Human Aware Robotics Exploration Lab

SARV: A Real-Time Infrared–RGB Fusion VTOL Drone for Search-and-Rescue

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PANDEMIC OF LOVE SMARTAID

Effective and Efficient Search and Rescue

By minimizing tasks a rescue team needs to accomplish in a disaster, we can save more lives in a time-critical situation. A drone that can autonomously identify survivors on the ground can help a rescue-crew focus their efforts.

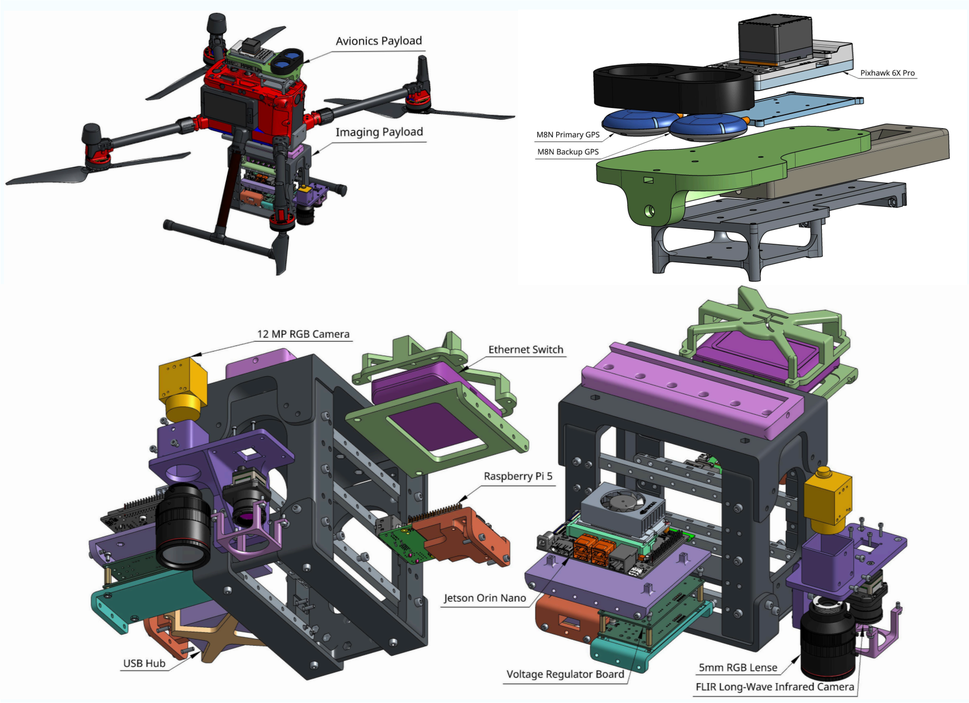
Primary UAV

- Vertical Takeoff and Landing (VTOL) in minimal space
- Efficient long-distance flight
  - >50 mph cruising speed
  - >40 min flight time
- Hover and maneuverability
- Higher payload capacity than traditional quadcopters

Test Payload Platform

- Versatile quadcopter platform[3]
- Specifically used for payload testing
- More compact than the VTOL drone
- Capable of carrying large payloads
- Optimally configured for testing purposes

Our Payload



SmartAIDs Mission

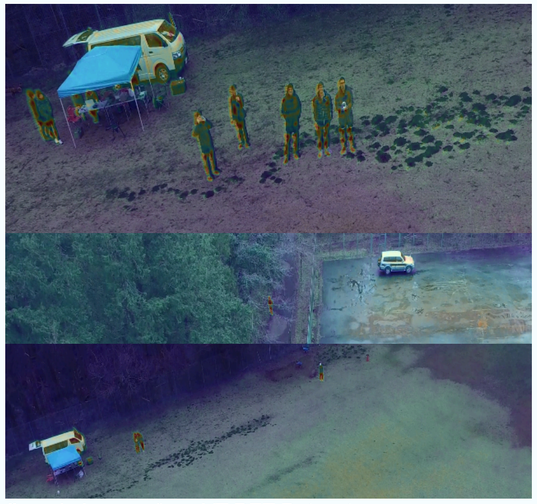
SmartAID is on a mission to advance humanity and empower communities with tech-driven solutions and innovative humanitarian initiatives.[1]

Project Objectives

- Identify people on the ground within our **critical 72 hour window**
- Outperform commercial options while being more **affordable** and **modular**
- Autonomously **survey** disaster zones in **real-time** to support ground crews

Imaging

- 12 MP RGB Camera and 0.33 MP Long-Wave Thermal Camera
- Images fused together together into an RGBT (4 Channel: Red, Green, Blue, Thermal) image

