IoT Automated Door

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Abstract: *The objective of this paper is to automate the data acquisition and monitoring of processes related to gate control in an industrial environment. This paper will help minimize the risk of unauthorized access to secure areas. One of the most critical factors that can be utilized for achieving this objective is the ability to control and record the operation of a machine(M2M). This is done by using IoT. This paper helps in keeping the security maintained by informing about the gate condition. This paper aims to provide a secure and reliable door opening system by monitoring the status of the gate using the IoT Gecko Website. It is implemented to achieve complete automation and security by integrating web connectivity with the electronic door lock.*

Keywords: Data Monitoring, IoT, M2M, Security, Automation, Connectivity

1. INTRODUCTION

Over time, since the doors are developed from mechanical to electronic powered many problems were discovered like sensor malfunction, gates opening for unwanted things like Birds, device software failure, etc. The IoT opens possibilities for a more direct integration of the real world into computer-based frameworks, resulting in increased proficiency, sharpness, and economic benefit despite diminishing the need for human supervision. It also enables it for artefacts to be detected or controlled remotely across the current organisational cornerstone. IoT becomes an exemplar of the broad category of digitized actual ities when it is expanded with actuators and sensing devices.[1] This IOT gate access control system will contribute to keeping the security limits. The system monitors the gate opening/closing, reports on the gate position, and informs the user about its situation. An Arduino Uno board embedded with ATmega 328 microcontroller combined with a display and a wireless module is used to send and receive the data from the IoT Gecko website. [2]

1.1 Internet of Things:

The Internet of Things (IoT) is a network of interconnected devices and the infrastructure that supports collaboration between networks and applications, as well as between peripherals. It may be used in a variety of circumstances, including the home, schools, offices, and other environments, depending on the complexity. It provides a way to access hardware management via the internet as well as a robust security [3] remote control. Any internet-connected gadget may be monitored regularly from any place with access to the internet [4] . For procuring and implementing data, both extremities require network access. [5]

Figure 1 Internet of Things

2. COMPONENTS AND SPECIFICATIONS

2.1 Arduino UNO: It is a board based on ATMEGA 328P. It is consisting of 14 digital input/output pins using pin mode(), DigitalWrite() and DigitalRead(), 6 analog input pins. a USB connection, a power jack, reset button. It has everything that a microcontroller can have, we can simply connect it to a computer with the help of a USB cable or we can simply connect it with AC to DC adapter or any battery source to give power. It has a Flash memory of 32KB and SRAM 2KB. Input voltage is between 7V to 12V, and its limit is between 6V to 20V. It should be programmed by Arduino Software (IDE) and will be pre-programmed with a bootloader that allows us to upload a fresh code without using an external hardware programmer. Open-source IDE available and Compactable with any OS. Arduino IDE makes coding a cinch. It's the Brain of the whole system, controls the whole system, computes the information, and proceeds for further operation. [6]

Figure 2 Arduino Uno

2.2 ESP8266: It is a microchip. It enables the microcontroller which connects with 2.4 GHz Wi-Fi, by using IEEE802.11bgn. It can be based on ESP-12 which contains 1 core,32-bit architecture, Xtensa LX106 80 -160MHz clock, and a flash memory of Extern QSPI -512KB A 4MB. We use the IoT Gecko Website to connect with the computer. It contains processor Tensilica Xtensa Diamond Standard 106Micro-based L106 32-bit RSIC CPU core running at 80 MHz Memory, 32 KB instruction RAM, user data RAM up to 80KB, ETS system-data RAM of 16KiB. [7]

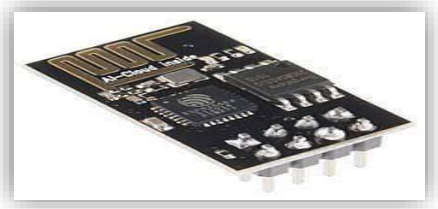

Figure 3 ESP8266

2.3 PIR: A passive infrared sensor (PIR sensor) is a type of digital sensor that monitors infrared (IR) light emitted from objects in its observable field. They are mostly used as motion sensors. PIR sensors are widely deployed in surveillance alarm systems and autonomous lighting design. The main sensing unit or eyes of the whole System is the PIR sensor it sends the signal to the Arduino whenever someone comes into its sensing field. [8], [9]

