NSBM Green University

Faculty of Computing

PUSL2022 Introduction to IOT

Internet of Things (IoT) Group Project

Group – AZ

Project Initiation Document

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General Template for IOT Project Proposal

Laser Security System

In the realm of IoT, the main goal of a laser security system project would be to leverage the capabilities of the Internet of Things to enhance and optimize security measures. This could involve integrating the laser security system with other smart devices and systems, enabling remote monitoring and control through the internet, and leveraging data analytics for more intelligent threat detection. The idea is to make the security system not just a standalone device but a connected and intelligent part of a larger network, making it more responsive and adaptable to various situations.

The main purpose of a laser security system as an IoT project is to create a smart and interconnected security solution. By integrating the laser security system with IoT technologies, you can achieve:

Real-time Alerts: Receive instant notifications or alerts on your devices when the laser barrier is breached, allowing for immediate response.

Data Analytics: Analyze data collected by the system over time to identify patterns, improve security strategies, and predict potential vulnerabilities.

Automation: Integrate the laser security system with other IoT devices or systems to enable automated responses, such as triggering lights, cameras, or other security measures.

Scalability: Easily scale and expand the system by adding more sensors or connecting with other IoT devices to cover larger areas or enhance overall security.

In essence, the purpose is to create a more intelligent, responsive, and easily manageable security system by leveraging the capabilities of the Internet of Things.

Literature Review:

> According to previous researches highlight,
> By reviewing the previous articles we can identify that most of the laser security system are based on security camera system and laser module. The main issue of this is person who is going to enter the monitored entrance can disturb the view of camera and enter to the premises. In our project we are going to use a carbon dioxide sensor to detect carbon dioxide level of entered intruder because it is getting increase carbon dioxide level when enter an unknown person to the premises. As well as humanity sensor is using for detecting when an intruder enters the premises. The specialty of these sensors can detect intruders.

Aim

This project is aimed at developing a aimed at developing a smart laser security system leveraging IoT technologies to enhance real-time threat detection, enable remote monitoring, and provide automated responses for improved security measures.

Objectives

- **Door Sonar system**

We use a door sonar system to detect if an unauthorized person approaches the door. If an unauthorized person approaches the door this sonar system will activate inform to the control room.

- **Laser & LDR**

A laser LDR system is a type of electronic system that uses a laser diode and light-dependent resistor to detect unauthorized entry to a secure area. If someone trying to enter to the secure area without using the door (using ventilators, windows) and cross this Laser LDR system, It will automatically inform to the control room and automatically lock all the windows, ventilators and main door until it will reset by the control room.

- **CO2 detector**

A carbon dioxide detector is a device that measures the level of carbon dioxide in the air.If some unauthorized person enters the secure area without getting detected to above devices, we can detect that action by using this CO2 detector. If someone enters the secure area, CO2 percentage will change because of breathing and the detector will identify that and inform the control room and automatically lock all the windows, ventilators, and the main door.

- **Humidity detector**

A humidity detector is a device that measures the amount of water vapor in the air.If some unauthorized person enters the secure area without getting detected to above devices, we can detect that action by using this Humidity detector. If someone enters the secure area, its body temperature will affect the humidity level of the area and it will detect by the system and inform the control room and automatically lock all the windows, ventilators, and the main door.

System Overview & Expected Outcome:

In designing a laser security system, the selection of sensors plays a pivotal role, with specific considerations for humidity and LDR sensors. The overarching sensor requirements encompass accuracy, range, sensitivity, precision, response time, signal-to-noise ratio, calibration, cost, and application-specific specifications. These include factors such as temperature, power consumption, dimensions, output type, and communication interface.

Humidity Sensor:

Function: Measure moisture content.
Requirements: Precision, adequate range, quick response, environmental resilience.
LDR (Light Dependent Resistor) Sensor:
Function: Detect changes in ambient light.
Requirements: Sensitivity, wide dynamic range, swift response, environmental adaptability.
The integration of these sensors enhances the system's adaptability to environmental changes, minimizing false alarms caused by non-intrusive factors.

Embedded vs. Edge Computer System:
Embedded System:
Ideal for simple, dedicated tasks., Lower power consumption, compact form., Cost-effective for basic sensor interfacing and alarm generation.
Edge Computer System:
Suitable for complex data processing, real-time analytics., Higher processing power, flexibility., Ideal for advanced features, multi-sensor data fusion, machine learning.
Provides scalability and room for future upgrades.
Considerations for the laser security system involve sensor quantity, data processing complexity, real-time requirements, and connectivity needs. For a straightforward system with basic functions, an embedded system suffices. If more sophisticated features, integration, or real-time analytics are required, an edge computer system is more suitable. The choice depends on the specific constraints and requirements of the laser security system, ensuring a balance between functionality and cost-effectiveness.

