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## IOT Based Smart Door Lock System

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### ABSTRACT

This paper presents the design and implementation of an Internet of Things (IoT) based smart door lock system equipped with keypad authentication. The system aims to enhance security and convenience by allowing users to remotely control access to their premises using a smartphone application. The architecture of the proposed system is detailed, highlighting the integration of hardware components, software modules, and communication protocols. Additionally, the paper discusses the authentication mechanism, security features, and potential applications of the smart door lock system. Experimental results demonstrate the effectiveness and reliability of the system in real-world scenarios.

Keywords: IOT, Smart Door Lock, Keypad, Authentication, Security, Remote access

### 1. Introduction

In the rapidly evolving landscape of home security and automation, Internet of Things (IoT) technology has become a cornerstone for enhancing safety and convenience. Traditional door locks, while effective to some extent, are increasingly vulnerable to sophisticated intrusion techniques. In response to these security challenges, IoT-based smart door lock systems have emerged as innovative solutions, offering users remote control and monitoring capabilities through smartphone applications. This paper introduces a novel approach to smart door locking, integrating IoT technology with keypad authentication to provide a secure and user-friendly access control system.

One of the key advantages of IoT-based smart door lock systems is their flexibility and scalability. Unlike traditional locks, which require physical keys or combinations, smart locks can be easily integrated into existing home automation ecosystems. This allows users to control multiple access points, such as front doors, garage doors, and even interior doors, from a single centralized platform. Additionally, smart door locks can be programmed to grant temporary access to guests, service providers, or family members, eliminating the need for physical keys or the risk of unauthorized key duplication.

Security is a paramount concern in any access control system, and IoT-based smart door locks are no exception. These systems employ robust encryption algorithms and authentication mechanisms to safeguard against unauthorized access and tampering. By leveraging techniques such as two-factor authentication and end-to-end encryption, smart door locks ensure that only authorized users can gain access to the premises. Furthermore, built-in sensors and alarms provide additional layers of security, alerting users to potential threats or intrusion attempts in real-time.

Moreover, the integration of machine learning algorithms into smart door lock systems holds promise for further enhancing security and functionality. By analyzing user behavior patterns and access logs, machine learning algorithms can identify anomalous activities and potential security threats. This proactive approach to security allows smart door lock systems to adapt and respond dynamically to changing threat landscapes, minimizing the risk of unauthorized access. Additionally, machine learning algorithms can optimize user experiences by predicting access patterns and adjusting authentication mechanisms accordingly. This predictive capability not only enhances convenience for users but also strengthens overall security by reducing the likelihood of false positives or unauthorized access attempts. As research and development in machine learning continue to advance, the incorporation of these technologies into smart door lock systems is poised to revolutionize the future of home security.

### 2. Literature Review

This section includes going through three different papers, published in Scopus indexed journal which have been summarized and presented in this table.

Table 1 –Table of Literature Review.

Publisher	Title	Summary
IEEE	IoT-based Smart Door Lock Systems: A Review	An Arduino kit was used to develop a project using a survey. The database verifies the user credentials. A buzzer alarm and an SMS alert are sent to the home owner together with a pop-up warning notification to the user if the programme receives invalid credentials.
IEEE	Design and Implementation of a Cloud-based Smart Door Lock System	An Arduino kit was used to develop a project using a survey. The database verifies the user credentials. A buzzer alarm and an SMS alert are sent to the home owner together with a pop-up warning notification to the user if the programme receives invalid credentials.
Springer	Security Analysis of IoT-based Smart Door Lock Systems	Apartments, homes, and businesses can all use the password-enabled door locking system.  Only approved users will be able to open the system after it has verified the user's password.

Only approved users will be able to open the system after it has verified the user's password.

### 3. Methodology

A smart door lock is an electromechanical lock that is intended to lock and unlock a door in response to a signal from a registered mobile device via Bluetooth, Wi-Fi, biometric sensors, access cards, or electronic keypad. The reason these locks are termed "smart locks" is that they make use of cutting-edge technology and Internet connectivity to facilitate user access and improve security against intruders. The physical lock, the key (which can be electronic, digitally encrypted, or virtual to enable keyless entry), a safe Bluetooth or Wi-Fi connection, and a management mobile app are the principal parts of a smart lock. In addition to monitoring access, smart locks have the ability to deliver warnings in reaction to certain circumstances.

#### 3.1 Requirement Analysis

1. Arduino Uno ATmega328p
  - Input Voltage Limits –
  - Recommended: 7 to 20V
  - Input/Output (I/O) pins: 1.8V to 5.5V
  - Output Current Limits : total of 200mA
2. 12 V Battery - Used for giving power to Solenoid lock system.
3. Solenoid Lock – Lock and unlock the system of door.
4. 4X4 Keypad - It helps adding input PIN in the system.
5. Relay – Is electromechanical device acts as a switch.
6. Node MCU - ESP32

Power consumption: Stand by 80 mAh

#### 3.2 Working

In this study, The IoT-based smart door lock system with keypad authentication operates through a series of interconnected components and processes to provide seamless access control and security features. User interaction initiates the authentication process, where individuals can input a predefined PIN code on the door's keypad or authenticate via a smartphone application. The system then verifies the user's credentials by comparing them with stored data in the system's database, and upon successful authentication, grants access by activating the electronic door lock mechanism, such as unlocking a deadbolt or disengaging a latch. Throughout this process, real-time monitoring detects any suspicious activities or unauthorized access attempts, triggering

immediate alerts to the user's smartphone application. Additionally, the system offers remote access capabilities, allowing users to lock or unlock the door, monitor access logs, and receive alerts from anywhere with an internet connection

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#### **4. Conclusions and future scope**

System allows the requiring direct user input, the suggested solution enables remote access to lock or unlock the door. The system satisfies the needs of supporting both the physically sensed keypad and the autonomous locking device. The system allows for key customisation and has minimal hardware requirements, the constructed prototype demonstrates that the idea uses very little power.

A smart door lock has enormous business potential in the future. Every day, its popularity grows. Estimates for the precise evolution of common mechanical devices during the next ten years vary. Bluetooth and WiFi are two of the newest technologies that we might encounter.

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