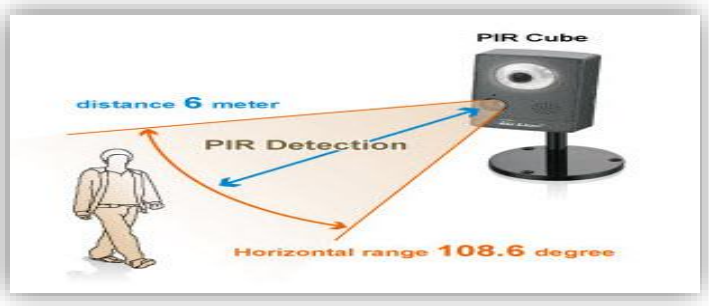

Figure 4 PIR Sensor

2.4 LCD DISPLAY: Liquid Crystal Displays are commonly utilized to obtain the results of experimental observation. Each character can be displayed on the area of a 16x2 size screen. It consists of 16 pins out of which 8 pins are data bus, one is an enabled pin one is a ground, and one is 5V power supply pin, a pin that can set contrast and Anode, Cathode, and Register Pins are also present [10]

Figure 5 LCD Display

2.5 Step-Down Transformer and Rectifier: A step-down transformer is a device that transfers high-voltage alternating current to low-voltage alternating current. It has Rectifier that converts AC to DC and delivers a flexible DC output and a Regulator which reduces turbulence by having a consistent PWM signal.

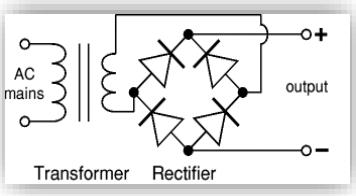

Figure 6 Step-Down Transformer

2.6 Servo Motor: Power, ground, and signal are the three wires of servo motors. The Arduino board's 5V pin should be linked to the power cable, which is usually red. The ground wire is usually black or brown and should be linked to one of the board's ground pins. The PWM pin on the board should be linked to the signal pin. The main mechanical head of the opening system is the Servo motor, it mechanically moves the door according to the information provided. [11]

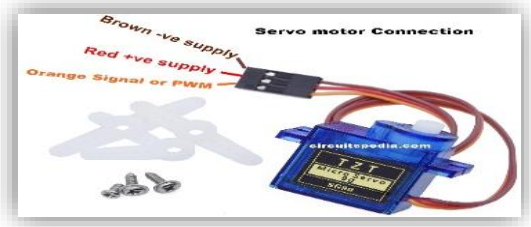

Figure 7 Servo Motor

3. SYSTEM SETUP

The circuit Power requirement is 12V DC for the Arduino board, for the motor driver, it is 5V, and the same is for the microcontroller IC, LCD 16x2, and sensor. Use Stepdown Transformer for converting AC voltage into DC one along with rectifier filter. There are a few pins that are marked by ~. These pins are known as Pulse-Width Modulation (PWM). There is a LED that should light up whenever you plug your Arduino into a power source. If this light does not turn on, it means there is an error or problem, examine the circuit and proceed. A PIR sensor (Passive Infrared Sensor) will be used in this system to detect body gestures. We can use ESP8266 for Wi-Fi connectivity.

