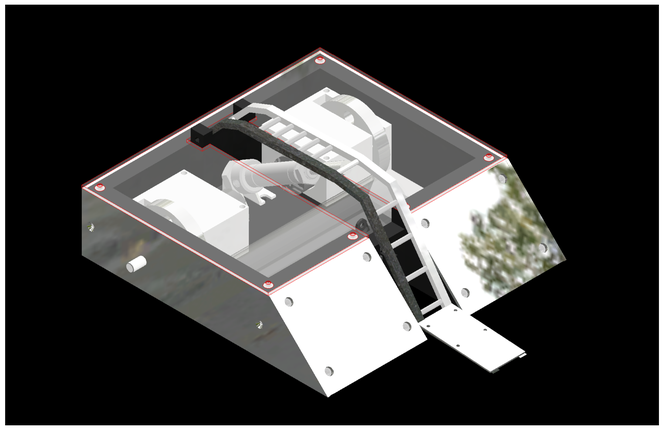
THIS PROJECT SEEKS TO INTEGRATE THE CONCEPT OF SEMI-AUTONOMY INTO THE NICHE SPORT OF COMBAT ROBOTICS, AIMING TO ELEVATE CREATIVITY AND TECHNICAL CHALLENGES WITHIN THE FIELD. WITH A BACKGROUND IN BUILDING COMBAT ROBOTS AND PROFICIENCY IN ENGINEERING TOOLS LIKE CAD SOFTWARE AND 3D PRINTING, THE FOCUS IS ON DEVELOPING A 3-LB SEMI-AUTONOMOUS FLIPPER ROBOT CAPABLE OF FIRING ITS WEAPON BASED ON SENSOR INPUT. FOR A SHORT HISTORY, COMBAT ROBOTICS ORIGINATED FROM EVENTS LIKE 'CRITTER CRUNCH' AND ARE EVOLVING THROUGH SHOWS LIKE 'ROBOT WARS' AND 'BATTLEBOTS', UNDERSCORES THE CONTINUOUS GROWTH AND INNOVATION WITHIN THE SPORT. DESPITE THIS, SEMI-AUTONOMOUS ROBOTS REMAIN SCARCE, WITH NOTABLE EXCEPTIONS LIKE 'CHOMP' FROM 'BATTLEBOTS' (2019 SEASON) AND MELTYBRAINS. THROUGH THE ANALYSIS OF DIFFERENT WEAPON TYPES, THE FLIPPER WAS SELECTED DUE TO ITS SUITABILITY FOR SEMI-AUTONOMY. DISTANCE SENSORS AND PRESSURE SENSORS WILL BE INTEGRATED INTO THE WEAPON AND WOULD TRIGGER AUTONOMOUS RESPONSES UPON DETECTING THE OPPONENT'S PROXIMITY. CONSTRAINTS SUCH AS THE 3-LB WEIGHT LIMIT, MATERIAL SELECTION, AND DRIVE SYSTEM CHOICE ARE CONSIDERED. WITH THE FINAL SELECTIONS FOR MATERIALS INVOLVING UHMW, ALUMINUM, AND STEEL. WHERE THE UHMW WILL BE THE MATERIAL USED FOR THE BODY, ALUMINUM USED FOR THE ARMOR PLATING ALONG THE OUTSIDE OF THE ROBOT, AND THE STEEL USED FOR THE FLIPPER ARMS. AS AN END GOAL FOR THE PROJECT, I AIM TO COMPETE WITH THE 3-LB FLIPPER IN APRIL AT NORWALK HAVOK ROBOT LEAGUE (NHRL) WHO IS A LEADING COMPETITION THAT ENCOURAGES INNOVATION AND CREATIVITY IN THE SPORT.

DESIGN

MATERIALS

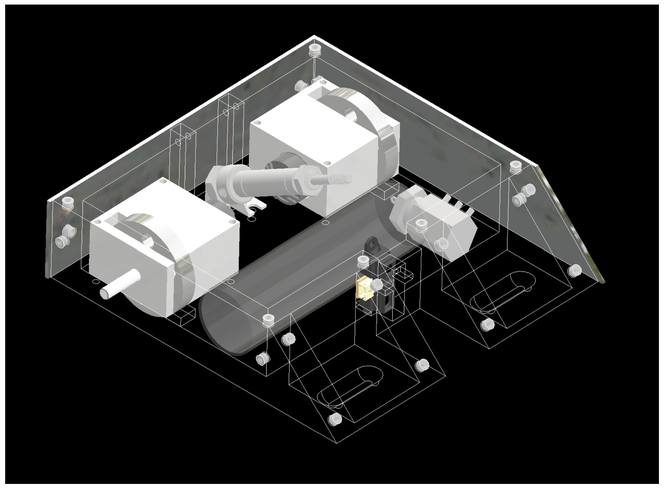
BASE: UHMW PLASTIC
FRONT PLATES: A36 STEEL
SIDE AND BACK PLATES: ALUMINUM
TOP PLATE: POLYCARBONATE
FLIPPER ARMS: A36 STEEL

DUE TO RESTRICTIONS IN WEIGHT HEAVY CONSIDERATION WAS TAKEN WHEN PICKING MATERIALS. UHMW WAS CHOSEN AS THE BASE MATERIAL DUE TO ITS IMPACT RESISTANCE AND DURABILITY. A36 STEEL WAS CHOSEN FOR THE FLIPPER AND FRONT PLATES DUE TO IT BEING A MORE DURABLE METAL SINCE THESE AREAS WILL SEE MOST OF THE HITS IN THE COMPETITION. WHEREAS ALUMINUM WAS CHOSEN FOR THE BACK AND SIDE PLATES DUE TO ITS LIGHTWEIGHT AND SLIGHT DURABILITY. FINALLY, POLYCARBONATE WAS CHOSEN AS THE TOP PLATE SIMPLY FOR ITS LIGHTWEIGHT AND THE ABILITY TO SEE WITHIN THE ROBOT DURING IT FUNCTIONING.



COMPONENTS

MOTORS: 1500 KV PREMIUM PLANETARY GEARMOTOR (X2)
ESCS: BL-HELI 20A BRUSHLESS SPEED CONTROLLER (X2)
WHEELS: 50 MM ALUMINUM WHEEL (X2)
AIR CYLINDER: AIR EXTENDS ROUND AIR CYLINDER (X1)
AIR TANK: 120 CC AIR TANK (X1)
AIR VALVE: 3-WAY AIR OPERATED SWITCH (X1)
SERVO: SG90 MICRO SERVO (X1)
DISTANCE SENSOR: B5W-LA01 STD 22.8~70 MM DISTANCE SENSOR (X1)
PRESSURE SENSOR: SEN0294 ROUND PRESSURE SENSOR (X1)
ARDUINO: ARDUINO NANO V3 (X1)
LIPO BATTERY: 650 MAH 3 CELL LITHIUM POLYMER BATTERY (X1)



SUB-SYSTEM MAPPING