To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, IE Capstone Design Programs

Team #22: Combat Robot "Laura"

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Project Objective

This combat robot competed in the 30-lb weight class at a competition hosted at Patrick F. Taylor Hall. The combat took place on a 16' x 16' platform, and the objective was to disable the opposing robot, or push it off the platform.

Engineering Specification

- Must not weigh more than 30 lbs
- Ground clearance of less than 1 in
- Withstand repeated drops from 3 ft (combat arena height)
- Frame profile will not exceed 16 in x 14 in x 8 in
- Must be capable of accelerating to 19 ft/sec
- Budget of $3000

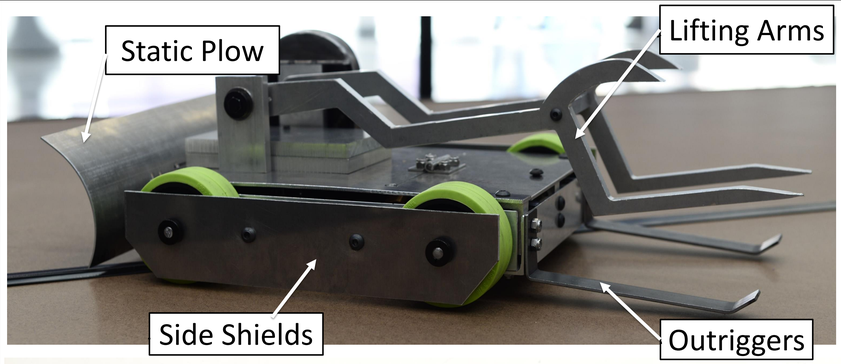
Safety Considerations

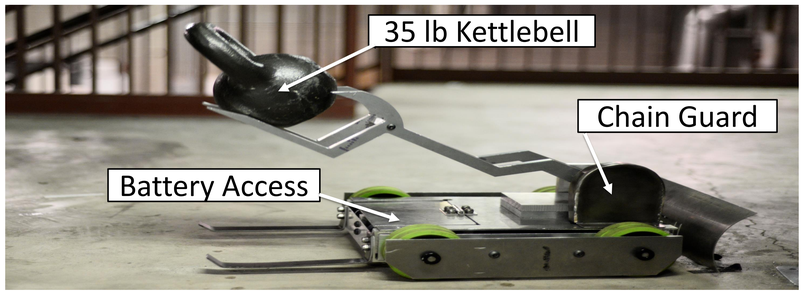
- Cannot present as a hazard to judges, spectators, or opposing operators
- Implement active weapon kill-switch
- Battery will be placed in a durable enclosure
- Wear PPE during manufacturing/testing

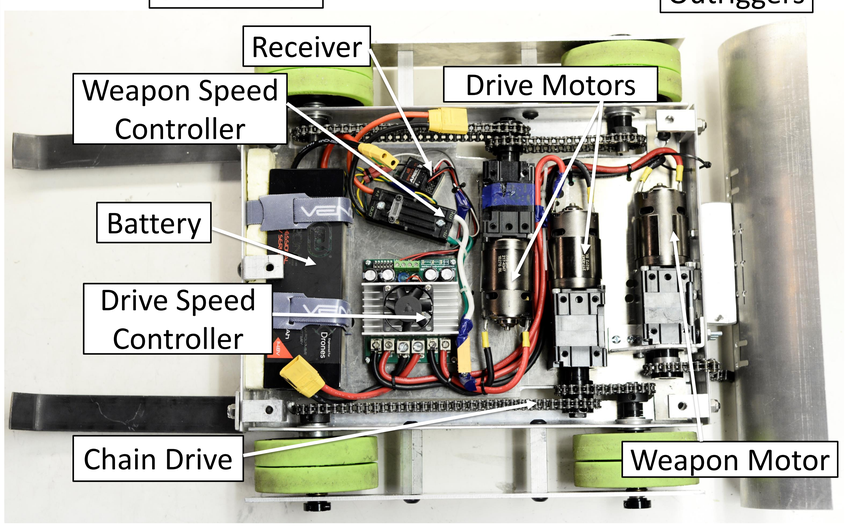
Project Budget

Subassembly	Projected	Actual
Frame	$109	$517
Weapon	$50	$254
Wheels/Hubs	$104	$136
Electronics	$1,717	$1,641
15% Contingency	$450	-
Total	**$2,430**	**$2,548**

Embodiment







Performance

- Maximum Speed: 22 ft/sec
- Weight: 28.50 lbs
- Battery Duration: 29 minutes
- Extended Profile: 25 in x 15.25 in x 8.25 in
- Frame Profile: 14.75 in x 10.5 in x 3.25 in
- Lifting Capability: 35 lbs

Results of Competition

- Finished in 4th place
- Chain drive was critically damaged early in the competition which caused several other subsystems to consequentially fail
- Competition revealed need for design modifications

Analysis and Testing

- Experimentally determined coefficient of static friction was used in conjunction with motor torque calculations
- Dropped weights from various heights to test structural integrity
- Closed-box temperature testing
- Average current draw in simulated combat situations

Improvements

- Eliminate the chain drive and propel each wheel with its own independent motor
- Extend the width of the robot by at least 8 in to accommodate additional motors
- Create internal brackets to securely fasten the motors
- Extend the reach of the lifting arms

Concept Gen. September → Embodiment October-November → Analysis December → Procurement December-January → Weapon Redesign January → Fabrication February-March → Testing February-April → Optimization April

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