FACULDADE DE CIÊNCIAS E TECNOLOGIA
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Artificial Intelligence

Project Proposal

Specialized Drone Object Identification with Master Control and Confidence Assessment

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1. Introduction:

The integration of drones (Agents) in the field of object identification and specialization is a compelling area of research with diverse practical applications. In this proposal, we outline our approach to investigating this problem, addressing its importance, and highlighting the interesting facets of our research.

Our primary focus in this research is to examine not only the specialization of drones but also the pivotal role of the master in controlling these drones. Specifically, we aim to understand how training drones with a primary focus on a particular object category affects their ability to accurately identify objects. Moreover, we are intrigued by the master's role in leveraging confidence to determine which drones are best suited for specific identification tasks. We seek to comprehend the intricate interplay between specialization, master control, and the application of confidence in real-world scenarios.

2. Problem Statement:

2.1 Problem Description:

The problem under investigation pertains to the specialization of drones in object identification. Specifically, we aim to understand how training drones with a primary focus on a particular object category affects their ability to accurately identify objects. We are concerned with the efficiency and effectiveness of specialized drones in various real-world scenarios.

2.2 Why is it Interesting?

This problem is intriguing for multiple reasons:

Machine Learning Specialization: The research focuses on the fascinating realm of specialization in machine learning models and how it influences the identification of objects. This represents a novel and practical application of machine learning.

Real-World Significance: The project addresses a practical issue regarding object identification in various scenarios, including agriculture, security, and environmental monitoring. The outcomes could significantly impact industries that rely on object recognition technology.

3. Methodology and Algorithm:

3.1 Proposed Method with Key Steps

Our proposed methodology involves training drones with specialized data and integrating a master/slave system. Key steps in our methodology include:

Data Collection: Acquiring and preprocessing diverse datasets for specialized drone training.

Specialization Training: Training drones primarily on specific object categories (e.g., trees, cars, houses, humans).

Master/Slave Integration: Developing a communication system for real-time data transfer and enabling the master's role in decision-making.

Object Identification: Implementing specialized algorithms for accurate identification by each drone.

Confidence Estimation: Developing algorithms to estimate the confidence of each drone in its identifications.

3.2 Existing Implementations:

We will also investigate existing implementations and solutions related to object identification using drones and master/slave systems. This analysis will inform our research by highlighting best practices and potential areas for innovation.

4. Evaluation Criteria:

4.1 Qualitative Evaluation:

Qualitative evaluation will encompass:

Visualizations: Creating plots and figures to display the results of object identification by specialized drones, including visual representations of identified objects and master confidence.

User Feedback: Collecting qualitative insights from operators at the master station to understand their observations and experiences in real-world scenarios.

4.2 Quantitative Evaluation:

The quantitative evaluation will consist of:

Performance Metrics: Employing precision, recall, F1-score, accuracy, and statistical tests to measure the accuracy of object identification by specialized drones and the influence of the master's decisions.

Confidence Scores: Quantitatively assessing the ability of drones to estimate confidence in their identifications and evaluating how well the master's confidence aligns with actual outcomes.

5. Conclusion:

Finally, this research project addresses the complex area of object identification and specialization using drones integrating master/slave methods. The problem of specialization and its practical significance are the focus of our research.

Our proposed methodology describes the key steps of our approach, including data collection, training, integration, object identification and trust estimation. Additionally, we will analyze existing implementations to learn from previous work.

Evaluation criteria include qualitative and quantitative measurements, including views, user feedback, performance measurements, and trust measurements. We anticipate that the research will not only advance the field of object identification but also improve decision-making and efficiency across various industries.

Considering the qualitative and quantitative aspects of our study, we aim to provide valuable insights into the specialization and importance of the role of the sample in real-world scenarios.

Ultimately, this project sets the stage for an exciting exploration of data-driven technologies and innovations that have the potential to increase the accuracy and reliability of object identification systems.