# IoT Based Bank Security System

Ajay Mishra<sup>1</sup>, Khushi Sawant<sup>2</sup>, Sujita Suryawanshi<sup>3</sup>, Pragati Ahire<sup>4</sup>

<sup>1</sup> Ass. Prof, E&TC, Sandip Foundation's Sandip Institute of Technology and Research Center Nashik, Maharashtra, India

<sup>2</sup> Student, Sandip Foundation's Sandip Institute of Technology and Research Center Nashik, Maharashtra, India

<sup>3</sup> Student, Sandip Foundation's Sandip Institute of Technology and Research Center Nashik, Maharashtra, India

<sup>4</sup> Student, Sandip Foundation's Sandip Institute of Technology and Research Center Nashik, Maharashtra, India

# ABSTRACT

This project uses the Node-MCU ESP8266 microcontroller to create a smart and safe locker system for bank security applications. To improve security through motion detection and biometric recognition, the system incorporates a PIR motion sensor, buzzer, servo motor, and R307 fingerprint sensor. Detailed instructions are given on how to connect parts, use voltage regulators to control the power supply, and integrate features using coding. PCB design guidelines guarantee a small and sturdy hardware configuration, and comprehensive testing confirms the system's dependability and efficiency, making it a perfect tool for instructors, students, and Internet of Things enthusiasts. By integrating the Blynk platform, real-time warnings and smartphone remote control are made possible, enhancing system functionality and user experience. This project exemplifies the innovative use of IoT technology to create interactive systems by seamlessly integrating multiple sensors and actuators. Detailed documentation, including circuit diagrams, PCB designs, and complete code, simplifies replication and customization, catering to diverse user needs. Beyond its technical utility, the project serves as a comprehensive role of IoT in enhancing security solutions. It underscores the potential of IoT to foster innovation and accessibility in developing user-friendly, reliable, and adaptable systems.

Keyword: - Nodemcu; IoT lockers; Biometric Entry; Remote Security;

# **1.INTRODCUTION**

In the ever-changing electronic world of today, making sure bank vaults are secure has become essential. The use of physical keys or passwords in traditional security systems has made them more susceptible to theft and security breaches. To improve security and user experience, this necessitates creative solutions that combine cutting-edge technology. In order to overcome these obstacles, the IoT-Based Bank Security System incorporates contemporary IoT components including motion detection, fingerprint identification, the NodeMCU ESP8266 microcontroller, and real-time monitoring features.

The technology limits unwanted access by using motion detection and biometric verification, offering a clever and trustworthy substitute for traditional techniques. Reactivity to any dangers is also much improved by the incorporation of the Blynk platform for remote monitoring and real-time notifications. The project, which is intended to be a scalable and economical solution, offers insights into electronics, system design, and Internet of

Things applications for both educational and practical reasons. This research demonstrates how the Internet of Things may revolutionize the development of safe and interactive solutions that meet the demands of contemporary banking settings by tackling urgent security issues and providing a basis for future developments.

## **1.1 LITERATURE SURVEY**

The dependability and usefulness of bank security systems have been greatly improved by the switch from conventional security systems to cutting-edge IoT-based mechanisms. To develop a multi-layered defensive strategy, Ragavendra Prasad, Harun, Venu Gopal, Aslam Basha, Mahesh, and Raja Sekhar [1] integrated motion sensors and fingerprint recognition into their Internet of Things-based security system. Microcontrollers in conjunction with PIR and smoke sensors were used by Singh, Kumar, and Sharma [2] to enable systems to efficiently detect and respond to intruders. With an emphasis on data transfer and user accessibility, Mehta, Patel, and Shah [3] created a system utilizing GSM and facial recognition. Using IoT technologies and sophisticated biometric identification, Reddy, Rao, and Naik [4] developed a safe locker method. An effective, scalable architecture for IoT-enabled banking security was put out by Gupta, Verma, and Singh [5].

