ASTRA

The Autonomous System for Tracking, Reconnaissance, and Assistance

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Demand for Autonomous Rescue Detection

1) The Problem

- Search and Rescue (SAR) in unpredictable environments
- Need quick detection and response

2) Current Limitations

- SAR systems rely on manual input
- Response time puts humans at risk

3) Real-World Impact

- Delays can determine life and death

4) Solution

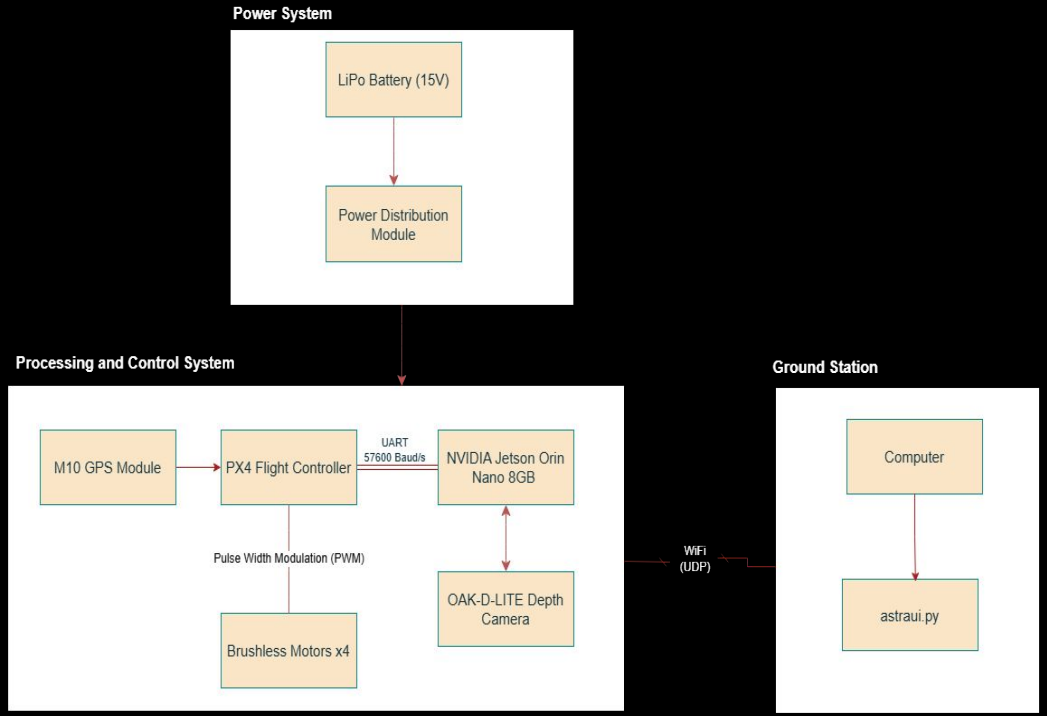
- Robotic support for human rescuers
- Minimizes human effort & maximizes response efficiency

Goals and Objectives

- Real-Time human detection
- Maintain accuracy
- Autonomous navigation
- Transmit alert signal with low latency

Problem Identified	ASTRA Objectives
Slow Human Detection	YOLOv8
Latency	On-board AI processing
Manual Labor	QGroundControl Autonomy

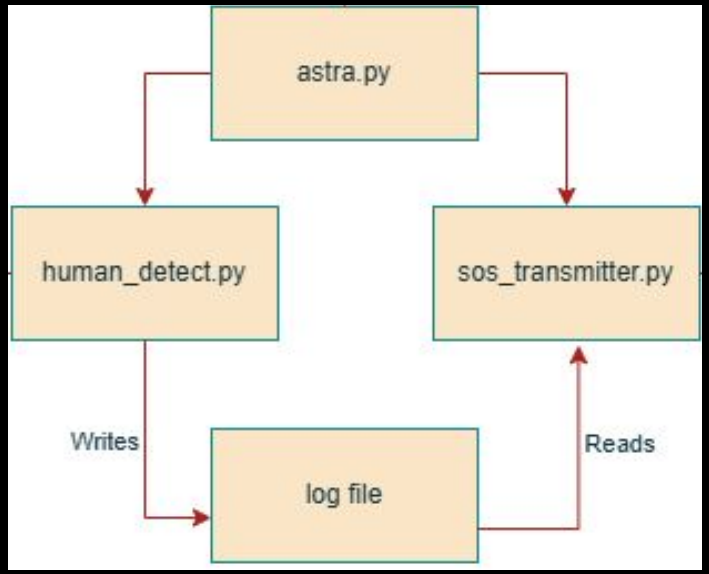
Hardware System Integration



Functionality

1) Power Distribution
2) Flight Control
3) Onboard Processing
4) Wireless Communication
5) Ground Station

Software System Integration



Methodology Process

1) Object Detection Selection

2) Vision Pipeline Integration

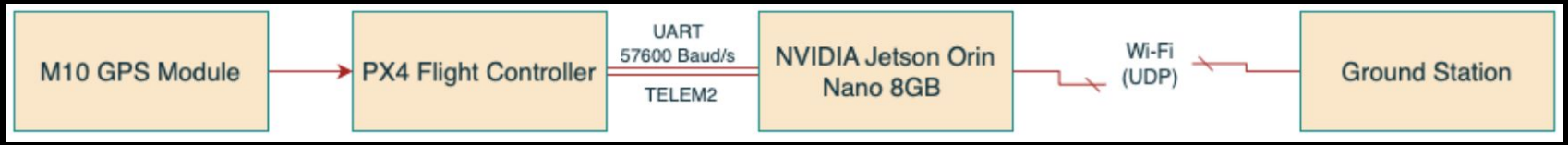
3) Communication Interface

4) Test and Improve

5) Final Integration

Implementation & Results

- UAV followed predefined routes
- Real-time alerts were transmitted (<800 ms)
- Live video streaming maintained ~25 FPS
- Iterative fixes for GPS and components
- Demonstrated semi-autonomous capabilities



Limitations & Future Work

- Improve video latency and resolution
- Wi-Fi Dependency Workaround
- Integrate Person Differentiation
- Implement full autonomy
- Flight Duration

Thank you

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