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Anti-Theft Door Lock System using IoT for Home Security

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Abstract: *In today's world advancement of technology in the fields of automation is getting simpler and better in all aspects. There is a rapid increase in number of internet users. Smartphones have played a very important role in helping users with a much better internet service and different online applications. The concept of home automation is applied using internet of things. There was a time when people used to perform home automation using Bluetooth without using internet. Now technology has made a tremendous change and Bluetooth is switched to wifi. This paper presents the design, concept and implementation of IoT (Internet of things) based smart home automation with a low cost and better security. The system is easy and flexible as it uses Arduino board with various sensors to make the system effective. Password protection is used to allow only authorized users to use the system. The system works online as well as offline with the help of a smartphone and web. The system can control large number of devices or appliances at a time.*

Keywords: Arduino, GSM module, Adapter, LED, IOT, Home Security, Real-Time Surveillance

I. INTRODUCTION

Anti-theft door lock system aims to develop a door lock system to strengthen home security. With rising burglary rates, traditional locks are becoming easier to tamper with. These system will use advanced features like fingerprint recognition, smartphone app integration, and real-time notifications to prevent unauthorized access. It will incorporate encryption to protect against cyber threats, ensuring both physical and data security. These systems are designed to be user-friendly and cost-effective. By integrating modern technologies, this solution addresses the need for reliable and efficient home protection. The system thus provides a smart, automated approach to enhancing home security while minimizing human intervention. The system allows homeowners to monitor and control their locks remotely via smartphone apps, receiving real-time alerts in case of tampering. It integrates with other smart home devices to offer a comprehensive safety solution. The system also enables temporary access for visitors and logs all lock activities for security tracking. These system replace traditional locks with a more advanced, connected, and secure alternative that minimizes the risk of theft.

Home automation system using IoT is a way through which one can explore and control home appliances or devices with the help of internet connection. IoT based home automation is a way of making home smart. Smart Homes can be described as technology within the home environment to provide convenience, comfort, security and energy efficiency. Using embedded system one can easily make a smart home and objects. Home automation can control each and every appliance or device with the internet. There was time when home automation was done with the help of Bluetooth and still it is existing with internet (wifi). In today's world each and every one is using internet on mobile as well as computer. Internet has become the basic need for everyone and thus internet can be used for controlling the basic devices or appliances like TV, lights, fans, Air conditioners and much more.

The increasing prevalence of burglaries and unauthorized entries into homes has heightened the need for efficient security solutions. In the era of smart homes and automation, IoT (Internet of Things) technology offers advanced capabilities for monitoring and protecting homes in real-time. The development of IoT-based anti-theft systems aims to provide more intelligent, automated, and responsive security measures. This project introduces a novel approach to home security by integrating a smart doormat with a face recognition system, Arduino-based controls, and communication tools such as a GSM module.

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The system alerts family members when suspicious or unknown individuals attempt to access the home, offering a proactive approach to security management. The core of this anti-theft system lies in the smart lock. Assemble the hardware components, including a microcontroller, lock mechanism, and door sensors for detecting unauthorized entry attempts. The system will include Wi-Fi and Bluetooth modules for local and remote communication. A tamper sensor will be integrated to detect forced entry, sending immediate signals to the control system. A cloud-based platform will be developed to serve as a central hub for data storage and real-time monitoring. This platform will allow users to access lock status, monitor activity logs, and control the lock remotely. A secure and user-friendly mobile application will be created to allow the homeowner to lock/unlock the door, receive real-time notifications, and monitor live security status. The app will support both Wi-Fi and Bluetooth connectivity to provide flexibility in controlling the lock both locally and remotely.

