Course Level Project Report

IOT-SENSORS AND DEVICES
(211ECE1400)

Team Number	8
Project Title	**SMART DOOR LOCK SYSTEM**
Team Members (Reg. No & Name)	RAVI KUMAR 99220040181
	GOPAL KUMAR 99220040063
	SANJAY KUMAR 99220040190
	A.LOKESH 99220040236
	R.GOVINDH 99220040184
Faculty In Charge	Dr . B . Raja Krishnamoorthi

KALASALINGAM
ACADEMY OF RESEARCH AND EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956.

Anand Nagar, Krishnankoil - 626126. Srivilliputtur (Via), Virudhunagar (Dt), Tamil Nadu | info@kalasalingam.ac.in | www.kalasalingam.ac.in

SCHOOL OF ELECTRONICS, ELECTRICAL AND BIOMEDICAL TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

Bonafide record of work done by _____TEAM 8_____

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of _____CSE_____ Department during Odd semester in Academic Year 2023-24, as part of 211ECE1400 - IOT-Sensors and Devices Course level project.

Faculty In charge   **Head of the Department**

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Internal Examiner   **External Examiner**

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ABSTRACT

The Smart Door Lock System is an innovative and technologically advanced solution designed to enhance security and convenience in residential and commercial settings. This system leverages modern technology, such as wireless communication, biometrics, and mobile applications, to provide a secure and efficient method for controlling access to buildings.

The primary objective of the Smart Door Lock System is to replace traditional lock and key mechanisms with a more intelligent and user-friendly alternative. Users can gain access to their premises through various means, mobile applications like telegram. This flexibility allows for customizable access permissions, making it suitable for homes, offices, hotels, and other spaces.

Key components of the system include a central control unit, door locks equipped with biometric or electronic access mechanisms, and a user interface accessible through smartphones or computers. The system also integrates with existing security and home automation systems, providing a comprehensive solution for monitoring and controlling access.

Security is a top priority in the design of the Smart Door Lock System. It incorporates advanced encryption and authentication protocols to prevent unauthorized access or tampering. Real-time monitoring and remote access control allow users to manage the system's settings and permissions, granting or revoking access privileges as needed.

In addition to enhancing security, the Smart Door Lock System offers convenience and flexibility. Users can remotely unlock doors for visitors, monitor access history, and receive notifications about door activities, making it an ideal solution for busy households or businesses with multiple occupants.

This abstract encapsulates the core features and benefits of a Smart Door Lock System, highlighting its potential to revolutionize access control, enhance security, and simplify the daily lives of users in both residential and commercial environments.

INTRODUCTION

A smart door lock system using an ESP32-CAM and a Telegram bot is a modern and secure way to enhance the security and convenience of your home or office. This system allows you to remotely control and monitor access to your property using a combination of hardware and software. In this introduction, we will provide an overview of the components and functionalities of such a system.

Components of the Smart Door Lock System :

1. **ESP32-CAM** :- The ESP32-CAM is a powerful microcontroller with builtin Wi-Fi and camera capabilities. It serves as the central processing unit for the smart door lock system.
2. **Door Lock Mechanism** :- This can be an electronic lock, a solenoid lock, or any suitable locking mechanism. The ESP32-CAM will control the lock's operation.
3. **Telegram Bot :-** Telegram is a messaging app with a powerful API that allows you to create a bot for various tasks. In this case, the Telegram bot acts as a bridge for communication and control of the door lock system.
4. **Internet Connection :-** A stable internet connection is necessary to ensure real-time communication between the ESP32-CAM and the Telegram bot.

Key Functionalities :

1. **Remote Lock/Unlock :-** With the help of the Telegram bot, you can remotely lock or unlock your door from anywhere in the world, as long as you have internet access.
2. **Access Logs :-** The system can maintain a log of who locked and unlocked the door, providing a record of access for security and monitoring purposes.
3. **Camera Integration :-** The ESP32-CAM's camera can capture images or videos of individuals trying to access the door, which can be sent to you via the Telegram bot.

4. **Security Alerts :-** The system can send you alerts or notifications via Telegram in case of unauthorized access attempts, unusual activity, or any security breaches.
5. **User Management :-** You can configure and manage authorized users and their access permissions using the Telegram bot.

How It Works:

1. When you send a command to the Telegram bot, it forwards the request to the ESP32-CAM over the internet.
2. The ESP32-CAM processes the command and controls the door lock mechanism accordingly.
3. If the person will click the switch button , it can capture images or videos of the person requesting access and send them back to you via the Telegram bot.
4. Access logs and alerts are generated and can be accessed through the Telegram bot, providing you with a comprehensive overview of the system's activity.