Data Processing Tasks:

The efficient operation of a laser security system relies on comprehensive data processing tasks, including sensor data acquisition, signal processing, data fusion, threshold detection, alarm generation, logging and storage, communication, system diagnostics, user interface, continuous monitoring, and regular updates and maintenance. These tasks collectively enable the system to detect and respond to security threats in a timely and accurate manner.

Communication Infrastructure:

The communication infrastructure is crucial for the laser security system, involving sensors and IoT devices connected to a central cloud or server through the internet. Sensors, equipped with communication modules, utilize wireless (Wi-Fi, Zigbee, Bluetooth) or wired (Ethernet) protocols. Edge computing may be employed for local data processing, and gateway devices facilitate data aggregation. The system connects to the internet via wireless technologies (4G, LTE) or wired connections, transmitting data to the cloud or server for real-time monitoring and analysis.

Data Storage and Analysis:

The expected data storage method for the laser security system involves using relational databases or optional time series databases, organized to store information from various sensors, timestamps, alarm events, and metadata. Cloud storage services offer scalability and accessibility. Data analysis includes deriving insights, identifying patterns, and facilitating decision-making. The system employs encryption and secure authentication for communication security, utilizing protocols like MQTT or HTTP/HTTPS. User interfaces enable remote monitoring and control, while mobile applications may provide real-time alerts and control capabilities. In summary, the laser security system integrates robust data processing, a well-defined communication infrastructure, and effective data storage and analysis methods to

ensure the accurate detection of security threats and timely response, providing a comprehensive and secure solution for various applications.

Creating a user interface for laser security system management involves a comprehensive and user-centric approach to address the needs of administrators, operators, and maintenance personnel. The design incorporates various elements to ensure efficient interaction and seamless system management:

1. User-Centric Design:

Understand user needs through user personas and stories., Tailor the interface to different user roles for optimal usability.

2. Dashboard Design:

Provide a comprehensive dashboard with key metrics for system status., Include real-time updates to ensure users have the latest information.

3. Visualization:

Integrate map interfaces for visualizing the secured area layout., Display sensor status, alarm indicators, and real-time alerts for quick assessment.

4. Configuration and Administration:

Implement secure user authentication with role-based access control., Allow configuration of system settings, user management, and customization of notification preferences.

5. Alerting and Notifications:

Display real-time alerts and allow users to customize notification preferences., Ensure prompt communication of security breaches and system anomalies.

6. Historical Data Analysis:

Include an event log detailing historical security incidents and system events., Integrate analytics tools for in-depth data analysis and report generation.

7. Mobile Accessibility:

Ensure a responsive design for access across various devices., Develop a dedicated mobile application for on-the-go monitoring and management.

8. Intuitive Navigation:

Organize the interface with an intuitive menu structure for easy navigation., Include search functionality for quick location of specific information.

9. Help and Documentation:

Provide user guides and documentation to assist users in understanding the interface., Include tooltips and contextual help for a user-friendly experience.

10. Regular Updates and User Feedback:

Implement an iterative development process based on user feedback., Offer training sessions and resources to enhance user proficiency with the interface.

By adhering to this approach, the developed interface ensures not only efficient management of the laser security system but also accommodates user preferences and varying roles. The interface facilitates real-time monitoring, historical data analysis, and proactive configuration, contributing to a robust and user-friendly security management experience.

Expected Outcome

It is anticipated that the laser security system will offer real-time response capabilities, a powerful and intuitive security monitoring solution, and analytical tools for optimizing system performance.

1. Secure and Reliable Laser Security System:

- A fully functional laser security system with reliable sensors and IoT devices.
- Robust communication infrastructure ensuring secure data transmission.

2. User-Friendly Interface:

- An intuitive and responsive user interface accessible through web applications and, optionally, a dedicated mobile app.
- Dashboard providing a clear overview of the laser security system's status, including key metrics and real-time updates.

3. Infrastructure Visualization:

- Map integration for visualizing the layout of the secured area with laser beam paths.
- Visualization of sensor status, alarm indicators, and other relevant information.

4. Configuration and Administration:

- User authentication with role-based access control for secure system access.
- Configuration settings section allowing administrators to define system parameters, sensor
- thresholds, and communication settings.
- User management capabilities for administrators to create, modify, and delete user accounts.

