EGN 4950C Group 32 Project Main Summary

1. **Project Title**: Multiple Drones Coordination

2. **Project Sponsor**: Dr. Xiangnan Zhong

   Phone: (561)297-3412

   Email: xzhong@fau.edu

3. **Team Members**:

   - Tutku Gizem Guder (Computer Science) – Team Leader
   - Tarek Kayali (Computer Science)
   - Brenden Martins (Computer Science)
   - Matthew Paternoster (Computer Science)
   - Matthew Wyatt (Computer Science)

4. **Project Overview**:

   The Multiple Drones Coordination project is dedicated to designing a sophisticated platform that enables the seamless coexistence and coordination of multiple drones within a realistic 3D simulation environment. The primary objectives of this platform include:

   - Simulated Environment: Developing a highly realistic 3D simulation environment where multiple drones can operate simultaneously, mimicking real-world conditions.
   - Target Detection: Implementing advanced algorithms for drones to detect and identify target objectives on the ground with high accuracy.
   - Real-Time Interface: Creating an intuitive, real-time interface compatible with mobile devices, allowing users to monitor and control drone operations remotely.
   - Rescue Operations: Facilitating coordinated rescue missions involving multiple drones, applicable to scenarios such as hurricanes, natural disasters, power outages, and other emergency situations.
   - This project aims to provide a versatile tool for disaster response and management, enhancing the ability to perform coordinated drone operations in challenging environments.

5. **Key Challenges**:
    - Real-Time Coordination: Ensuring reliable and efficient communication among multiple drones to coordinate actions without delays.
    - Collision Avoidance: Developing sophisticated control algorithms to prevent drone collisions in a dynamic 3D environment.
    - Accurate Target Detection: Creating robust target detection systems capable of identifying objectives under varying environmental conditions.
    - Scalability: Designing the platform to handle an increasing number of drones without compromising performance.
    - User Interface Design: Building a user-friendly real-time interface that is accessible and functional on various mobile devices.
    - Environmental Simulation: Accurately simulating diverse and realistic disaster scenarios within the 3D environment to test drone performance.
    - Data Management: Handling large volumes of real-time data from multiple drones efficiently, ensuring quick processing and storage.
    - Data Management: Handling large volumes of real-time data from multiple drones efficiently, ensuring quick processing and storage.
    - Integration of Systems: Seamlessly integrating software and hardware components from computer science and electrical engineering disciplines.

6. **Key Technologies**:
    - Programming Languages: Python for developing control algorithms, data processing scripts, and backend services.
    - Simulation Platforms: Tools like Gazebo or **AirSim** to create realistic 3D environments for drone simulation and testing.
    - Control Systems: Advanced control algorithms and hardware interfaces to manage drone navigation, stability, and coordination.
    - Database Management: Utilizing databases (e.g., PostgreSQL, MongoDB) to store and manage real-time data from drone operations.
    - Mobile Development Frameworks: Technologies such as React Native or Flutter for developing the real-time interface compatible with mobile devices.
    - Sensor Integration: Incorporating sensors (e.g., cameras, LIDAR, GPS) for accurate target detection and environmental awareness.
    - Communication Protocols: Implementing reliable wireless communication standards (e.g., MQTT, ROS) to facilitate drone coordination and data exchange
    - Digital Systems Design: Designing digital circuits and interfaces necessary for drone control and data acquisition.
    - Cloud Computing: Leveraging cloud services for scalable data storage, processing power, and remote access capabilities.
    - Machine Learning: Applying machine learning techniques for enhancing target detection accuracy and predictive maintenance of drones.