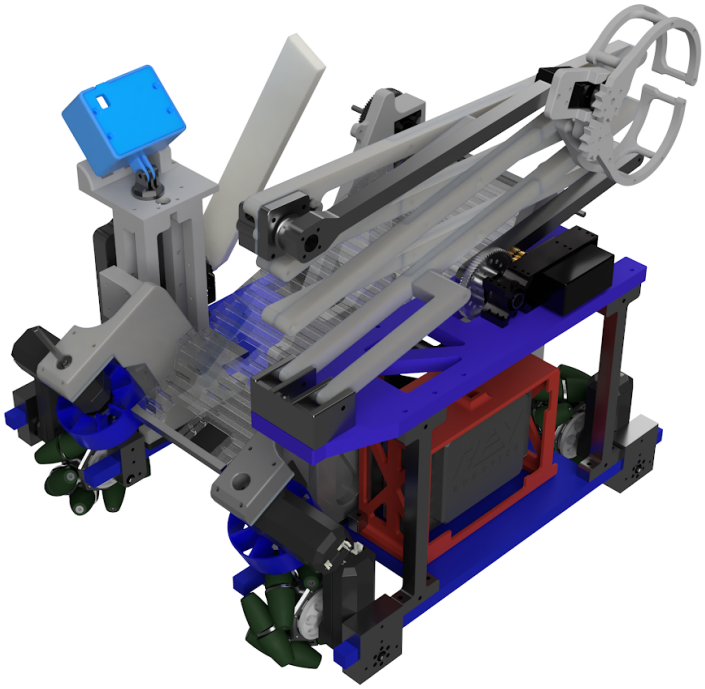
ERR⚙R 4⚙4

Team Name Not Found

Assembly Instructions for Our Robot

How to Build “Gar-E”



2017-2018

Revision History		
Revision	**Date**	**Description**
1.0	2/13/18	Initial release
2.0	2/26/18	Updated glyph collector and lifter

Table of Contents:

1.0 Introduction

At the beginning of this season, we decided on highest priority mechanical design goals for our base robot. We have stuck to all of these throughout the season and all of them are key to the current abilities of our robot.

- CAD before manufacturing: Enables us to find perfect design and eliminate flaws before manufacturing.
- 4 wheel drive: Necessary for our mecanum wheels and used to gain maximum speed.
- Mecanum Wheels: These allow maximum mobility and driving in any direction from any position.
- Design from home via cloud based softwares: These let us make changes and designs from anywhere.
- Even balancing: Evenly distributed weight on the robot so we can balance on the balancing stone.
- Modularity: Building the robot in modules enables us to work on multiple sections at once and also allows for easier replacement of parts as they wear out or are upgraded.
- Light Weight: Allows us to move faster and more efficiently.

While following these goals, our team has incorporated agile project management into our design process. Agile project management is a product design system (used mainly in software development) that utilizes short design cycles called “sprints”. The design team begins by creating a “backlog,” a list of every feature they want in the final product. Then, for each sprint, the design team works on several items from the backlog that will give the product basic functionality. Then the cycle is repeated for each sprint, each time adding more features and functionality, until the final product is produced.

After the release of the game season, we decided that our first sprint (to be completed by Meet 1) would include being able in autonomous to score the relic and drive to the safe zone and, in tele-op, scoring one to two relics for a max of 130 points. Sprint 2 (to be completed by Meet 3) would score 200+ points by completing the glyph cypher in autonomous and stacking glyphs in tele-op. Sprint 3 was planned from Meet 3 to the end of the season. In this sprint, we would strive to improve all current mechanisms and modules of our robot.

Modularity was key to the design of our robot. As each mechanism was built in a separate module, we were able to work on multiple modules simultaneously. In the case that work would need to be done in an emergency, we could take one module off and work it individually. Instructions for the assembly of each of our currently completed modules and then the assembly of the modules into the final robot is documented below.