5. Real-Time Alerts and Notifications:

- Real-time alerts displayed prominently on the interface for security breaches and system
- anomalies.
- Customizable notification preferences allowing users to choose their preferred alert channels.

6. Historical Data Analysis:

- Event log providing a detailed history of security incidents, system events, and user interactions.
- Integration with analytics tools for in-depth data analysis, allowing users to explore historical
- data and generate reports.

7. Mobile Accessibility:

- A responsive design enabling users to access the interface from various devices, including
- desktops, tablets, and smartphones.
- A dedicated mobile application for convenient on-the-go monitoring and management.

8. Intuitive Navigation:

- Well-organized menu structure for easy navigation within the interface.
- Search functionality facilitating quick location of specific sensors, events, or configurations.

9. Help and Documentation:

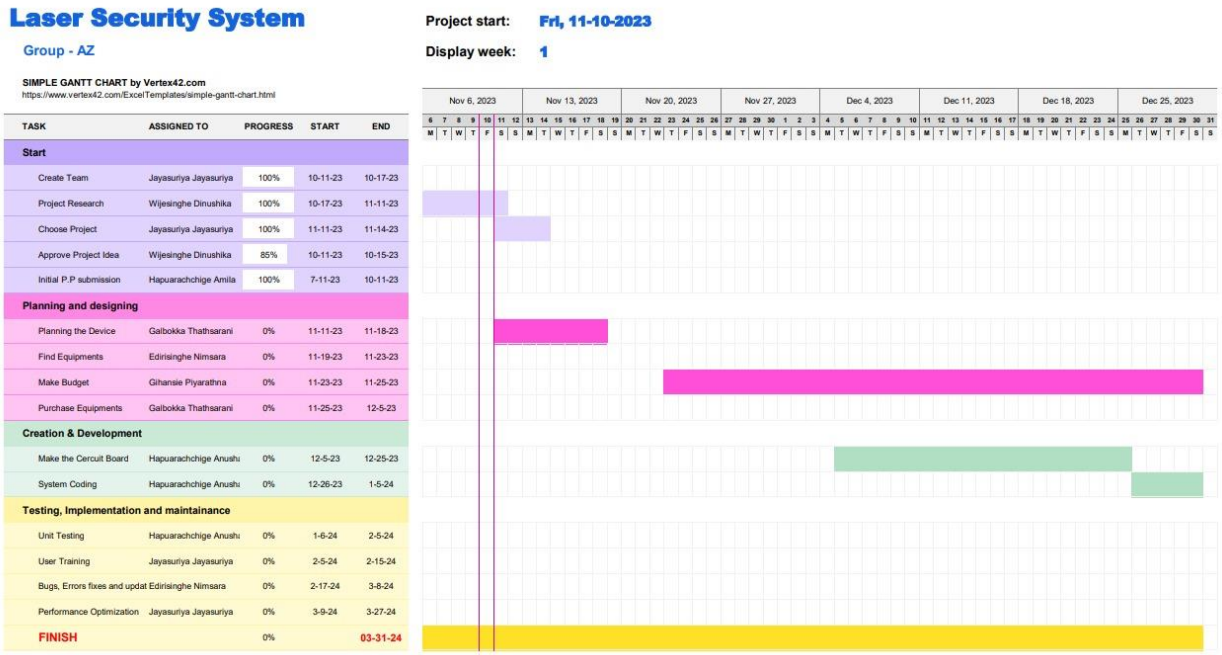
- User guides and documentation to assist users in understanding and utilizing the interface.
- Contextual help features, including tooltips, to guide users within the interface.

10. Continuous Improvement:

- An iterative development process incorporating user feedback for continuous improvement.
- Regular updates and maintenance to address security vulnerabilities and enhance system
- Features

The end result is a complete laser security system that can identify and react to security risks, provides an easy-to-use interface for system administration, and can be customized to fit the requirements of different users, such as operators and system administrators. Robust hardware and an advanced software interface work together to provide a comprehensive and effective security solution.

Gantt Chart:



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Group Contribution

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2	10898500	Jayasuriya A Jayasuriya	Background research, Process documenting, Performance optimizing, User training,
3	10898578	Edirisinghe Nimsara	Background research, Equipment research
4	10898614	Gihansie Piyarathna	Background research, Budget handling
5	10899715	Galbokka Thathsarani	Background research, Quality analyzing
6	10903094	Wijesinghe Dinushika	Background research, Project leading, Bugs and errors fixing