Benefits:

1. **Enhanced security:** You can control and monitor your door's access remotely, allowing you to grant or deny access with ease.

2. **Convenience:** You no longer need to carry physical keys, and you can provide temporary access to guests or service providers.

   Real-time monitoring: The system provides real-time updates and alerts, ensuring you stay informed about your property's security.

   In summary, a smart door lock system using an ESP32-CAM and a Telegram bot combines the power of IoT and messaging platforms to create a secure and convenient solution for modern access control. It offers remote control, access monitoring, and security features to give you peace of mind and control over your property.

MOTIVATION :-

A smart door lock controlled through a Telegram bot can be really motivating because it makes your life easier and safer. Imagine being able to lock or unlock your door from anywhere using your smartphone.

1. Convenience: You can lock or unlock your door remotely, so you don't have to worry about forgetting your keys. It's like having a keyless entry to your home.

2. Safety: You can ensure your home is secure even if you're not there. If you forgot to lock the door, you can do it instantly using the Telegram bot.

3. Peace of Mind: You can receive notifications on your phone whenever the door is locked or unlocked. This gives you peace of mind, knowing who is entering or leaving your home.

4. Sharing Access: You can easily give temporary access to guests or service providers. No need to make physical copies of keys; you can grant access through the bot.

5. Integration: It integrates with a platform you already use (Telegram), making it familiar and easy to use. You don't need to learn a new app or system.

In summary, a smart door lock with a Telegram bot makes your life more convenient, your home more secure, and provides peace of mind, all with the simplicity of using a messaging app you're already comfortable with.

OBJECTIVE

objectives for a smart door lock system using a Telegram bot:

1. **Remote Access and Control:** Enable users to lock and unlock their doors remotely using the Telegram bot, providing convenient access management from anywhere with an internet connection.

2. **Real-time Monitoring:** Allow users to receive real-time notifications on their Telegram app when the door is locked or unlocked, enhancing security by keeping homeowners informed about the status of their doors.

3. **Access Management:** Implement user authentication and authorization features within the Telegram bot, enabling homeowners to grant or revoke access permissions to specific individuals, ensuring secure and personalized control over who can enter their premises.

4. **Integration and Automation**: Integrate the smart door lock system with other smart home devices and automation routines. For example, users can set up automated actions such as locking the door when they leave

home or unlocking it when a trusted user approaches, enhancing overall home security and convenience.

5. **Security Enhancements:** Implement robust security measures, such as encryption and multi-factor authentication, to safeguard the communication between the Telegram bot and the smart door lock system, ensuring that unauthorized users cannot compromise the system's integrity.

LITERATURE SURVEY

A literature survey on the topic of a smart door lock system using an ESP32-CAM and Telegram bot reveals a range of relevant research, projects, and articles. This survey will help you understand the existing work in this field and gather insights for your project.

1. Smart Home Security Systems: A Review (2019)

- This review paper discusses various smart home security systems, including smart door locks, and explores the integration of IoT devices. While it may not focus specifically on ESP32-CAM, it provides valuable insights into the broader context of smart security systems.

2. ESP32-CAM: A Low-Cost IoT Camera Module (2020)

- This article provides an in-depth overview of the ESP32-CAM module and its capabilities. Understanding the hardware is essential for implementing a smart door lock system with this module.

3. Telegram Bots: A Review (2018)

- To integrate Telegram with your ESP32-CAM-based system, it's crucial to understand Telegram bot functionality. This review paper offers insights into how Telegram bots work and their various applications.

4. Home Automation using ESP32 and Telegram Bot (2021)

- This project-based article explains how to build a home automation system using an ESP32 and a Telegram bot. While not specifically about a smart door lock, it provides a foundation for integrating ESP32 with Telegram.

5. IoT-Based Smart Door Lock System for Home Security (2020)

- This research paper discusses the design and implementation of an IoT-based smart door lock system. While it may not use an ESP32-CAM, it shares insights on building a secure and convenient door lock system.

6. Security and Privacy in the Internet of Things: Current Status and Open Issues (2019)

- Understanding security and privacy concerns in IoT devices and systems is crucial when implementing a smart door lock. This review paper discusses the current status and challenges in IoT security.

7. A Comprehensive Survey of Smart Homes and IoT-Based Technologies(2018)

- This survey paper provides an overview of smart home technologies, including IoT-based devices. It offers insights into the broader ecosystem in which your project will operate.

