

Overview of Autonomous Vehicle Research

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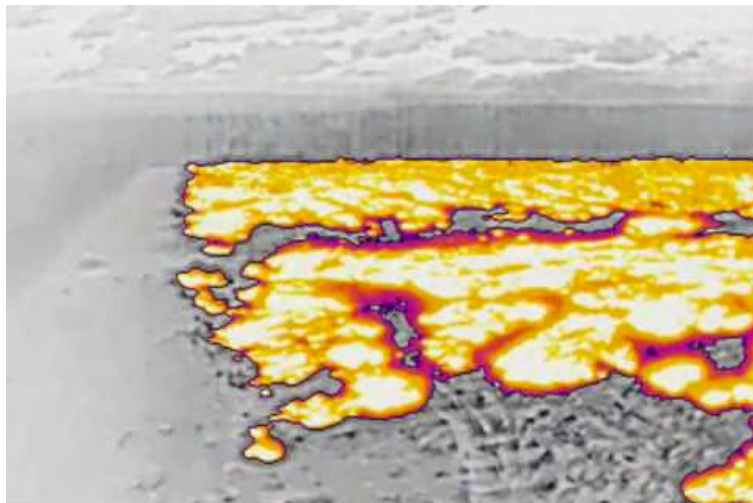
Acknowledgements

- Ph.D. students: Abhishek Nayak, Vamsi Vegamoor, Abhay Singh, Kenny Chour
- Sponsors:



Autonomous Vehicles

- Civil and Military Applications.
- Used in Intelligence, Surveillance and Reconnaissance operations.



