

Smart Key

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Abstract: *The use of the student accommodation room security system at the Universiti Pertahanan Nasional Malaysia (UPNM) is now no longer considered efficient due to several problems experienced by the students themselves such as the limited provision of accommodation room keys causing difficulties due to the need to share keys, loss and damage to property in the accommodation room as a result of break-ins and waste of time and energy by students to follow procedures to replace new dorm room keys. Now with the Smart Key System can increase the level of security and make it easier for students to access their accommodation. The system equipped with Arduino Uno microcontroller hardware allows students to access using a password pin and also through an Android smartphone application. This system has a security feature in sending Short Messaging Services (SMS) notifications to registered user phone numbers. All user and administrator information for this system such as full name, username, application/web password and even phone number are stored in the MySQL database. In addition, the website for system administrators was developed using HTML, BOOTSTRAP, CSS and PHP while the Android application for users was developed using Kodular and PHP. Overall, the Smart Key system that was developed can improve the safety and convenience of students while also helping administrators to monitor the progress of the system.*

Keywords: *Arduino; Android; Smart Key.*



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1. INTRODUCTION

UPNM provides accommodation to students who continue their studies at the National Defense University of Malaysia (UPNM). It is a resting place for students between lectures, leisure and self-administration, and is the safest place to store personal belongings. During the absence of male or female students, the accommodation rooms are locked to prevent misbehavior. The Smart Key system acts as a digital key for student accommodation room access, and the development of the Smart Key system will help to overcome the problems faced by students.

2. METHOD & MATERIAL

The Agile Software Development (ASD) methodology was chosen as the methodology to be used in the development of this Smart Key system, based on several factors such as technical excellence and good design increasing agility. The ASD methodology model consists of six phases, namely planning, design, construction, testing, implementation and feedback. Figure 1 show description of each phase in the chosen Agile Software Development (ASD) methodology.

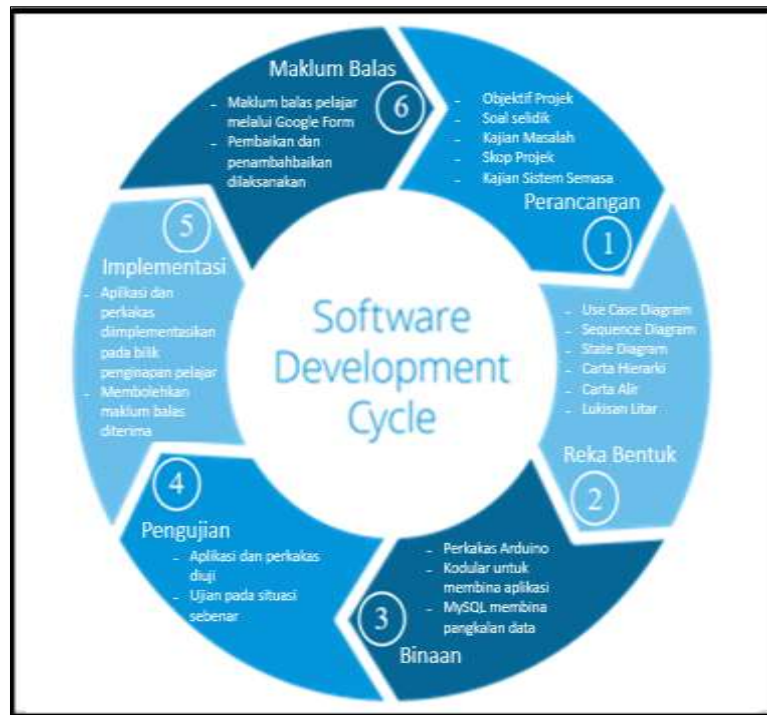


Figure 1. Agile Methodology for Smart Key System

There are several materials used in developing this system to ensure that this system is successfully developed. The materials used are as follows:

1. Users
 - a. Students who get an offer to stay at the UPNM accommodation college.
 - b. The administrator who manages the system.
2. Software
 - a. *Kodular*
 - b. *Arduino IDE*
 - c. *MySQL*
3. Hardware
 - a. *Arduino Uno R3*
 - b. *NODEMCU ESP32*
 - c. *HC-05 Bluetooth Serial Module*

- d. LCD 20x4 I2C
- e. Membrane 4x4 Matrix Keypad

The correct installation of Arduino equipment is very important in ensuring that this system can achieve the main objective in solving the problem, which is to open and close the student's residence college door when receiving a password input or Bluetooth signal from the student. In addition, it is also to ensure that the equipment can operate smoothly according to the system development specifications that have been targeted.

