Modular Robot Swarm

BEng (Hons) Software and Electronic Engineering

Iwo Kania

Ollscoil Teicneolaíochta an Atlantaigh

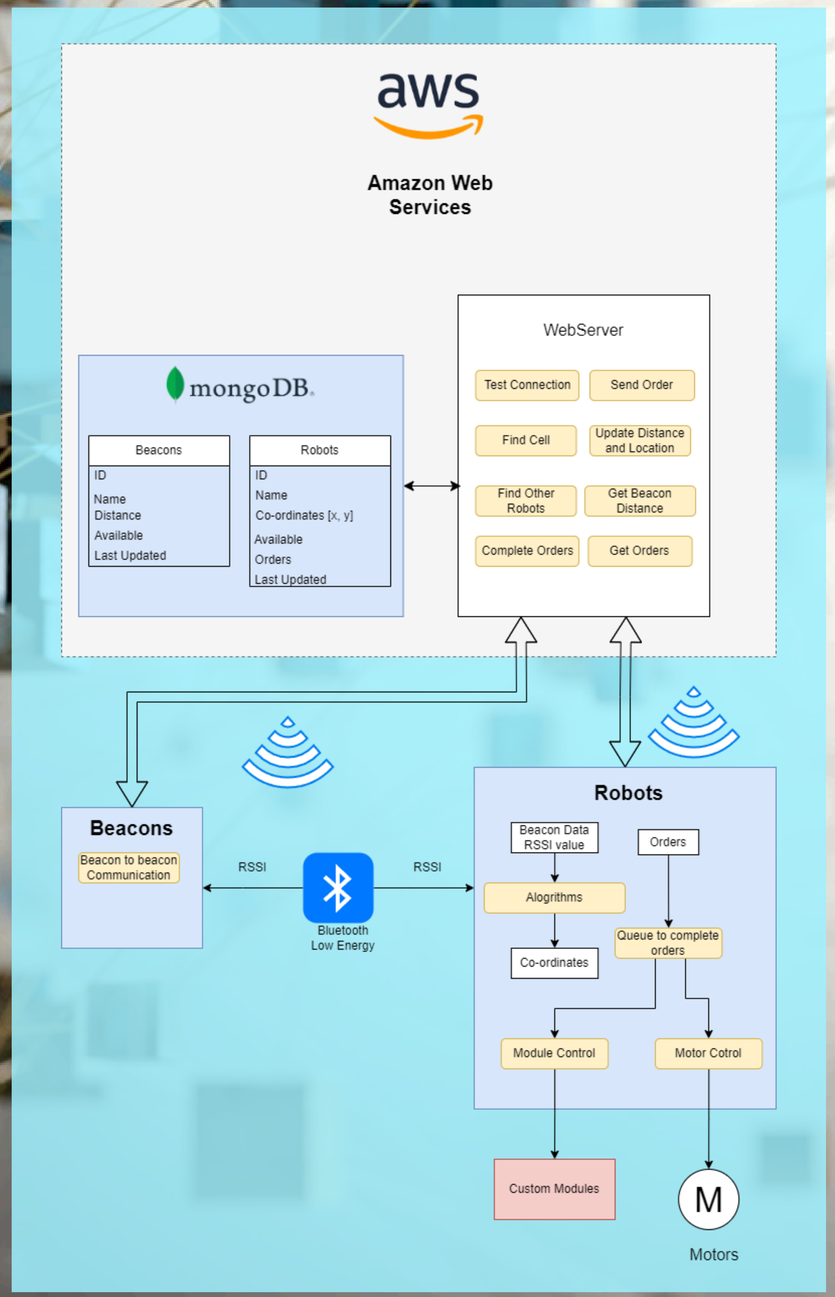
Atlantic Technological University

Summary

The Modular Robot Swarm is a network of drones developed to function seamlessly under a unified control system accessible via the internet. It is designed to be easily expandable and adaptable, making it suitable for various applications. The project aimed to minimize costs and component usage while maximizing functionality and accessibility. This project aligns with my interests in swarm technology and low-level programming, particularly within embedded systems and Real Time Operating Systems.

Technology

- Languages used: C++ for programming the robots and JavaScript for the webserver.
- IDE: PlatformIO was chosen as the IDE due to its integration with Visual Studio Code and compatibility with other extensions.
- Framework: The robots were programmed using FreeRTOS within the Arduino framework.
- AWS: AWS services were utilized for hosting both the webserver and the database.
- MongoDB: Chosen as the database for the Robot Swarm due to its NoSQL nature, providing low latency and easy modification capabilities.



Hardware

- ESP32s
- Wi-Fi module
- Bluetooth Low Energy Module
- LN298N Motor Controller
- DC motors

Features

- Beacon to beacon communication via Bluetooth Low Energy.
- Robot to beacon communication via Bluetooth Low Energy.
- Beacon and robot communication to webserver.
- Calculate co-ordinates of robots.
- Calculate distance between robots and detect proximity.
- Motor and LED control.
- Sending orders from Webserver to robots and completing the orders.
- Robot and beacon data saved to a MongoDB database saved on an AWS server.

Results

- Working Webserver to ESP32 communication.
- MongoDB data sent to robots and beacons as JSON.
- Bluetooth Relative Signal Strength Indicator to distance and Co-ordinates.
- Working robot order execution.