AI for Autonomous Drone Navigation

Agent

CSE
Indian Institute of Information Technology

Week:1

Presentation Overview

1 Project Overview & Problem Statement

AI for Autonomous Drone Navigation

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Project Overview & Problem Statement

Current Research Focus

Expected Project Outcome

Approach to Problem Statement

Proposed Tech Stack

Project Overview & Problem Statement

- **Project:** AI for Autonomous Drone Navigation
- **Problem Statement:** Develop an AI-driven system for autonomous drone navigation in complex environments
- **Key Challenges:**
  - Real-time obstacle detection and avoidance
  - Accurate depth estimation from visual input
  - Efficient path planning in dynamic environments
  - Integration of AI algorithms with drone hardware

Section Overview

2 Current Research Focus

Current Research Focus

- **Paper Currently Reviewing:**
  - "Machine Learning Subsystem for Autonomous Collision Avoidance on a small UAS with Embedded GPU"
- **Key Aspects Being Studied:**
  - ML techniques for collision avoidance
  - GPU acceleration for on-board processing
  - Integration of ML with UAS (Unmanned Aerial Systems)

Section Overview

3 Expected Project Outcome

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- **Primary Goal:** Develop a robust architecture for an AI system for autonomous drone navigation
- **Key Deliverables:**
  - Preliminary vision-based depth estimation module
  - Initial real-time environment mapping system
  - Basic AI-driven path planning and navigation algorithm
- **Expected Capabilities:**
  - Basic autonomous navigation in controlled environments
  - Preliminary obstacle detection and avoidance
  - Initial path planning and execution

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1. **Literature Review and Research**
   - Comprehensive study of current AI techniques in drone navigation
   - Analysis of existing solutions and their limitations

2. **Modular System Design**
   - Develop independent modules for depth estimation, mapping, and navigation
   - Ensure modularity for easy testing and integration

3. **Iterative Development, Testing, and Simulation**
   - Implement and test individual modules
   - Gradually integrate modules and refine the overall system
   - Use simulation environments to validate the architecture
   - Conduct preliminary tests to ensure the feasibility of the design

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- **Programming Languages:**
  - Python (primary language for AI and CV algorithms)
  - C++ (for performance-critical components)
- **AI and Machine Learning:**
  - TensorFlow or PyTorch for deep learning models
  - OpenCV for computer vision tasks
- **Robotics and Control:**
  - ROS (Robot Operating System) for integration and control
- **Simulation:**
  - Gazebo or AirSim for virtual testing environments