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COMBINATION LOCK SYSTEM USING PUSH BUTTONS

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Abstract: The design and implementation of a combination lock system with push buttons for embedded systems applications are examined in this study. Combination locks are a dependable security solution that may be used to secure safes, doors, and lockers, among other things. The suggested solution uses push buttons to collect user input and compares it to pre-programmed code that is kept on the embedded device. This implementation provides a small and effective solution suitable for various real-world scenarios. The combination lock system's practical implementation, algorithm development, system architecture, and design concerns are all covered in detail in this study. In order to shed light on the efficacy and adaptability of this suggested approach, other security considerations, usability elements, and prospective improvements are also investigated.

IndexTerms - Combination lock, Push button, Embedded systems, Security, Algorithm, Implementation

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I. INTRODUCTION

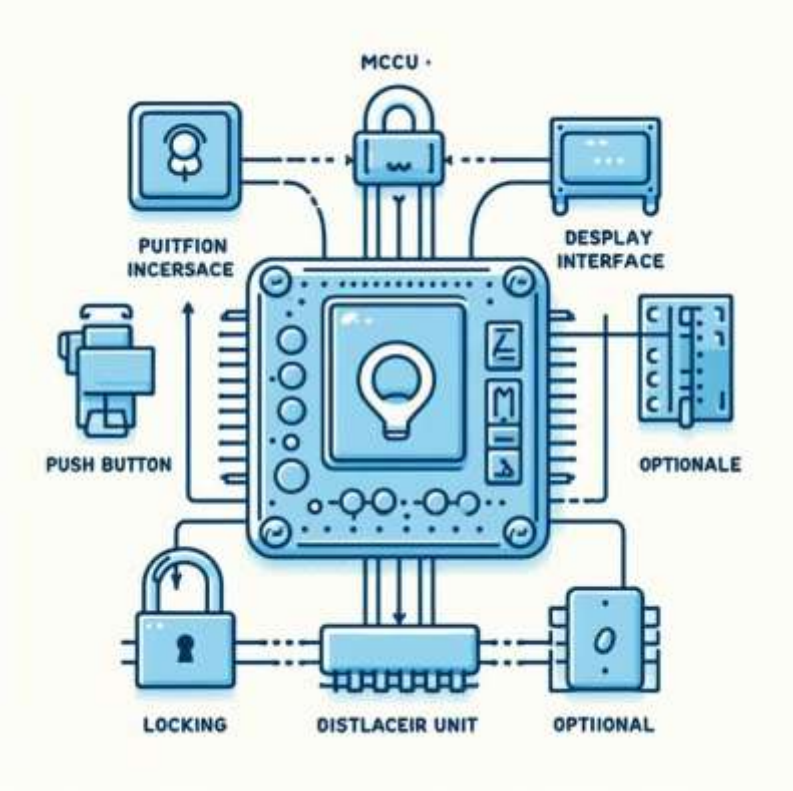
The simplicity, dependability, and efficacy of combination locks have led to their widespread usage for safeguarding a variety of physical assets. The mechanism of traditional combination locks is often unlocked by users entering a series of numbers on a dial or keypad. But the use of electronic parts and embedded systems in combination locks has become more popular as a result of technological advances. This work offers a contemporary and flexible method of addressing security issues by focusing on the design and implementation of a combination lock system for embedded devices employing push buttons.

II. DESIGN CONSIDERATIONS:

For the combination lock system to be practical, secure, and easy to use, a number of important factors must be taken into account during design. Important considerations are as follows: • Input Device Selection: Because push buttons are robust, simple, and simple to integrate with embedded systems, they are used as the main user interface. • Combination Length and Complexity: The user experience and security level of the system are directly impacted by the combination code's length and complexity. The ideal combination parameters must be determined by balancing security and usability.

• Algorithm Development: The performance and dependability of the system depend on the creation of an effective algorithm for comparing the entered combination to the specified code.