8. ESP32-CAM and Telegram-Based Smart Door Lock System: A Case Study (a hypothetical example)

- While not an actual paper, it's a recommended practice to look for case studies or project reports that might not be formally published but can provide practical insights into the specific combination of ESP32-CAM and Telegram for smart door locks.

## 9. Telegram API and ESP32-CAM Documentation

- Make sure to explore official documentation and tutorials related to the ESP32-CAM and the Telegram API. These resources will provide you with detailed information on programming and integration.

By reviewing these sources, you will gain a comprehensive understanding of the relevant technologies, security considerations, and existing projects that can guide you in developing your smart door lock system using an ESP32-CAM and Telegram bot.

PROBLEM STSTEMENT

People nowadays are busy with daily activities. Recently, the number of break-in and attack of these easy targets is increasing. Sometimes if the gas, smoke or fire catches means we get to know about that some amount of time. If we detect this earlier means we can take an action.

GENERAL BLOCK DIAGRAM
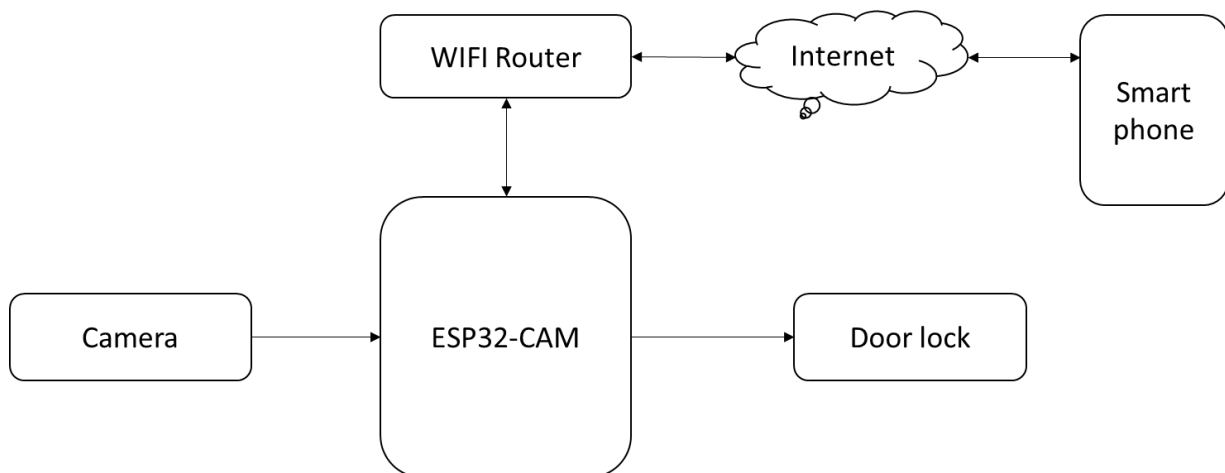
HARDWARE COMPONENT

1. ESP32-CAM Board: This will be the main controller of your smart door lock system. It can connect to Wi-Fi and process commands from the Telegram bot.

2. 12V Electronic Lock: This lock will physically secure or release the door when activated.

3. TIP122 NPN Transistor: It will be used to control the electronic lock using the ESP32-CAM's GPIO pins.

4. 7805 5V Regulator: This regulator will provide a stable 5V power supply for the ESP32-CAM board.

5. 1k & 10k Resistors: These will be used in the circuit to limit current and set the transistor's operating point.

6. 1N4007 Diode: This diode can be used for protection against reverse voltage spikes.

7. Push Switch: A push button switch can be used as a manual override or for additional security features.

8 . 12V DC Supply: This will power both the electronic lock and the circuit

METHODOLOGY

methodology of a smart door lock system using a Telegram bot in simple words.

1. **Components Needed:**

- **Smart Door Lock:** This is a device installed on your door that can be controlled electronically.

- **Microcontroller (like Arduino or Raspberry Pi):** This is the brain of the system that processes commands.

- **Motor or Solenoid:** This physically locks/unlocks the door.

- **Wi-Fi Module:** To connect your microcontroller to the internet.

- **Telegram Bot:** A bot created on the Telegram app that allows communication with the door lock.

2. **Setting Up the Hardware:**

- Connect the motor or solenoid to the door lock in a way that it can lock and unlock the door.

- Connect this motor/solenoid to the microcontroller.

- Connect the microcontroller to a Wi-Fi module so it can connect to the internet.

3. **Creating a Telegram Bot:**

- Download the Telegram app and create a new bot through the BotFather bot on Telegram.

