Poster#: 6

Drone Ranger

Student Names: Chunzhang Liu, Xiaoman Zou, Renxiang Yin, PI: Dr.Yoon Ilmi , Affiliation info: khoury college Computer Direct

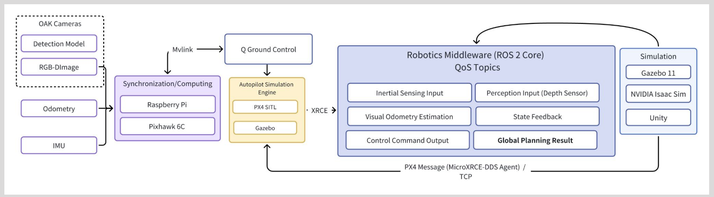
Northeastern University
Khoury College of Computer Sciences

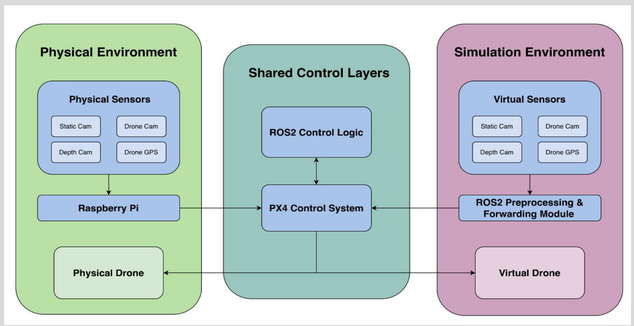
Motivation

Wildlife in the California Bay Area often enters private gardens, causing property damage while remaining important to protect from harm. To address this, we aim to build an autonomous, non-harmful deterrence system that removes the need for continuous human monitoring.

Methodologies

Our workflow uses a unified three-stage pipeline—SITL, HITL, and physical tests—where ROS 2 logic and PX4 run identically across all stages, letting virtual and real hardware mirror each other. This shared architecture streamlines iteration, accelerates debugging, and improves overall system reliability.

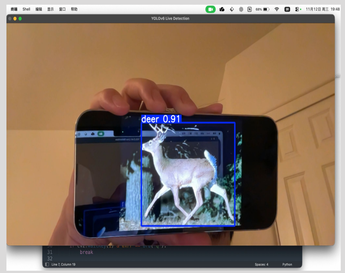


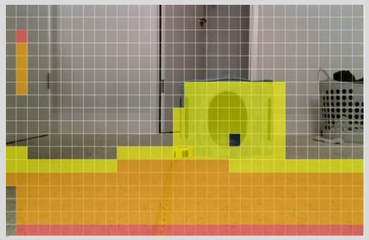


Results

Hardware

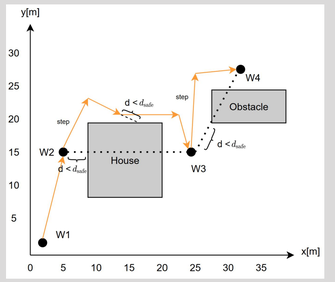
- Obstacle detection algorithms using depth cameras
- Achieved ~90% detection accuracy with the fine-tuned YOLO model.
- Verified closed-loop stability and consistent ground-truth alignment across tests.

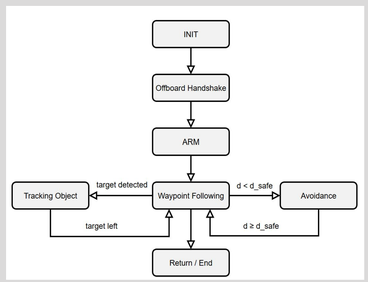




ROS2 Autonomy & Simulation

- Build a PX4–ROS 2–Unity simulation stack with virtual counterparts of all hardware modules.
- Maintained consistent topics, frames, and interfaces across SITL/HITL and hardware testing.
- Implemented a modular autonomy framework with pursuit and reactive obstacle-avoidance behaviors.
- Integrated pluggable planners, including RRT (mapless) and A* (local-map).
- Validated the full pipeline from simulated sensor input to PX4 offboard control.





Conclusions

We developed a humane backyard-deterrence UAV system combining PX4–ROS 2–Unity simulation, YOLO-based animal detection, and an RRT pursuit/avoidance controller, enabling realistic testing with hardware-matched interfaces and fast iteration.

References

Yolo V6 (By Meituan Visiion AI Department)
https://github.com/meituan/YOLOv6
Px4 by © 2025 Dronecode Project
Flightmare: A flexible quadrotor simulatorin Proc. Robotics