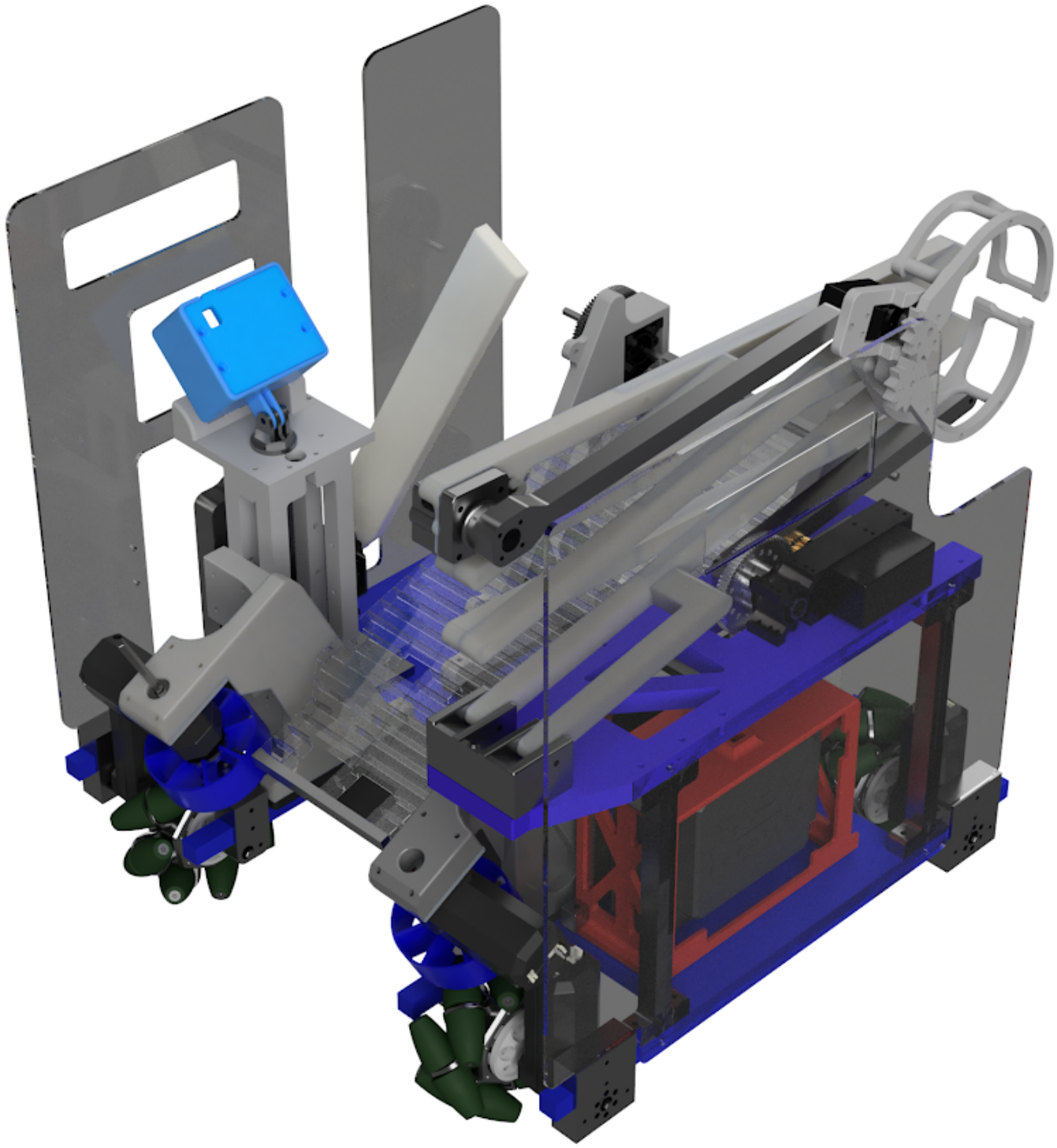
2.0 Parts List

The parts needed for each individual robot module are listed in the chapter for that module. However, this list consolidates all the parts lists for the whole robot.

Quantity	Item	Price
1	½ inch HDPE (The price given is for a 24” x 48” sheet.)	$80.00
--	¼” HDPE (price varies)	$35.00
2	18”x18” lexan, ⅛” thick (price varies)	$80.00
3-4 rolls	ABS 3D printing filament (price varies - $25.00/roll)	$100
2 rolls	Ninjaflex 3D printing filament (price varies - $35.00/roll)	$70
1	⅜” polywall, 12”x12”	
4	Ace Hardware Nylon Spacers	$00.10
--	Misc bolts and nuts (4mm, 6-32, ¼”)	
∞	Misc wires, heat shrink tubing, servo screws, etc.	
6	Rev Robotics Core Hex Motor, REV-41-1300 ($21.00/ea)	$126.00
2	Servocity, HS-485HB, Hitec servo model #32625S, $17.50/ea	$35.00
1	High Torque Servo w/ 5:1 Gearbox- assembled, HS-785HB Prt #: CM-785HB-5-A	$130.00
1	CM-785HB Servo and Gearbox Assembly Gear Ratio 3.8:1	$129.98
2	Rev Robotics, Smart Servo, part # REV-41-1097 $30.00/ea	$60.00
3	Rev Robotics, hex axles, 400mm long, (cut to 3”- 4” lengths), REV-41-1362, ($15.00/pack of 4)	$15.00
6	Rev Robotics, axle collars, REV-41-1327, ($7.00/pack of 10)	$7.00
4	Vex Mecanum Wheels, 2 Left: 217-3645, 2 Right: 217-3644 ($29.98/ea)	$119.92
1	Tetrix MAX Single Standard-Scale Servo motor bracket, Part #: W39060	$9.95
1	Servocity, 25 tooth C1 spline, servo horn, prt # 525125	$3.99
1	Servocity Actobotics 25 Tooth Servo Hub Shaft C1 Spline prt# 525123	$9.99
2	Servocity, 24 tooth C1 spline, servo horn Part #: 525124	$4.99
1	Servocity, 6mm axle, 12” long (cut to 5 ¼”)	
2	Servocity Face Tapped Clamping Hubs, 0.77” Pattern	$5.99
2	Rev Robotics Expansion Hub, Part #: REV-31-1153 $175/ea	$350.00
2	Short Flex Sensor (ie, Whisker) (1070 by Adafruit) - $7.95/ea	$15.98
1	CMUcam5 Pixy (Pixycam) (550-1601 from Amazon)	$69.00
2	REV Robotics Touch Sensor (REV-31-1425 by REV Robotics) - $6.00/ea	$12.00

2	HS-5125MG High-Tech Digital Wing Servo (35125S by ServoCity) - $50.00/ea	$100.00
1	NavX Micro Navigation Sensor (am-3554 by AndyMark)	$79.00
1	Square Jellyfish Spring Phone Tripod Mount (Frys Electronics part no. #8448478)	$14.95
1	AKOAK 1/4" Swivel Mini Ball Head Screw Tripod Mount (4332050683 from Amazon)	$6.00
1	GoPro Tripod mount + thumbscrew (RSX-03 from Amazon)	$6.00
1	Rev Robotics battery, REV-31-1302	$50.00
	Total--	$1419.77

12.0 Finished Robot



13.0 CAD Drawings

The previous chapters gave the manufacturing and CAD instructions for each module. In this chapter, you will find all the CAD drawings and assembly views for all the modules plus the overall robot.