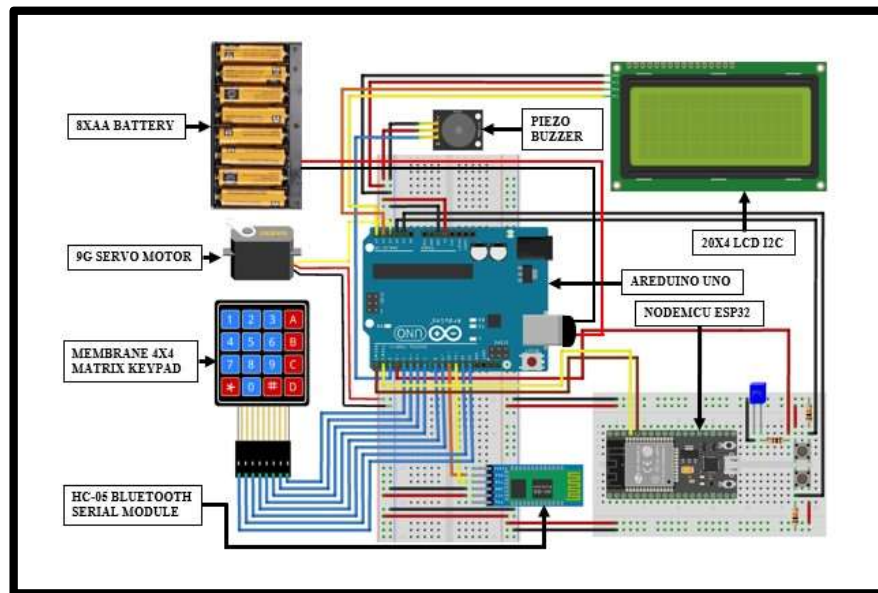


Figure 2. Arduino circuit drawing

3. FINDINGS

The Smart Key system that was developed is to increase the level of security for students in the accommodation room in addition to increasing the level of convenience for students. In this system, students can register through the application and update their door password alerts and student phone numbers. The updated student door password information will be used by students to access the accommodation room while the student's phone number information will be used for notification notifications. Student information will be stored in the MySQL database and will be retrieved by the device from the MySQL database through the web request method sent. Interface design is used to enable students and administrators to access the system.

3.1 Interface Design

Figure 3 and 4 show interface design is used to allow students and administrators to register personal information into the system.



The image shows a web-based admin registration form titled "New Admin". It is part of a system called "SMART KEY", as indicated by the header. The header also includes links for "Students List", "Admins List", "Info", and "Logout". The form itself has four input fields: "Full Name", "Username", "Password", and "Phone Number". Below these fields are two buttons: a blue "Save" button and a white "Cancel" button with a grey border.

Figure 3. Admin registration interface design



The image shows a mobile app-based student registration interface. The header is a dark blue bar with the text "SMART KEY" and a three-dot menu icon on the right. The background of the screen is light blue. In the center, there are four white input fields with rounded corners, labeled "Fullname", "Username", "Password", and "Mobile Number". Below these fields are two dark grey buttons with white text: "DAFTAR" (Register) and "LOGIN".

Figure 4. Student registration interface design

Registration information for administrators and students will be stored in a MySQL database that will be reused for the login process into the system. Figure 5 and 6 show Interface design is used to allow students and administrators to login into the system.



Figure 5. Admin login interface design



Figure 6. Student login interface design

3.2 Algorithm System Design

The system algorithm is to enable the system to be explained logically step by step. Figure 7 and 8 shows the algorithm design for this system.