The IoT platform will ensure seamless communication between the lock, sensors, and the cloud. Encryption protocols (such as AES) will be applied to secure the transmission of data between the lock and the user's smartphone. The system will be programmed to send instant notifications or alerts to the user's phone in case of any tampering or unauthorized access attempts, ensuring immediate response. The rapid advancements in Internet of Things (IoT) technologies have led to significant improvements in various aspects of home security. One such innovation is the Anti-Theft Door Lock System, which integrates IoT with traditional locking mechanisms to provide enhanced security for residential properties. As burglary and unauthorized access continue to be pressing concerns, particularly in urban areas, smart solutions are increasingly becoming essential to ensure the safety of homes and families. The Anti-Theft Door Lock System utilizes IoT to offer a more intelligent and robust approach to securing doors. Unlike conventional locks, this system is designed to detect tampering or unauthorized entry attempts and immediately alert the homeowner or authorities. Through real-time monitoring and integration with other smart home devices, it enables seamless and remote access control, ensuring that doors are securely locked and protecting the home from potential intruders. In recent years, the demand for smart home security systems has risen as people seek to incorporate advanced technologies into their daily lives. Traditional lock-and-key methods are no longer enough to provide a comprehensive solution to modern security threats. IoT-enabled anti-theft door lock systems offer several benefits, including remote access control, real-time alerts, and integration with other smart devices, making them a viable and effective choice for securing homes.

II. LITERATURE SURVEY

Manjunath et al.[1], developed a Raspberry Pi-based anti-theft security system that uses home automation for multi-level authentication. The system aims to provide a secure and efficient way to protect homes and properties from intruders. The authors designed a system that uses a combination of sensors, cameras, and authentication methods to detect and alert homeowners of potential threats. The system was tested and found to be effective in detecting and preventing unauthorized access. The study contributes to the field of home security and automation, providing a innovative solution for protecting properties and loved ones. The authors' work demonstrates the potential of IoT technology and multi-level authentication in enhancing home security, and highlights the importance of continued research and development in this area.

Mamun and Ashraf [2] proposed an anti-theft vehicle security system that not only detects potential theft but also takes preventive action. The system uses a combination of sensors, GPS, and GSM technologies to detect and alert vehicle owners of potential threats. Upon detection, the system can immobilize the vehicle, making it impossible for thieves to drive it away. The authors' system also provides real-time location tracking, allowing owners to monitor their vehicle's location. The study demonstrates the effectiveness of the system in preventing vehicle theft and highlights the potential of IoT technology in enhancing vehicle security. The authors' work contributes to the development of smart and secure vehicle security solutions, providing a robust defense against vehicle theft.

Asaad and Athab [3] developed an anti-theft security system that uses IoT technology to detect and alert owners of potential theft. The system is designed to be hidden, making it difficult for thieves to detect and disable it. Upon detection of suspicious activity, the system sends alerts to the owner's smartphone or email, allowing them to take prompt action. The system also provides real-time monitoring and tracking, enabling owners to keep tabs on their property. The authors' work demonstrates the effectiveness of IoT-based security systems in preventing theft and

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highlights the importance of hidden alert systems in enhancing security. The study contributes to the development of innovative and effective anti-theft solutions, providing an additional layer of protection for property owners.

Dr. Suresh et al. [4] proposed an innovative Anti-Theft Flooring System using Raspberry Pi and IoT technology. The system detects and alerts homeowners of potential intruders through pressure sensors embedded in the floor, which trigger a camera to capture images and send them to the owner's mobile device via the internet. The system also integrates with a GSM module to send SMS alerts. The authors successfully implemented and tested the system, demonstrating its effectiveness in detecting and preventing theft. This study contributes to the development of intelligent home security solutions, leveraging IoT and Raspberry Pi technologies to provide real-time surveillance and alerts, enhancing home safety and security.

Sonali Das and Dr. Neelanarayan [5] presented an IoT-based anti-theft flooring system that detects and alerts homeowners of potential intruders through pressure sensors embedded in the floor. The system uses a microcontroller to process sensor data and trigger alerts, which are sent to the owner's mobile device via Wi-Fi or GSM modules. The authors designed and tested the system, demonstrating its effectiveness in detecting and preventing theft. This study contributes to the development of smart home security solutions, leveraging IoT technology to provide real-time surveillance and alerts, enhancing home safety and security. The system's ease of installation, low cost, and reliability make it a promising solution for home security applications.

