Final Report Rebuttal

ECE445/ME470 Senior Design Project Lab

Project 13: Autonomous Indoor Patrol Robot for Cat Deterrence

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May 26, 2026

Summary

We sincerely thank Professor Blake Johnson and Professor Yu Lin for reviewing our final report draft and providing useful comments. Based on the feedback, we revised the report by adding two missing supporting materials: the updated project schedule and the final physical product image.

These materials had already been prepared during the project, but they were not included in the original final report draft because they were not explicitly required in the initial final report guideline. In the revised submission, we added them to improve the clarity and completeness of the report.

The main revisions are summarized as follows:

- An updated project schedule has been added to the Cost and Schedule section.
- A physical image of the final product has been added to Section 1.2 Overview.

Response to Professor Blake Johnson's Comment

Comment 1

Add or clarify the project schedule in the final report.

Response 1

Thank you for the suggestion. We agree that including the project schedule makes the report more complete and helps document how the design, implementation, testing, and debugging work progressed throughout the semester.

In the original final report draft, the detailed schedule was not included because the initial final report guideline did not explicitly require it. However, we had already prepared and updated the project schedule during the design process. In the revised report, we added the updated schedule to the Cost and Schedule section.

The schedule summarizes the major work completed by each team member. Jiawei Kong was mainly responsible for electrical system integration, including chassis assembly, PCB design and soldering, water pump testing, DC motor testing, and stepper motor testing. Chentao Fang was mainly responsible for gimbal modification, connector design, 3D printing, water tank design, and battery box design. Ronglong Liu was mainly responsible for the main control code and stepper motor debugging. Yanchen Liu was mainly responsible for vision model training and debugging.

The added schedule is shown below.

Week	Jiawei Kong	Chentao Fang	Ronglong Liu	Yanchen Liu
4/6	Selected major electrical components, including pump, motor drivers, batteries, buck modules, and stepper motor system.	Started gimbal structure redesign and connector layout planning.	Started main control code structure and basic Arduino control planning.	Set up the vision training workflow and prepared initial dataset/model testing.
4/13	Tested the water pump, DC motors, and basic power distribution; began chassis assembly and electrical layout.	Designed and tested early gimbal mounting parts and water tank arrangement.	Tested motor control logic and began stepper motor control debugging.	Trained and evaluated the initial vision model for cat detection.
4/20	Integrated the chassis hardware and electrical system; tested wiring, motor drive, pump control, and stepper motor connections.	Modified the gimbal structure, designed 3D-printed connectors, and improved the mechanical mounting.	Developed main control code and continued stepper motor control/debugging.	Improved the vision model and tested detection stability under different conditions.
4/27	Designed the custom PCB for power distribution and prepared the board for fabrication/assembly.	Designed and fabricated improved gimbal parts, water tank support, and battery box structure.	Integrated the main control logic with the patrol, aiming, and spray functions.	Debugged the vision model output and communication with the control system.
5/4	**Mock Demo:** Presented the first integrated prototype with chassis motion, vision detection, gimbal aiming, and water spraying functions.			
5/11	Completed PCB soldering and electrical integration; continued debugging power distribution, pump control, and motor connections.	Improved gimbal stability, water tank mounting, and battery box installation.	Debugged the main control code and improved stepper motor response for aiming.	Improved vision detection accuracy and tested model performance with the integrated robot.
5/18	**Final Demo:** Presented the final integrated robot with completed electrical system, custom PCB, mechanical gimbal, vision detection, patrol control, and water deterrence function.			

Table 1: Updated project schedule and major individual contributions.

Revision made: The updated project schedule has been added to the Cost and Schedule section of the final report.

Response to Professor Yu Lin's Comment

Comment 1

Add image of your product in Section 1.2 Overview.

Response 1

Thank you for this suggestion. We agree that the overview section is clearer with a physical image of the completed product. In the original final report draft, we described the robot system in text, but we did not include a product image because the initial final report guideline did not explicitly require one in the overview section.

In the revised report, we added an image of the completed robot to Section 1.2 Overview. The image shows the integrated physical prototype, including the mobile chassis, gimbal structure, vision module, water deterrence mechanism, battery placement, and electrical components. This figure helps readers quickly understand the final system layout before reading the detailed design sections.

The added product image is shown below.

