Software Project Management

Lab Report 2

Group 5: Section 003

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Introduction:

The topic we have chosen for our project is ‘Design and Analysis of low cost IoT Radar’. IoT Radar technology has immense applications in many domains such as transportation, security, agriculture etc. The market demand for “smart” IoT devices is projected to grow, and reach almost 1.6 Trillion USD by 2025 [1]. The key element to these IoT devices is the sensors that allow them to perceive their environment. Many different sensors are available on the market, with radar sensors having the most capability. Our IoT Radar sensor will have many applications including, but not limited to:

- Detection: Detecting the presence/ absence of humans, and being able to differentiate between humans and other beings. This is useful for security applications.
- Localisation: Can be used in sound system applications, to track and locate the position of listeners to optimize the sound experience.
- Fall detection: This is useful for elder care, and can be used in passive emergency signaling systems.
- Monitoring vitals sign: This technology can be used to track breathing patterns and heart rates with great accuracy.

The current IoT radar sensors on the market are expensive. This is why our objective is to design a low cost version of an IoT radar sensor so that we can bring them to applications where cost is a limiting factor.

Project Objectives:

The following project objectives were identified:

- Designing an accurate radar sensor, with real time object detection and tracking abilities. Ensuring a low product cost is also a priority for this objective.
- Allowing remote access to the sensor, as well as remote control capabilities by integrating IoT technology. This involves designing a user friendly mobile application for our sensor, in keeping with IoT standards.

- Ensuring the radar sensors have power efficiency, to reduce operating costs, and also ensure longevity when used in inaccessible locations.
- User friendliness is a big priority. The sensor should be able to be used easily by people without technical experience.
- By making the sensors low cost, we hope to make this technology within reach to a large number of users. By doing so, we also hope to explore new unexplored domains where this technology can be used, by allowing integration capabilities with other third party services.

Project Success Measures:

We were able to define the following measures for our project's success:

- The sensor can differentiate between humans and other organisms, as well as inanimate objects.
- The accuracy of detection is within a specified range.
- The sensor's power consumption fulfills the expected target requirements, for a prolonged battery life.
- Testing user friendliness of the sensor as well as the mobile application via user testing and feedback.
- Calculating the Total Cost of Ownership of the product, to examine the lifecycle costs of the sensors, to guarantee cost effectiveness.

Infrastructure Requirements:

We identified the following infrastructure requirements:

- We will need to identify and choose a suitable cloud computing platform such as Microsoft Azure or Amazon Web Services. Such a platform will be required to support the sensors by providing virtual servers and databases.
- An IoT Gateway device. This hardware component will act as the communication "middleman" between the sensor and cloud platform.

- Tools to determine and analyze performance metrics for the sensors as well as all the involved infrastructure. Such tools exist on the market, such as Splunk, Grafana, Datadog etc.
- Hardware components for the radar sensor, such as receivers, transmitters etc. Low cost is a priority.

References:

[1] K. Y. Lee, “11 myths about radar and intelligent IOT,” Microwaves & RF, https://www.mwrf.com/technologies/analog/article/21277421/infineon-technologies-11-myths-about-radar-and-intelligent-iot (accessed Feb. 12, 2024).