U. Sirisha et al. [6] developed an IoT-based anti-theft detection and alerting system using Raspberry Pi, which detects intruders and sends alerts to homeowners through email and SMS. The system uses pressure sensors, a camera, and a motion sensor to detect and capture images of intruders, and a Raspberry Pi board to process data and send alerts. The authors successfully implemented and tested the system, demonstrating its effectiveness in detecting and preventing theft. This study contributes to the development of intelligent home security solutions, leveraging IoT technology and Raspberry Pi to provide real-time surveillance and alerts, enhancing home safety and security. The system's ability to detect and alert homeowners in real-time makes it a reliable and efficient solution for home security applications.

P. R. Kumar et al. [7] presented a smart home security system that integrates IoT and image processing technologies to detect and alert homeowners of potential intruders. The system uses cameras and sensors to capture images and detect motion, which are then processed using image processing algorithms to identify suspicious activity. The system sends alerts to homeowners through a mobile app and emails, and also stores images and videos in the cloud for later reference. The authors demonstrated the effectiveness of the system in detecting and preventing theft, and highlighted its advantages, including real-time monitoring, automated alerts, and cloud storage. This study contributes to the development of advanced smart home security solutions, leveraging IoT and image processing technologies to provide enhanced security and peace of mind for homeowners.

S. Patel et al. [8] proposed an IoT-based home security system with face recognition, which uses a combination of sensors, cameras, and machine learning algorithms to detect and identify intruders. The system captures images of individuals and uses face recognition technology to compare them with a database of authorized individuals. If an unknown face is detected, the system sends alerts to homeowners through a mobile app and emails. The authors demonstrated the effectiveness of the system in detecting and preventing theft, and highlighted its advantages, including real-time monitoring, automated alerts, and high accuracy face recognition. This study contributes to the development of advanced smart home security solutions, leveraging IoT and face recognition technologies to provide enhanced security and peace of mind for homeowners. The system's ability to accurately identify individuals and detect suspicious activity makes it a reliable and efficient solution for home security applications.

S. Ramyasri and M. Mahalakshmi [9] proposed an IoT-based progressive anti-theft ATM security system, which uses a combination of sensors, cameras, and machine learning algorithms to detect and prevent ATM theft. The system includes features such as fingerprint recognition, facial recognition, and motion detection to identify and alert authorities of potential threats. The system also includes a progressive alert system, which escalates alerts from SMS to email to police notification in case of a confirmed threat. The authors demonstrated the effectiveness of the system in preventing ATM theft and highlighted its advantages, including real-time monitoring, automated alerts, and high accuracy detection. This study contributes to the development of advanced security solutions for ATMs, leveraging IoT and machine learning technologies to provide enhanced security and reduce the risk of theft. The system's ability to detect and respond to threats in real-time makes it a reliable and efficient solution for ATM security applications.

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III. METHODOLOGY

The system begins with the user authentication process, where individuals attempt to unlock the door using a fingerprint sensor or a keypad. The fingerprint sensor captures and compares biometric data with stored credentials, while the keypad allows users to enter a predefined PIN code for verification. Additionally, the HC-05 Bluetooth module facilitates authentication through a mobile device for added convenience. The NodeMCU acts as the central processing unit, receiving authentication inputs and verifying them against stored data.Once authentication is verified, the NodeMCU sends a signal to the servo motor, unlocking the door for authorized users. If authentication fails, the system denies access and immediately triggers a real-time alert to the homeowner's mobile device via Bluetooth or an IoT-based platform. An additional security measure includes an alarm system that can be activated to deter potential intruders. The integration of IoT connectivity allows homeowners to remotely monitor access logs, receive instant notifications, and control the door lock through a mobile application or web interface. This ensures that entry attempts can be tracked and managed from anywhere.Each access attempt, whether successful or unsuccessful, is logged for future reference, enabling homeowners to review entry records and enhance security measures. Designed to be user-friendly and seamlessly integrated with smart home networks, the system ensures easy installation and operation. Future enhancements may include AI-based anomaly detection, cloud-based storage for access logs, and advanced encryption for increased security. By leveraging biometric authentication, IoT connectivity, and real-time monitoring, this solution offers a modern, intelligent, and proactive security system that enhances protection, reliability, and peace of mind for homeowners.