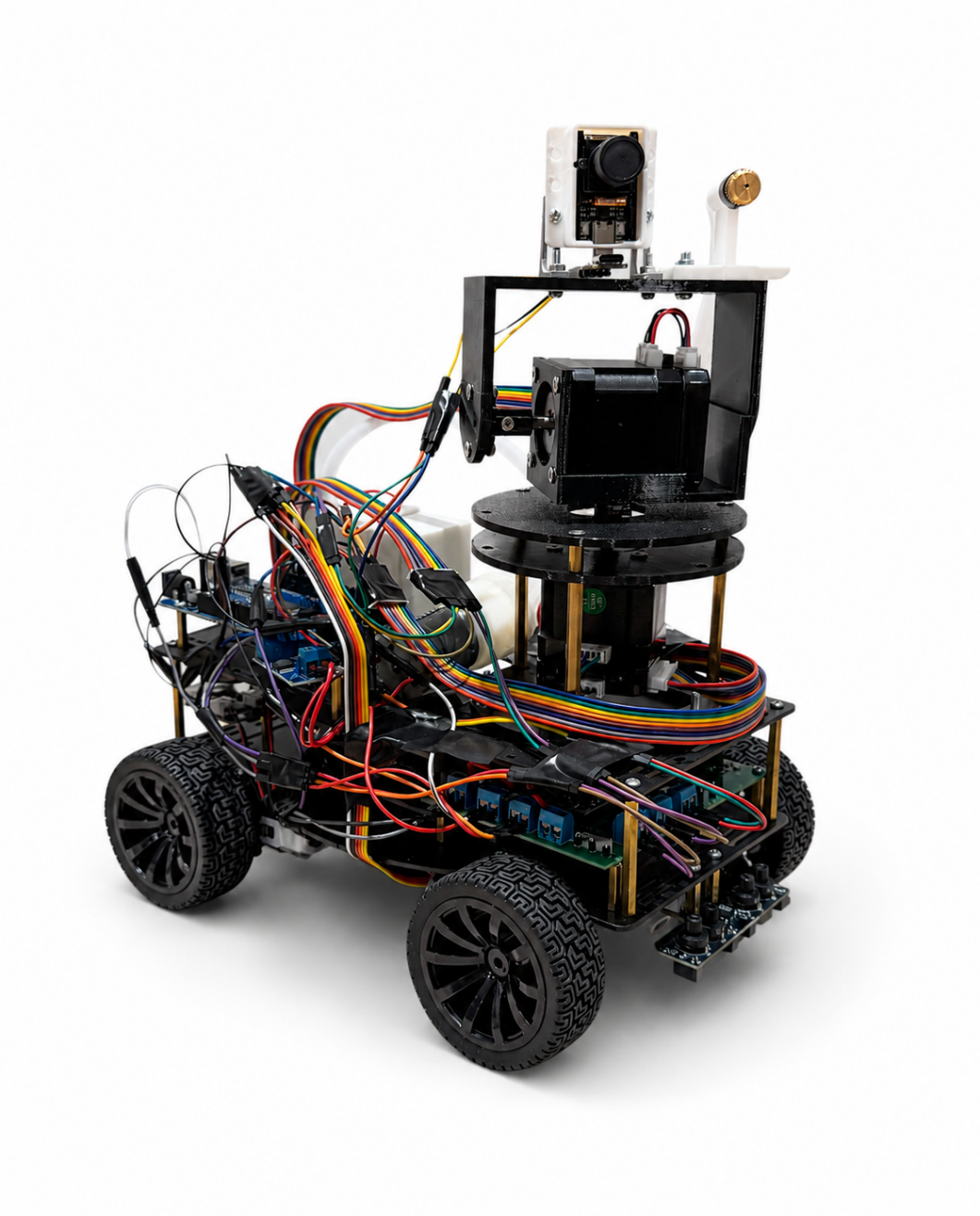

Figure 1: Final physical prototype of the autonomous indoor patrol robot for cat deterrence.

Revision made: A physical image of the completed product has been added to Section 1.2 Overview of the final report.

Additional Note

Both requested revisions have been completed in the resubmitted final report. These additions do not change the technical design itself, but they improve the presentation and completeness of the report. The schedule provides a clearer record of the project timeline and individual contributions, while the product image gives a more direct visual overview of the final prototype.