Forest Fire Monitoring



Crop Monitoring



Package Delivery



Disaster Management

Aerial Vehicles

Life span is 45 minutes



SIG Rascal

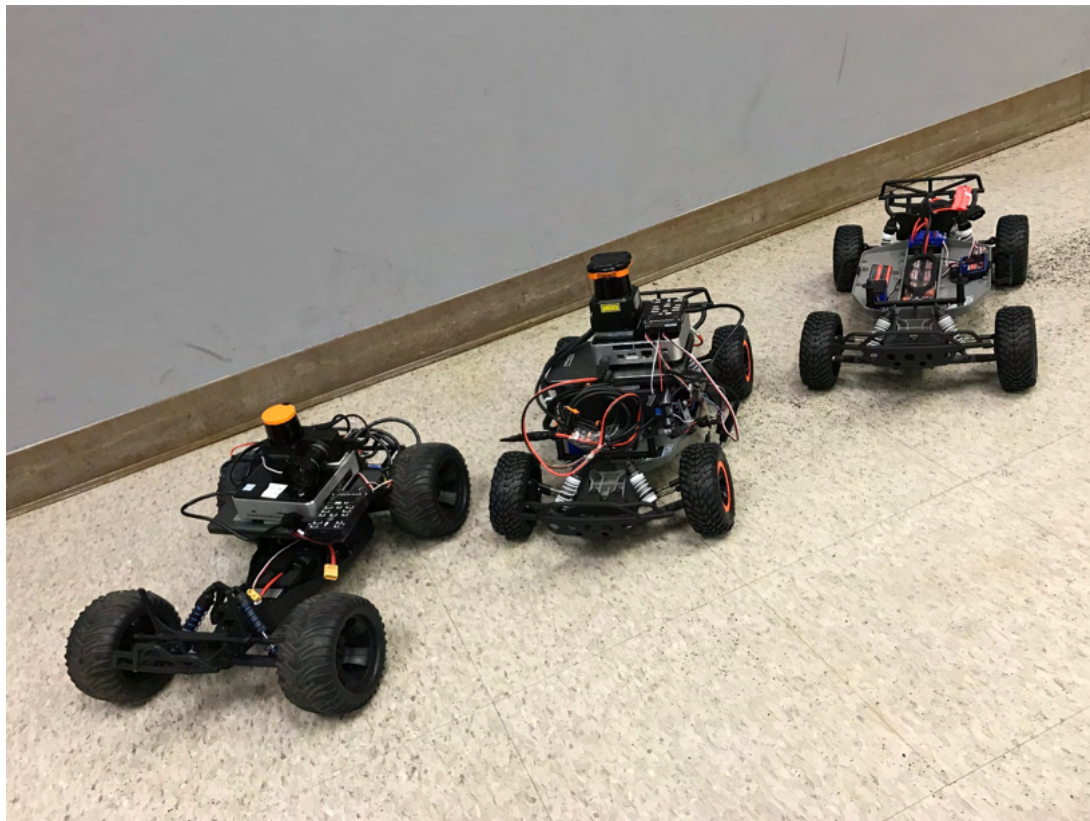
Life span is 2 hours



Bat-4

Unmanned Ground Vehicles

Small Indoor Robots



Autonomous Car



Unmanned Underwater Vehicles

Torpedo type



Remotely Operated



High Speed Autonomous Lane Tracking



Sensor Fusion Algorithms



Thermal Cameras



Radar

Sensor Fusion Algorithms



Sensor Fusion Algorithms



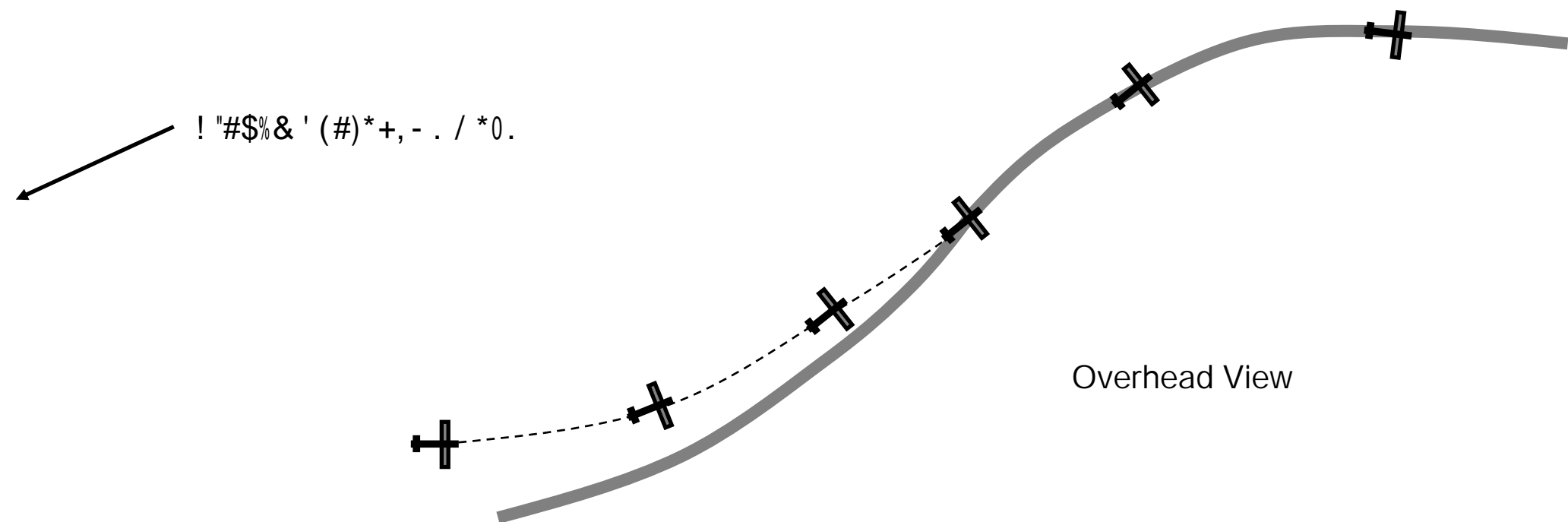
Image View

Sensor Fusion Algorithms



Vision Based Tracking

- Follow a structure based on camera feedback.