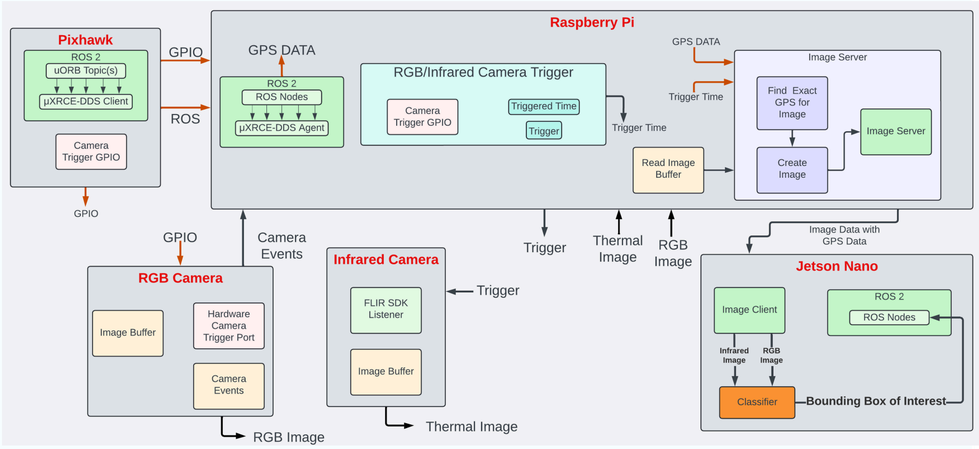


Sample Images from VT-DET Dataset[4]

Contributions

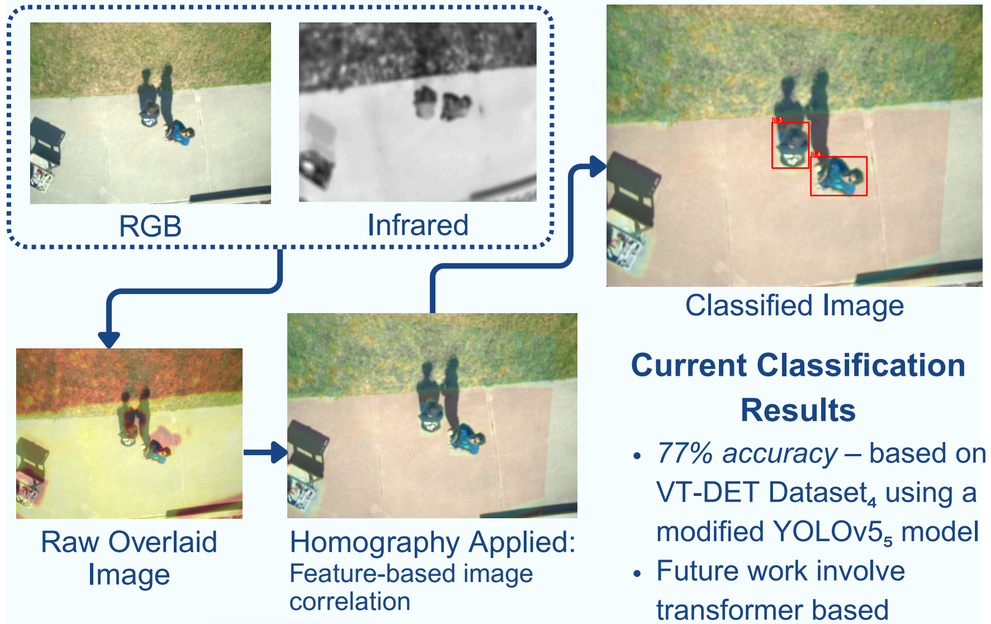
Thank You to our special team-members: **Bhargavi Suresh**, **Jesse Kegley**
Thank You to our advisors: **Morgan Masters**, **Dr. Steve McGuire**, **Dr. Zhicong Yu**, **Dr. Stephen Peterson**
Thank You to our Sponsors: **SmartAID**[1] and **Pandemic of Love**[2]

Software Diagram



- **Raspberry Pi 5:** Captures thermal and RGB imagery based on camera trigger
- **Pixhawk 6x Pro:** Controls vehicle flight, sends time accurate camera trigger to the RGB Camera and Pi, sends potential targets back to ground
- **NVIDIA Jetson Orin Nano**: Applies homography to fuse frames, runs a classification model to pinpoint ground-level targets

Real-Time Autonomous Identification



Current Classification Results

- *77% accuracy* – based on VT-DET Dataset[4] using a modified YOLOv5[5] model
- Future work involve transformer based classification algorithms[6]

Citations, Contact Info:

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