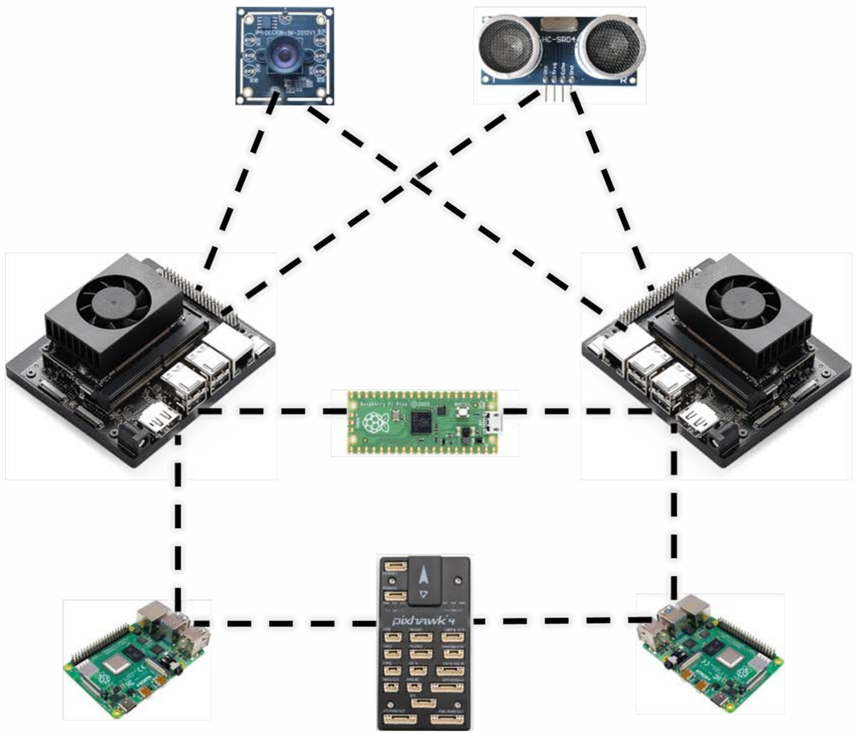
AROS
AUTONOMY RESEARCH CENTER FOR STEAHM

Trustable Autonomy

Mars Science Helicopter Processor



Synopsis

- Developing a Mars-ready airframe for the Mars Science Helicopter
- Designing a robust data transfer system for the primary and spare processors for the state estimator of a Mars Science Helicopter
- Creating an emergency landing system for the Mars Science Helicopter in case of system failure

Research Objective

- Determining essential data packages required for the spare processor to ensure seamless mission continuity
- Designing a bi-directional data exchange pathway between the primary and spare systems to ensure reliable data transfer and minimize latency for mission-critical and time-sensitive functions
- Developing a mechanism to activate the emergency landing system in the event of a malfunction in both the primary and spare systems
- Prototyping the entire navigation system, and validating the design

Research Approach

- Identify the requirements and constraints for each project objective
- Divide each project objective into small tasks and develop a timeline
- Perform literature review on fault-tolerant data transfer methods, and state estimation algorithms
- Evaluate various potential design solutions in terms of reliability, efficiency, and complexity, to select the most suitable approach
- Document the entire research process, including design decisions, testing results, and any modifications

Research Results and Products

- A robust navigation system for the Mars Science Helicopter that is resilient to processor fault recovery
- An emergency landing system for the Mars Science Helicopter, preventing the helicopter from crashing
- A prototyping system that demonstrates resilience to injected processor faults

Commercialization and/or Societal Impact Opportunities

- Applicable to any crucial task requiring a fail-safe mechanism
- Adaptable to commercial drones for search and rescue, surveying, and delivery
- Useful to improve the safety and reliability of self-driving cars by ensuring real-time sensor fusion and redundant data storage

Team Names & Collaborators

ARCS Students:

Sara Ali, BS Computer Engineering; Aditi Kashyap, MS Electrical Engineering; Matthew White, BS Electrical Engineering; Yannis Nyemeck-ndjip, BS Electrical Engineering; Jared Carrillo, BS Mechanical Engineering

CSUN Faculty:

Xiaojun (Ashely) Geng, Electrical and Computer Engineering; Bingbing Li, Manufacturing Systems Engineering

Citations

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