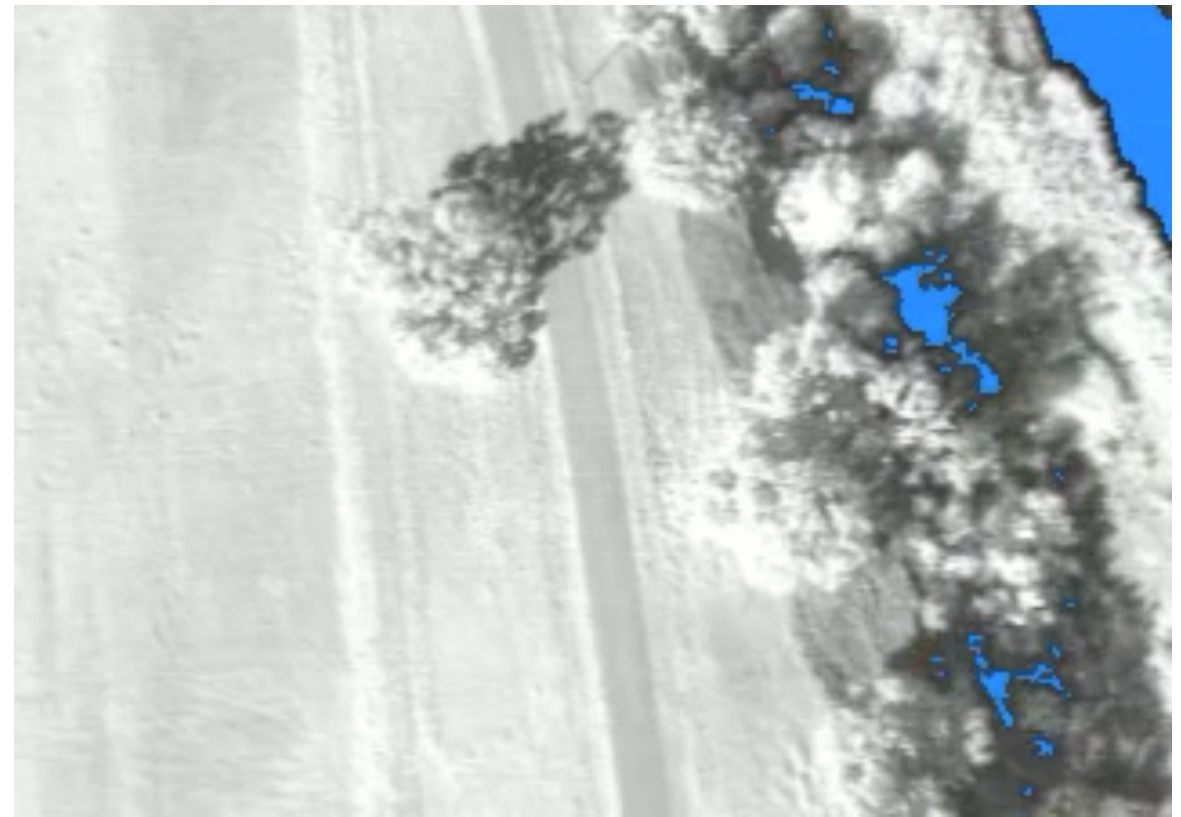


Vision Based Tracking

Overview of the Track



Demonstration Video



-Tracked a 2 mile long river with ~ 15 m crosstrack error.

Aerial-Ground Vehicle Coordination

- Autonomous last mile delivery problem.
- An autonomous FedEx truck travels through the streets and stops at strategic locations to deploy smaller robots to deliver packages.



Aerial-Ground Vehicle Coordination

The video shows a cooperative aerial coverage mission using a fuel-constrained UAV and a ground-based Refueling Vehicle (RV).

Routes for both UAV and RV were generated using an edge-labeling based Mixed Integer Linear Programming (MILP) Formulation.

The refueling operation is simulated using a landing and take-off sequence of UAV with RV remaining stationary at the same location.

Both vehicles were operated in autonomous mode for the experiment.



Unmanned Aerial Vehicle



Refueling Vehicle