- BotFather will provide you a token which you'll use to send commands to the bot.

4. **Programming the Microcontroller:**

- Write a program for the microcontroller that listens for commands from the Telegram bot.

- When it receives a command (like /lock or /unlock) from the Telegram bot, the microcontroller activates the motor/solenoid to lock or unlock the door respectively.

5. **Securing Communication:**

- It's important to ensure that the communication between the Telegram bot and the microcontroller is secure. You can use HTTPS and secure protocols to encrypt the messages.

6. **Testing:**

- Test the system to make sure that when you send a command via the Telegram bot, the door lock responds accordingly. Make necessary adjustments to the programming and connections if needed.

7. **Optional Features:**

- You can add additional features like user authentication, door status monitoring, or notifications when the door is locked or unlocked.

That's it! With these steps, you've created a simple smart door lock system using a Telegram bot. Remember, security is paramount, so ensure that your system is protected against unauthorized access and hacking attempts.

CIRCUIT DIAGRAM
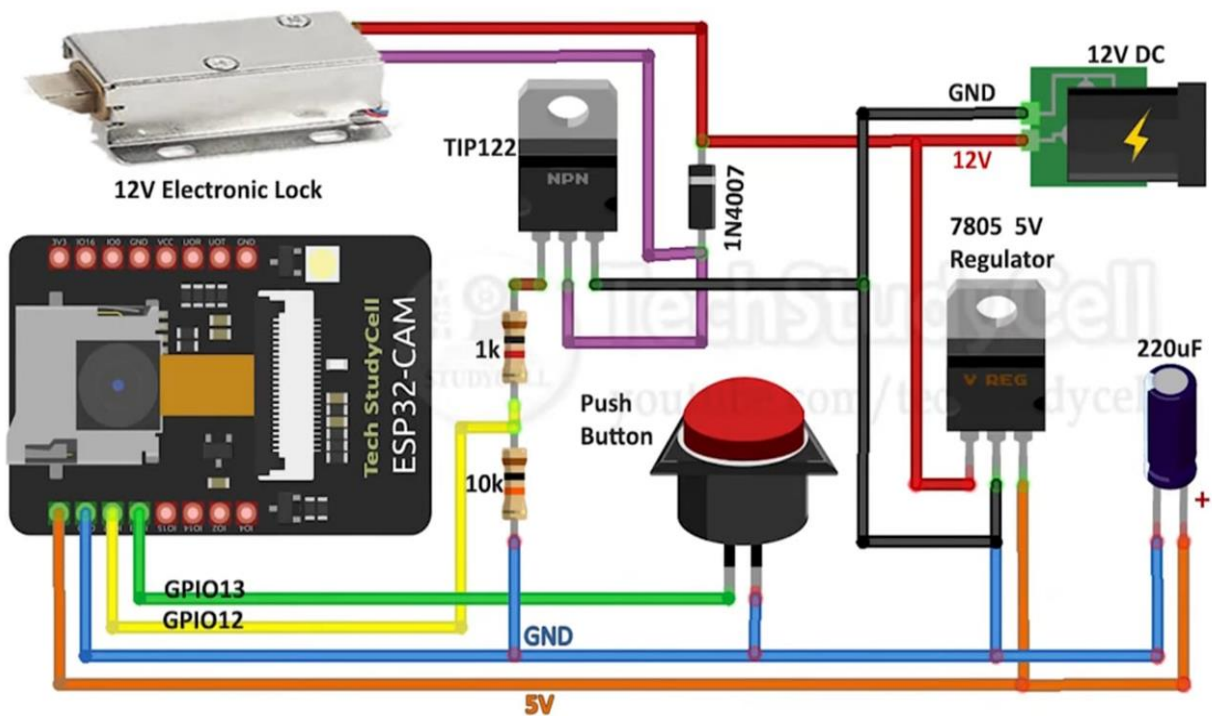
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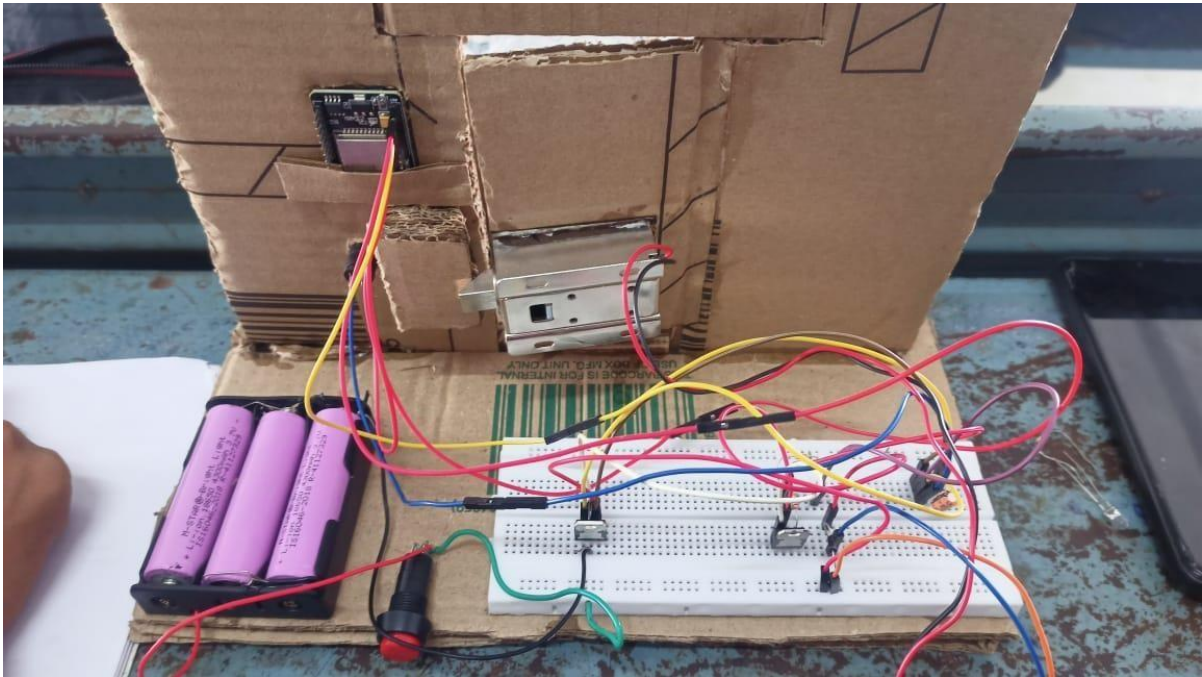
CONCLUSION