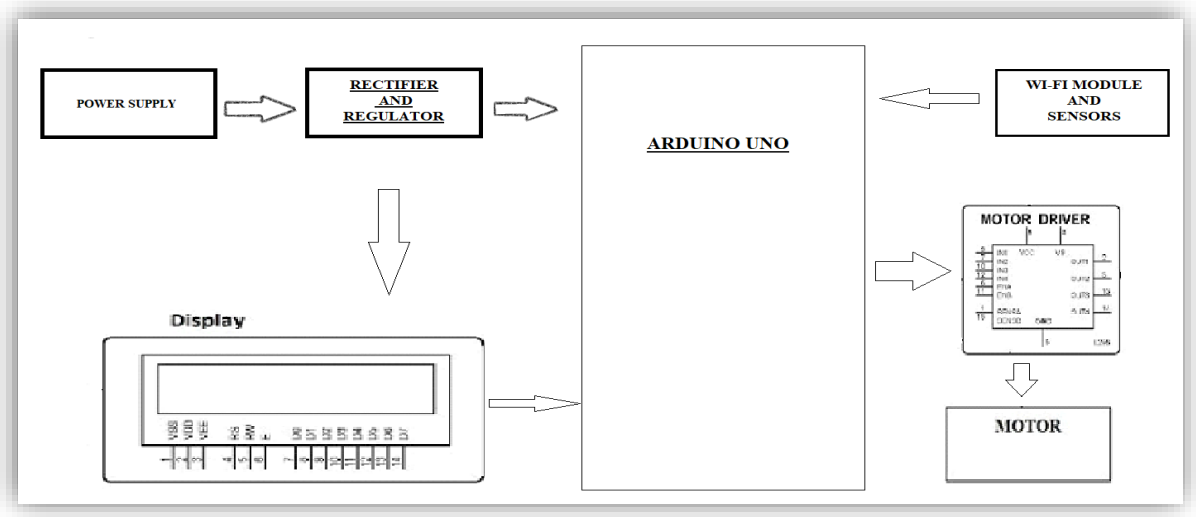

Figure 8 System Setup Architecture

4. IMPLEMENTATION

4.1 Software Implementation: We can conjure up our new IOT-based framework utilizing IOTGecko. IOTGecko is a platform where we often register for gratis and hook up to an ESP8266 through a cloud service to manipulate and evaluate all the devices associated with it. It is a tool that connects embedded systems, Arduino boards, and other controller boards. This interoperable internet of things technology platform may be used to forge any IoT system. All you must do now is set up your devices and operate them on the IoT Cloud. Undergrads, entrepreneurs, and research scholars utilize IOTGecko as a forum. IOTGecko provides a plethora of mock-ups and tools from which the user may pick and sustain with simplicity. Using IOT Gecko, you can control alternators and other peripherals with a few clicks. Its creation does not need extensive programming skills. [4], [12]. Fill in your contact information, such as your name, email address, nationality, and city. And decide which application you'll build an IoT system for. Check your inbox for login information. Using which
You can communicate with the server by logging in. Select your preferred layouts for home automation to liquid level display, data is shown in a variety of formats. motifs and much more IOT Gecko now offers significant visuals to demonstrate your data. [13],[14] Every week, data is posted online. Supports bilateral way of communication.