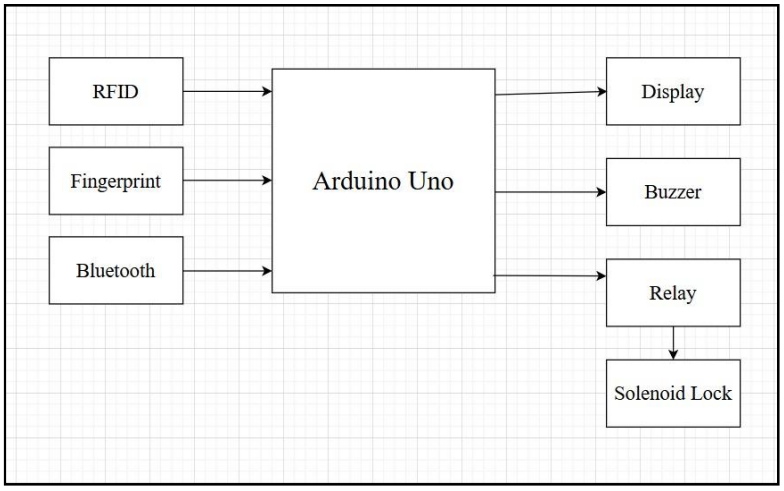

Figure-1. Block Diagram:

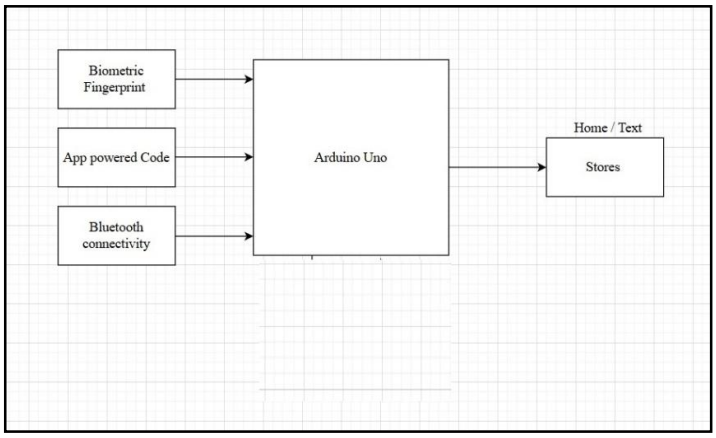

Figure-2. System Architecture

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System Necessity

Hardware:

- Node MCU
- Finger print sensor
- Keypad
- Hc05 Bluetooth
- Jumper wires

Software:

- Arduino ide
- Windows 10 or above

Applications:

1. Residential Security.
2. Commercial Buildings & Offices
3. Hotels & Hospitality
4. Banks & Financial Institutions
5. Educational Institutions

IV. PROBLEM STATEMENT

This research aims to design, develop, and analyze an Anti-Theft Door Lock System using IoT technologies. The goal is to create a system that combines advanced locking mechanisms with sensors and connectivity features to detect unauthorized access attempts, trigger alarms, and send real-time alerts to homeowners. The system will integrate with smartphones and other IoT devices to provide continuous monitoring and improved security.

This paper will explore the core components of the IoT-based anti-theft door lock system, including:

Sensor technologies (e.g., pressure sensors, motion detectors, vibration sensors) for detecting tampering or unauthorized access attempts.

