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(इस्लिङ्टन कलेज)

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Smart Garage Door System

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I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

Acknowledgement

We would like to take the opportunity to express our sincere gratitude and appreciation to our module leader Mr. Sugat Man Shakya and all our respected teachers Mr. Shishir Subedi, Mr. Ayush Bhakta Pradhanang and Mr. Suryansh Mathema, for their continuous guidance and the assistance for letting us to do real world implementation of IoT to make lives more automated. We are more than pleased to learn about cloud integrated IoT projects which can be implemented in real world scenario.

Furthermore, we are thankful to our college for assigning us with this task to work in a group and get a hands-on experience with IoT tools which we undoubtedly can say that the knowledge that we learn from here will be very helpful for us in the days to come. Thank you so much to everyone.

Abstract

We aim to build a system that is “Smart Garage Door” for this IoT project. “Smart Garage Door System” enhancing security and convenience through smart technology. This project is made using different IOT hardware components such as Node MCU, IR sensor, Jumper wire, Bread board and servo motor. The basic concept of this project is getting access to open or close the garage door by using a web application. This technology helps to control your garage door remotely through your smartphone. With the rise in theft incidents in recent years, this system helps to strengthen the protection of your home and garage. These kinds of technology provide an extra layer of security to our house.

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1. Introduction

The Internet of Things (IoT) is a network of connected objects that communicates with other IoT devices to exchange data and information. IoT uses various technologies to connect digital and physical worlds where physical objects include sensors, actuators, etc. IoT has so many applicability but some of the popular and widely applicable areas are home automation, agriculture, and health (McKinsey, 2002).

As we were assigned to make a prototype of IoT Project, we planned to make a particularly useful IoT project “Smart Garage Door System”. In this project, we propose a Smart Garage Door System based on NodeMCU or ESP8266 which further includes components like IR sensor and Servo Motor for smartly opening and closing the door with just a click from the web application.

1.1. Current Scenario

Traditional garage door functionality often involves a long process which requires individuals to manually open and close the door, which leads to potential security risks and inconveniences. Individuals must get out of the car get to the garage door and open the door and again come back to the car and drive the car into the garage which is quite a hassle. But with growing innovations these challenges can be easily overcome.

1.2. Problem Statement and Project as a Solution

The existing challenge involves manual operation of garage doors where someone, or the driver themselves, must open and close the garage door each time a car needs to be parked or removed from it. This is a very inefficient and perhaps time-consuming procedure. To address this inefficiency, we propose the “Smart Garage Door System” where individual can monitor the garage door with a smartphone through web application.

2. Aim and Objectives

2.1. Aim

The main aim of this IoT project is to gain the ability to control the status of your garage door from anywhere through mobile application. This improves your home's safety and security in addition to providing you with peace of mind.

2.2. Objectives

The objectives of this smart garage door system are listed below:

- The system is expected to open and close garage door using mobile via web application.
- The system is expected to enhance safety and security measures.
- The system is expected to provide real-time status updates if the garage door is opened or closed.
- The system is expected to utilize cost-effective components like nodeMCU, IR sensors and servo motors.
- The system is expected to enhance user experience through easy monitoring.

3. Background

Smart Garage Door System have emerged as essential parts of today's house as it offers enhanced convenience, security, and automation. This system plays a crucial role in updating traditional garage door's functionality which provides advanced control and monitoring capabilities. Smart Garage Door, as opposed to traditional garage doors, are equipped with technology which allows remote access via web interfaces, enabling user to open or close the garage door from any location which is both secure and easy to operate.

3.1. Expected Outcomes and Deliverables

The goal of the Smart Garage Door System is to completely transform the way it operates traditional garage doors. A mobile application or web interface specifically designed for this purpose will be developed to enable smooth remote control, allowing users to conveniently manage their access from any location.

Likewise, users may link their garage door into a comprehensive smart home environment by making it compatible with well-known home automation systems, creating a seamless and connected experience.

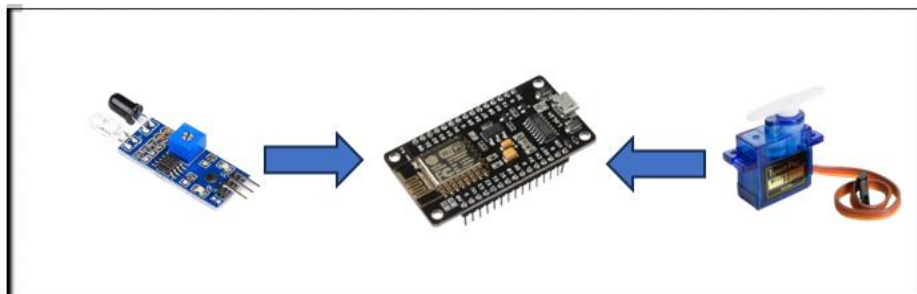


Figure 1: System Architecture of Smart Garage Door System

3.2. Requirement Analysis

3.2.1 Hardware Components

- **ESP8266(Node MCU)**

The NodeMCU (Node Microcontroller Unit) is an open-source platform for software and hardware development, centred around the affordable ESP8266 System-on-a-Chip (SoC) created by Espressif Systems. This chip includes essential components such as CPU, RAM, Wi-Fi connectivity, and a modern Operating system with a Software Development Kit (Make-It.ca, 2023).