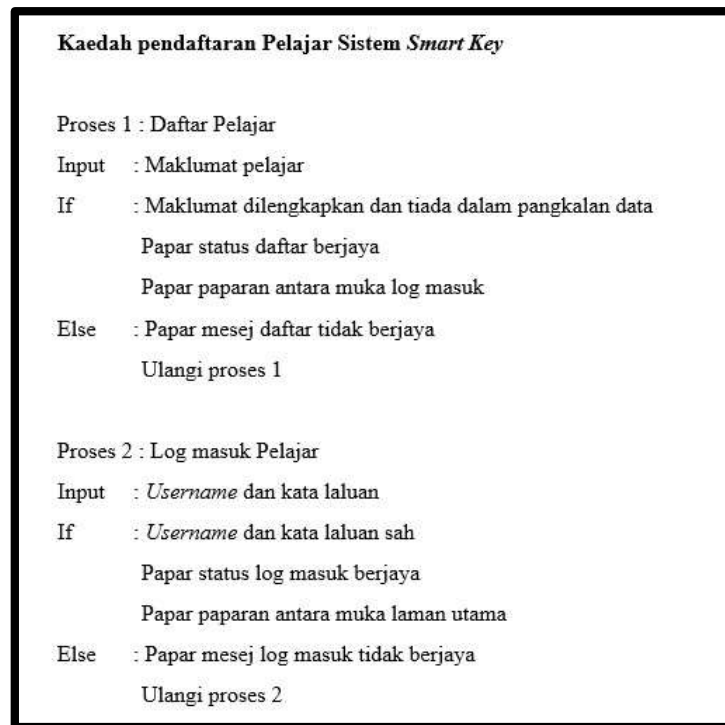


Figure 7. Algorithm design for student registration

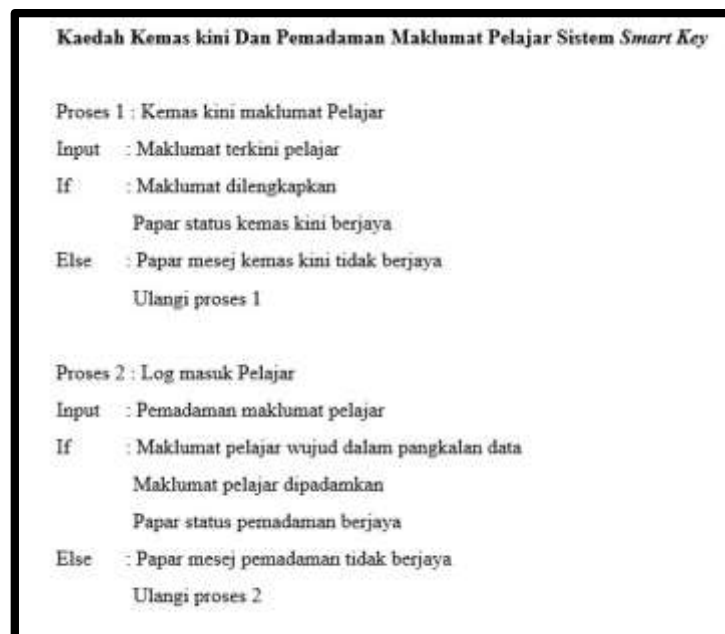


Figure 8. Algorithm design for student update and delete

4. DISCUSSION

This Smart Key system has been successfully developed to replace the existing lock method. It provides many benefits to users and organizations, such as making it easier for users to exit and enter by using door passwords and Android devices without having to use physical keys, creating a database to store user information and door passwords, and implementing security features such as notifications and alarms to discourage strangers from accessing the residential college. Additionally, it is more

efficient and effective used in residential colleges by all room occupants with the use of keypads and Bluetooth connection devices, and can prevent the occurrence of any intrusion with SMS notifications and alarms. This system allows only the appointed administrator to access student information and supervise the system to prevent any unwanted leakage of information from unknown parties. It only allows access through the device's Bluetooth connection and stores all student and administrator information in a MySQL database. It also has security features such as no repetition of using the same username and phone number and a five minute lockout period to prevent wrong attempts.

5. CONCLUSION

The system development has achieved the targeted objectives, but modifications and improvements are needed to meet current requirements. It is hoped that the system can be used and implemented by residential colleges in UPNM.

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