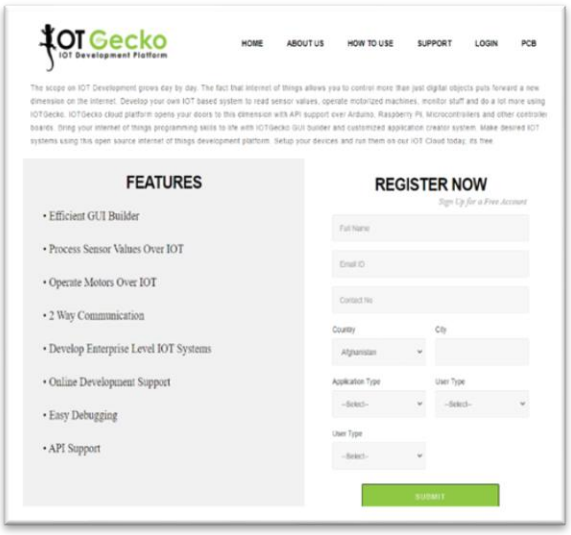

Figure 9 Register now on the IOTGecko Web page

Figure 10 Login page of IoT Gecko

4.2 Hardware Implementation

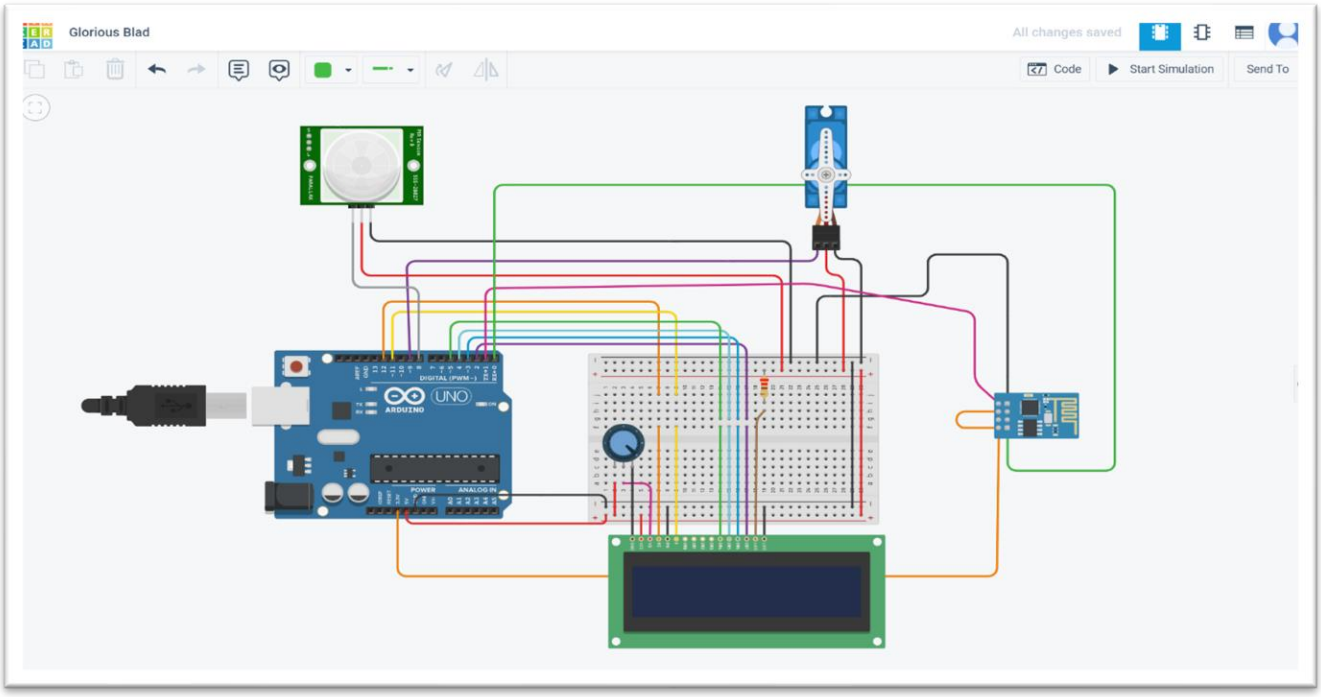

Figure 11 Implementation of Hardware on Tinker CAD Software

5. RESULT

TABLE 1: SIMULATION OUTCOMES

Case	Test	Position	Output
1	When person is standing in front of door at 90°	Under 2 meters	Open
		Above 2 meters	Closed
2	When the person is standing at the centre of door	Centre of the door	Remains opened until he moves
3	When person is standing at an angle of 45° to the door (left & right)	Under the 0.5 meter	Door opened
		Above the 0.5 meter	Door closed
4	When person is standing at 90° inside to door	Under 2 meters	Door remains Opened
		Above 2 meters	Door gets closed
5	When person is standing at an angle of 45° inside door (left & right)	Under 0.5 meter	Door remains opened
		Above 0.5 meters	Door gets closed

When the system is completely set and connected to the power supply than with the help of a Rectifier and Regulator power is supplied to the other components of the system as the Direct power supply will damage the components. When the Sensor senses a body in its sensing range then it produces a signal or generates a piece of information to the Micro-controller which holds the right to compute the signal and produce output towards the received signals, the output generated by the Micro-controller will drive the motor which is attached to Door opening mechanism and thus enabling the door to automatically open before the body in motion reaches nearly to the door. Since the door is IoT enabled it allows the respected authority to take control over the door remotely with the IoT Gecko website which holds the functions like the status of the Door whether it is open or closed, and whether the authorized user wants it to be locked or unlocked remotely and it can be also used to trace record how many people been through the door.[15]

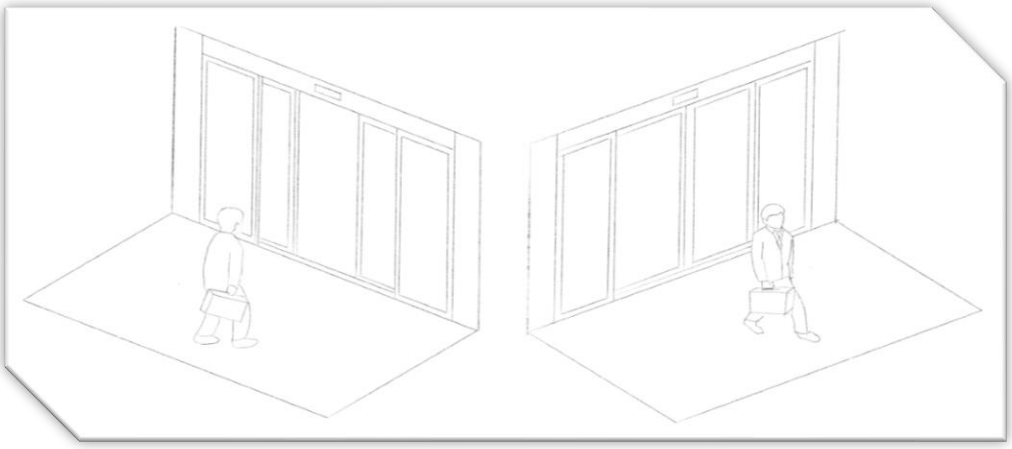

Figure 12 Demo of Door

6. Conclusion

Through this project, we can conclude that we can open the door when it is closed and we can close the door when it is open remotely from any place using ESP8266, Arduino Uno, PIR, Servo motors, and IoT Gecko. Process of opening the door when someone opens the adafruit.io server from any phone or PC, we can control the gate with the help of Atmega328 Arduino IC, PIR, Wi-Fi module, and servo motor. With the help of an automatic gate, we can guard our college, House, and other property by controlling the entry and exits in the area. It will provide convenience to the owner of the area by controlling entry and exit of the door.[16],[17] There are some disadvantages of automatic door openers like they are pricier than the normal gate. Installation and maintenance costs will also be high. If any component of the gate stops working, then obviously there will be trouble to open the gate.

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