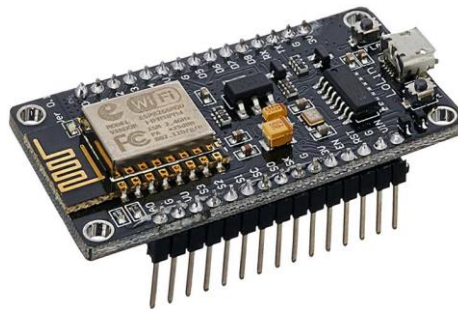


Figure 2: ESP8266 Node MCU

- **Digital IR Sensor**

An infrared or IR sensor is an electronic device designed to detect and capture infrared radiation present in its environment. Infrared radiation belongs to the electromagnetic spectrum, ranging from the red end to microwaves, and is not visible to the human eye. (Exertherm, 2023).



Figure 3: IR Sensor

- **Jumper Wires**

Jumper wires are wires with connector pins at both ends, enabling the connection of two points without the need for soldering. These wires are commonly used with breadboards and other prototyping tools to facilitate convenient circuit modifications. (Hemmings, 2018).



Figure 4: Jumper Wires

- **Servo Motor**

A servo motor is an electric motor that, in response to a controller's input signal, can rotate or move with precision to a specific position, speed, or torque. Modern servo motors excel in delivering high performance and accuracy, making them suitable as primary drives in a wide range of applications. (Electrical4U, 2023)



Figure 5: Servo Motor

- **Breadboard**

The breadboard is a rectangular board with embedded holes designed to insert electronic components. Widely utilized in electronics projects, the breadboard serves as a prototype and functions as a foundational platform for constructing electronic circuits. (Javatpoint, 2023)

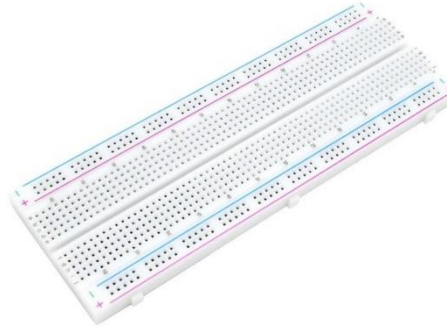


Figure 6: Breadboard

3.2.2 Software Components

- **Arduino IDE**

The Arduino Integrated Development Environment (IDE) includes a code editor, a message section, a text console, a toolbar with frequently used functions, and various menus. It is used to connect to Arduino devices to upload programs and communication.



Figure 7: Arduino IDE (MrSottong, 2023)

- **Ms-Word**

Microsoft is a word processor software used for documenting reports, documents etc. Here, Ms- Word is used for documenting reports. The system architecture diagram of our system is also made using Ms-Word.



Figure 8: Microsoft Word (SoftKeys, 2023)

4. Individual Contribution Plan

Below is a breakdown of each team member's responsibilities and expected contributions:

Team Members	Roles	Contribution
Dikshya Sharma	Proposal: Expected Outcomes and Deliverables and Individual Contribution Plan System Development Report: Introduction, Development, Results and Findings, Implementation: Coding for the connections, connecting physical components of the prototype.	25%
Shuvam Rajbhandari	Proposal: Requirement Analysis and Acknowledgement System Development Report: Designing Diagrams, Development, Overview Implementation: Setting up Arduino IDE to run nodeMCU and making connections with components.	25%
Ikshit Maharjan	Proposal: Aim and Objectives and Abstract System Development Report: Introduction, Designing Diagrams, Development Implementation: Connecting physical components and setting up Arduino IDE.	25%
Anushka Bhandari	Proposal: Introduction and Conclusion System Development Report: Requirement Analysis, Development, Conclusion Application Implementation: Connecting Physical components and looking after Prototype, components, and its connectivity.	25%

Table 1: Individual Contribution Plan

Every team member's committed work is essential to project's success.
Above it the tabular work breakdown of task of each member of the group.

5. Conclusion

In this modern era where everything is getting modernized, using this simple IoT device can provide many benefits for the users. Opening and closing the garage door has always been a hassle and most people forget to close their door which can lead to theft and threat to your family. These days, there are a lot of instances of rising theft everywhere. Using smart garage door opener, it can increase your home security. You can remotely access your garage door from anyplace until you have a Wi-Fi connection.

This tool has been proved to be efficient and we have gained knowledge about many new technological devices. This IoT project helped us to gain more knowledge, experience, and confidence. And we are more than sure that the knowledge we gained from doing hands-on experiences will be very beneficial in coming days to come.

6. References

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