STORM 2025 Design Report

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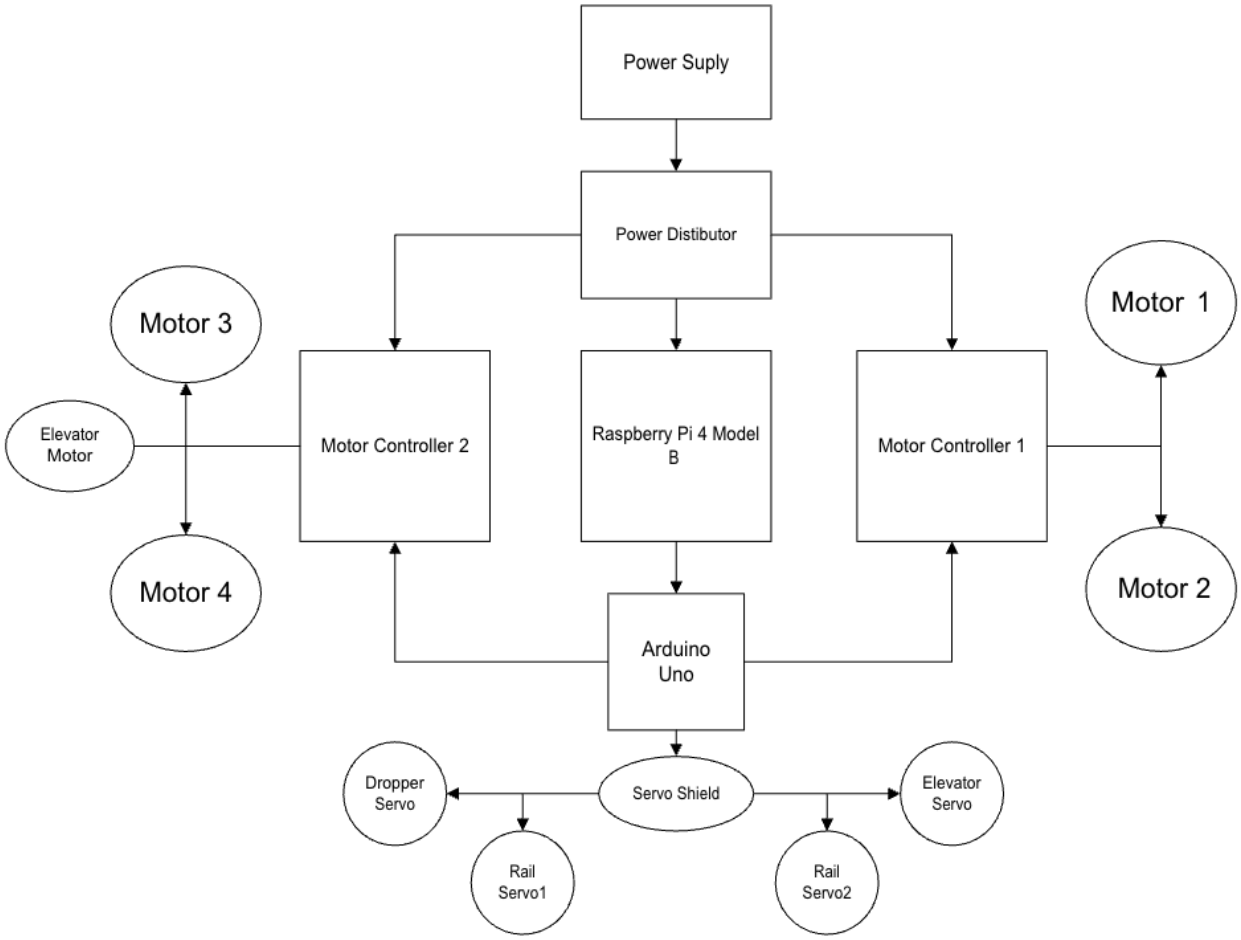
1 Team Organization and Team Members

Mercury Robotics is a design and competition robotics team at Oklahoma State University.

- **Team Captain:** Carson D.
- **Team Operator:** Sean M.
- **Team Members:** Carson D., Sean M., Daniel N., Caden A., Karson Y., Charles K., Jakob G., Luke C., Griffin G., Sudiksha S, Nathan F., Reese R.

2 Robot Block Diagram



3 Mechanical Design

3.1 Drivetrain Configuration

- The sheet metal 16”x16” U-shaped drive train consist of 4 mecanum wheels, independently powered by 4 Gobilda Yellow Jacket Planetary Gear Motors. These motors power a 90-deg gearbox, connected to a chain a sprocket system powering the wheels.

3.2 Field Manipulation

- The robot's field manipulation system has three major components, the ball collection system, scoring system, and sign lifting system. The ball collection system features a spinning rod with rubber fingers that feed balls into an elevator powered by a rope and pulley mechanism. The balls are then transferred into a U-shaped scoring rail system that can extend out 4 inches when needed, where a funnel directs them into a cylindrical scoring mechanism with a movable bottom for precise dropping. For the sign, the sign lifting system consist of a rear-mounted forklift system using a worm gear to move the 2 prongs up and down.

4 Electrical Design

4.1 Single-Board Computer and Microcontrollers

- A Raspberry Pi 4 Model B is being used for the systems computer, paired with one Arduino Uno and 2 GoBilda RoboClaw 15A Motor Controllers to serve as the microcontroller system. One servo shield is being used to control up to 16 servos.

4.2 Sensors

- No sensors are being used on this project.

4.3 Power

- 1, 12v NiMH GoBilda battery is being used as the power source. The system is using 2, XT30 GoBilda Power Distribution Boards connected to the 12v battery to distribute power across the electrical components.

5 Software Design

5.1 Operator Interface / Networking

- The operator of the robot will need to access the raspberry pi attached to the bot through a ssh connection, after a successful connection it'll be necessary for the operator to navigate to the raspberry server control script and activate it, then activating the control script on the operators personal laptop to allow a connection between the two. Upon successful connection values will appear on screen. You will be able to send values from your controller to the raspberry pi and the robots motors. Upon activation of both scripts a camera will activate, and you will be able to view the feed from the robots perspective

6 Safety and Reliability

- The robot's field manipulation system uses high-strength materials like carbon fiber-reinforced 3D filament and aluminum for increased durability. Multiple servos power critical components, allowing operation even if one fails. The forklift system uses a worm gear for precise control and secure lifting of the fallen sign. A power distributor regulates voltage, and a line fuse protects against electrical overloads. Clearances in the drive train limit the amount of damage taken from foreign objects on the field. These features ensure consistent and safe performance during competition.

7 Bill of Materials

Purchased Item	Price
Gobilda: 4 Motors, 2 morotcontrollers, wires	376.83
Hex Flanged Bearing	125.8
GOBILDA	124.5
MCMASTER-CARR	85.74
GOBILDA	442.53
NAPA AUTO PARTS 0000415	70.45
8020 LLC	33.36
LOWES #00241	53.02
GOBILDA	47.61
MCMASTER-CARR	51.3
AMAZON MKTPL 9I5825EZ3	78.93
AMZN Mktp US ZG8Q113E2	46.3
Total:	$1536.37