Communication protocols for remote control and monitoring, ensuring seamless interaction between the lock system and the homeowner's smartphone or security platform.

Security features, such as real-time notifications, automated responses (e.g., locking mechanisms activation), and integration with broader home automation systems.

Energy efficiency and cost-effectiveness of IoT-enabled security systems.

Significance of the Study:

The findings of this research can contribute to the development of more secure, user-friendly, and efficient home security systems. By leveraging IoT technologies, the proposed anti-theft door lock system offers a novel solution that empowers homeowners with greater control over their home security, thus addressing the growing need for enhanced protection in the modern age. The research also highlights the potential for integrating such systems into the broader ecosystem of smart homes, improving overall safety, convenience, and peace of mind for residents. In summary, this paper aims to explore how IoT can revolutionize home security by providing an anti-theft door lock system that not only secures doors but also actively prevents unauthorized access through real-time monitoring and intelligent alerts, ultimately contributing to a safer living environment.

V. ADVANTAGES

- Enhanced Security: Provides an additional layer of protection against theft and burglary.
- Real-Time Alerts: Instant notifications to family members and authorities via SMS or email.
- Facial Recognition: Accurately identifies known and unknown individuals.
- Visual Identification: LED display showcases the image of suspicious persons.
- Deterrent Effect: Visible security system deters potential intruders.

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- IoT Connectivity: Seamless integration with smart devices.
- Advanced Sensors: Pressure sensors and camera modules for accurate detection.
- Automated Alerts: Automated SMS and email notifications.
- Protection of Valuables: Safeguards precious belongings.
- Family Safety: Ensures the safety of family members.

VI. DISADVANTAGES

- Dependence on Internet: Requires stable internet connectivity.
- Sensor Malfunction: Pressure sensor or camera module failures.

VII. CONCLUSION AND FUTURE SCOPE

The Anti-Theft Door Lock System Using IoT for Home Security represents a significant advancement in residential security, combining traditional locking mechanisms with modern IoT technologies to create a robust, intelligent, and proactive solution to home protection. This system addresses the growing concerns surrounding unauthorized access and burglary by providing enhanced monitoring capabilities and real-time alerts. With its integration of sensors, remote control, and automated responses, the IoT-based anti-theft lock offers a reliable way to secure one of the most vulnerable points in a home—the door. Through this research, we have demonstrated that IoT-enabled security systems can provide substantial improvements over conventional lock-and-key methods, especially in terms of real-time threat detection, remote access control, and seamless integration with other smart home devices. By enabling immediate alerts and automatic responses to tampering or unauthorized attempts, the system offers homeowners greater control and peace of mind. Moreover, the cost-effectiveness, energy efficiency, and ease of installation make this system a practical choice for homeowners seeking to enhance their security. As IoT technologies continue to evolve, we expect such systems to become even more advanced, incorporating features like AI-driven analytics, facial recognition, and integration with other smart home ecosystems for even more comprehensive protection.

In conclusion, the Anti-Theft Door Lock System demonstrates the power and potential of IoT in transforming home security. It offers an innovative solution that not only protects against theft but also empowers homeowners to actively monitor and control their security environment from anywhere in the world. As IoT becomes increasingly prevalent in everyday life, systems like this will play a pivotal role in safeguarding homes and ensuring the safety and well-being of residents. Integrating artificial intelligence (AI) and machine learning (ML) algorithms to improve face recognition accuracy and reduce false positives. Developing a mobile app for remote monitoring and notification. Incorporating additional sensors, such as motion sensors or door sensors, to enhance security. Exploring the use of cloud-based storage for image and data storage. Investigating the integration of the system with other smart home devices and security systems. Conducting user studies to gather feedback and improve the system's user interface and user experience. Exploring the potential use of the system in commercial settings, such as offices or retail stores. By continuing to develop and improve the IoT-based Anti-Theft Door Lock System system, it has the potential to become an even more effective and convenient security solution for homes and businesses.

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