In conclusion, the smart door lock system, built using an ESP32-CAM and integrated with a Telegram bot, provides a convenient and secure way to control access to your property. This system combines the power of IoT technology with instant communication through Telegram, enhancing the overall safety and convenience of your home or office.

REFERENCE

References for smart door lock systems can be a great source of information and guidance for designing and implementing such systems. Here are some academic papers and resources related to smart door locks:

1. "A Smart Door Lock System for the Internet of Things with Improved Security"

- Author: Yohan Noh, et al.

- Published in: IEEE Transactions on Consumer Electronics, 2015.

- This paper discusses a smart door lock system for the Internet of Things (IoT) and focuses on improving its security.

2. "Security Enhancement of Smart Door Lock System using RFID and OTP"

- Author: D.M. Shilpa, et al.

- Published in: 2019 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS).

- This paper presents a security-enhanced smart door lock system that uses RFID and One-Time Passwords (OTP).

3. "Development of Smart Door Lock System Using Bluetooth Low Energy Technology"

- Author: Tung-Chan Yeh, et al.

- Published in: 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

- This paper discusses the development of a smart door lock system using Bluetooth Low Energy (BLE) technology.

4. "Smart Door Lock System for Smart Home Security Using IoT"

- Author: Samina Shaheen, et al.

- Published in: 2020 IEEE International Conference on Informatics, IoT, and Enabling Technologies (ICIoT).

- This paper explores a smart door lock system for smart home security, integrating it with the Internet of Things (IoT).

5. "Security Analysis of Smart Locks"

- Author: Julian Turner, et al.

- Published by: OpenAI, 2018.

- This is a technical report that provides an analysis of the security aspects of various smart locks.

6. "Smart Door Locking System Based on Biometric Technology"

- Author: Iman Abdali, et al.

- Published in: 2018 3rd International Conference on Control, Automation, and Robotics (ICCAR).

- This paper discusses a smart door locking system that uses biometric technology for authentication.

7. "Design and Implementation of a Smart Door Lock System for the Internet of Things"

- Author: Beob Kyun Kim, et al.

- Published in: 2017 IEEE International Conference on Robotics and Automation (ICRA).

- This paper presents the design and implementation of a smart door lock system for IoT applications.

These references cover a range of topics related to smart door lock systems, including security, authentication methods, and IoT integration. You can explore these papers to gain a deeper understanding of the subject and find relevant information for your own smart door lock project.