### **1.2 Previous Work**

Study	Motion Detection	Biometric Authentication	Real time Alerts	Scalability
[1] Ragavendra Prasad	Yes	Yes	Yes	Limited
[2] P. Singh	Yes	No	Yes	Moderate
[3] K. Mehta	No	Yes	Yes	Limited
[4] V. Reddy	No	Yes	No	High
[5] R. Gupta	Yes	Yes	Yes	Limited
This work	Yes	Yes	Yes	High

### Table 1. Comparison of work

## **1.3 Key Contribution**

This research's main contribution is its creative use of IoT technology to solve important security issues with bank lockers. Combining motion detection, fingerprint-based biometric verification, and real-time alerts via the Blynk platform, the system offers a reliable and effective solution that outperforms more conventional security measures like keycards or PIN codes. Its design has a strong emphasis on affordability and scalability, making use of open-source hardware and reasonably priced parts to facilitate future improvements and simple modification, such adding more sensors or functionalities. In addition to its usefulness, the project has significant educational value since it provides thorough documentation, such as circuit diagrams and coding frameworks, which makes it an invaluable tool for students, teachers, and IoT aficionados.

## 2. BLOCK DIAGRAM

A bank locker security system with a NodeMCU (ESP8266) microcontroller serving as the central control unit in the block diagram. Important elements consist of: 1) Fingerprint Sensor: Verifies users using their fingerprints to grant access only to those who are permitted. 2) Motion Sensor: Identifies possible unlawful entry by detecting movement close to the locker. 3) Buzzer (Alarm): Provides an instant alert in the event of questionable activity. 4) Servo

Motor: Uses fingerprint authentication to physically lock and unlock the bank locker. 5) LED: Provides visual indications of system health, including alerts or successful authentication. and 6) The Blynk IoT App: provides real-time notifications and status updates while enabling remote monitoring control through a smartphone app. For improved security and remote accessibility, this system integrates biometric and Internet of Things technologies.



**Diag -2**: Connection

All components are coordinated by the central control unit, the NodeMCU ESP8266 microcontroller. The fingerprint sensor is connected to the NodeMCU by connecting its RX to D1, TX to D2, VCC to 3.3V, and GND to ground. GND is connected to ground, VCC to 5V, and OUT to D3 in order to incorporate the motion sensor. The positive terminal of the buzzer, which serves as an alarm, is connected to D4, while the negative end is grounded. The mechanical movement-producing servo motor is connected to the NodeMCU's ground by GND, to 5V via VCC, and to D5 via signal. In conclusion, two LEDs—one red and one green—are wired with their anodes attached to D6 and D7, respectively.

## **3.2 Physical Testing**

### 3.2.1 Breadboard implementation



Fig-1 : No motion detected

This means that the green LED illuminates, indicating a secure status, when there is no motion or detection. The servo motor turns 180 degrees upward to its idle position while the buzzer stays off.



Fig-2 : Motion detected

This means that the green LED shuts off to signify a possible incursion when motion or detection takes place. The servo motor moves downward from its idle position to its active state as the buzzer sounds a warning.

## 3.3 Tools and Technology Used

Components: Nodemcu, Fingerprint sensor, PIR sensor, Servo motor, LED, buzzer.

Software: Arduino IDE.

Platform: Blynk IoT.

## 4. RESULT AND ANALYSIS



Chart-1 : Graphical result.

The precision of each component is displayed in the above chart: where while the fingerprint sensor verifies identification with 90% accuracy, the PIR motion sensor detects movement with 93.33% accuracy. The Blynk IoT app has a 96.67% success rate in remote control. With an efficiency rate of 93.33%, the SG90 servo motor guarantees accurate positioning.

# 4. CONCLUSIONS

This IoT-based bank locker system combines automated control mechanisms, real-time monitoring, and biometric verification to efficiently improve security. The system is scalable, reliable, and reasonably priced, as seen by its high success rates in motion detection, identity verification, remote alerts, and accurate locking procedures. Even though there are some minor inefficiencies with sensor calibration and network dependency, it can be made a viable solution for modern banking applications with future enhancements like advanced biometric integration, offline functionality, and AI-driven anomaly detection.

# 6. REFERENCES

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