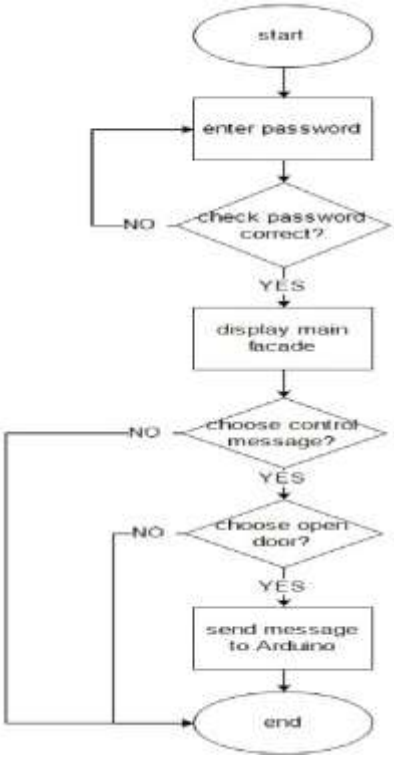
BLOCK DIAGRAM:



III. SYSTEM ARCHITECTURE:

The following parts make up the combination lock system:
A matrix-configured set of push buttons that accommodates the necessary amount of digits for the combination is known as a push button interface.
The Microcontroller Unit (MCU) is the central processing unit (CPU) that interfaces with the push buttons, verifies the combination, and regulates the locking mechanism inside the system.
• Optional Display Interface: An optional display interface can be included to provide the user feedback by telling them if the combination they entered was accurate or not.

FLOWCHART



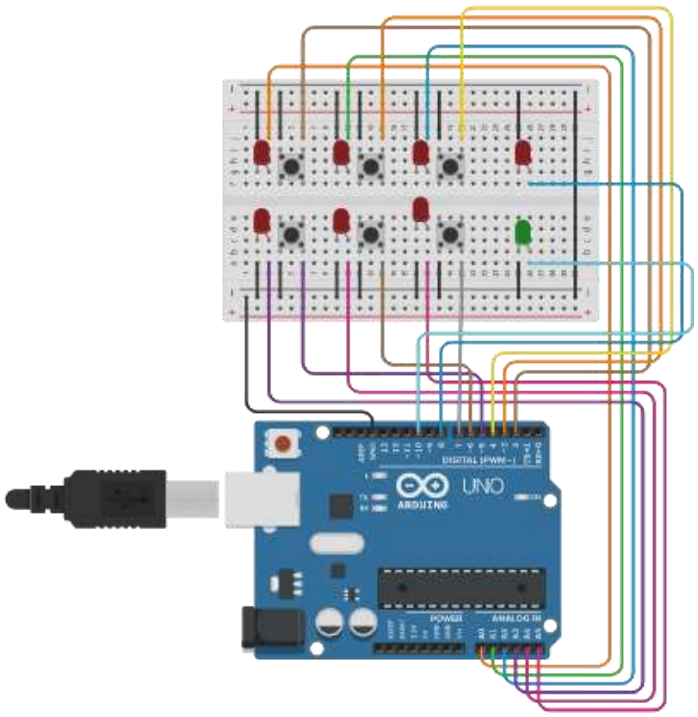
IV. ALGORITHM DEVELOPMENT:

The algorithm for validating the combination input consists of the following steps:

- **Initialization:** Initialize the system and define the predefined combination code.
- **User Input:** Capture the input from the push buttons corresponding to the entered combination.
- **Comparison:** Compare the entered combination with the predefined code.
- **Decision:** If the entered combination matches the predefined code, unlock the mechanism; otherwise, deny access.

V. PRACTICAL IMPLEMENTATION:

An embedded development board containing a microprocessor, push buttons, and an optional display module is used to construct the combination lock system. The algorithm is embedded in the microcontroller firmware, and the hardware elements are coupled in accordance with the system design. To guarantee the system's functioning, dependability, and security in real-world situations, extensive testing and validation are carried out.



VI. Security and Usability:

By giving users the opportunity to create unique combinations and providing strong authentication procedures, the combination lock system strikes a compromise between security and usability. A user-friendly interface offered by push buttons makes combination entry simple. To improve the system's resistance to unwanted access attempts, additional security features like timeout functions and anti-tamper methods can be included.

VII. Conclusion and Future Work:

In conclusion, an efficient and adaptable security solution is offered by the design and implementation of a combination lock system for embedded systems that uses push buttons. By utilizing integrated technology, the system provides a cutting-edge substitute for conventional mechanical combination locks while also improving usability and functionality. Subsequent efforts might involve refining the algorithm even more, incorporating sophisticated security measures, and investigating other user interface configurations to meet the needs of a range of applications.

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