

Implementation of attendance machine for entrance access system based on barcode scanning

Faisal Lubis¹, Bakti Viyata Sundawa², Cholish³

¹Mechanical Engineering, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

²Telecommunication Engineering, Politeknik Negeri Medan, Medan, Indonesia

³Electrical Engineering, Politeknik Negeri Medan, Medan, Indonesia

ARTICLE INFO

Article history:

Received Jan 20, 2023

Revised Jan 25, 2023

Accepted Jan 31, 2023

Keywords:

Barcode
Gy906 Sensor
NodeMCU ESP32
IR Proximity Sensor
Prototype

ABSTRACT

Attendance in Universitas Muhammadiyah Sumatera Utara (UMSU) uses the manual attendance method. So it is less effective to implement, because manual attendance is not environmentally friendly and in the process fraud can still occur. In addition, the health protocols that we should have implemented both on campus and in classrooms must still exist considering this is a post-pandemic. Based on these problems, the purpose of this research is to make a prototype of the entrance and attendance access system which is carried out by utilizing the features on the NodeMCU ESP32. The design step is divided into 2, namely hardware and software design. The manufacturing process for the door access system is carried out by utilizing the Gy906 temperature sensor as a body temperature detector, a relay to turn on the pump, an IR proximity sensor to detect people who are going out, and a servo motor as an open- or closed-door driver. Next, the process of making attendances is carried out using a barcode on the KTM (Student Identity Card) which is connected to the application that has been made so that the output for the presence can be seen on a google spreadsheet. This tool can make it easier to make attendance and access entrances and exits without touching the door.

This is an open access article under the CC BY-NC license.



Corresponding Author:

Bakti Viyata Sundawa,
Department of Telecommunication Engineering,
Politeknik Negeri Medan,
Jalan Almamater no.1 Kampus USU, Medan, 28711, Indonesia.
Email: baktisundawa@polmed.ac.id

1. INTRODUCTION

Attendance is an attendance made by an agency. Attendance shows how an agency is well intertwined because it shows the existence of intertwined activities. Universitas Muhammadiyah Sumatera Utara (UMSU) is an agency that uses attendance as an important thing in lectures, but in its application, it still uses manual attendance which has many shortcomings, for example, it takes a long time so that learning time in class is reduced, requires a lot of paper so that it is not environmentally friendly, and the possibility of human error.

Since entry of Covid-19 virus pandemic into Indonesia in March 2020, government has decided that community activities should be carried out online as well as teaching and learning

activities at UMSU. The covid-19 virus outbreak had decreased in mid-2021 so that activities outside the home began to be carried out by the community, such as face-to-face learning and others [1-3]. However, outbreak of this virus peaked again with a new variant in November 2021, so it can be concluded that this situation may increase at any time, plus new variants appear. However, in early 2022 after covid-19 was reduced in Indonesia, the government has given freedom to carry out face-to-face activities.

After pandemic, Indonesian government has given permission for people to carry out activities outside the home but must heed health protocols. Health protocols must continue because they are good for health. In its implementation, health protocols are still carried out in public places, such as schools, campuses, shopping places, places of worship, and others. These health protocols include temperature checks and hand sanitizers.

Previous research has been carried out, such as: "Implementation of RFID to identify the verified presence of an Android-based online attendance system [4]". In the study, L298N Mini Motor Driver was used to rotate the original DC Motor as a door open/close. This study modified the electronic door by replacing the original microcontroller with the NodeMCU ESP8266, adding a mini motor driver and using the original DC motor door. This study updated the locking system on electronic doors from a solenoid door lock to a mechanical system with a DC motor drive.

Next, the study is "Control of Entrance Access Rights Using QR-Code [5]". This research utilizes a self-made and modified QR-code scanner application that instructs android as a medium to open the door where there is a QR-code. If you already have user data, it can be used as an access right to unlock the door and can be an efficient virtual lock. The system is monitored through a website that communicates with Arduino to control the entire security system by storing data and recording the data of users who scan and enter the room.

Next, "Design an Infrared Thermometer System and Automatic Hand Sanitizer to Break the Chain of Spread of Covid-19 [6]". This research is in the form of a working system based on the distance detected between the sensor and human hands. The ultrasonic sensor will forward data in the form of a measured distance to the Arduino. Then Arduino will process and process the distance so that it can control the movement of the servo motor. This system planning utilizes a temperature sensor (MLX90614) as an input that functions to detect contactless-based temperatures, and the LCD and buzzer are outputs. The input and output will be controlled by Arduino Uno.

2. RESEARCH METHOD

Research method is consisting of:

1. The first stage is to design the block diagram of the system to be used. The system block diagram serves to make it easier to plan the system to be made from the input to the system output.
2. The second stage is hardware design. Design of electronic components used in system design. The hardware system consists of a sensor, a buzzer microcontroller, a 16x2 LCD, and a relay connected with a mini DC pump.
3. The third stage is software design. Software design is the design of a system through a program for each component used. Software design consists of programs for temperature sensors, IR proximity sensors, NodeMCU ESP32, relays, and buzzers. The next software design is to create an application to scan barcodes on a smartphone and customize the application with NodeMCU ESP32.
4. Testing, the test method is divided into several steps, namely testing the temperature sensor, testing the buzzer, testing the relay, testing the servo motor, and testing the proximity IR sensor. The purpose of testing is to check whether the components are working or not and make sure the program provided is appropriate or not.
5. Analysis The test results of the tools made are then carried out an analysis of these results. The analysis methods used are as follows analyze each program that has been created and comparison with testing with component datasheets.

The following is a working system of the tool using a flowchart (flowchart). The flowchart contains a flowchart of designing how the tool works, which consists of reading commands, and identifying commands. The tool design flowchart is shown in figure 1.

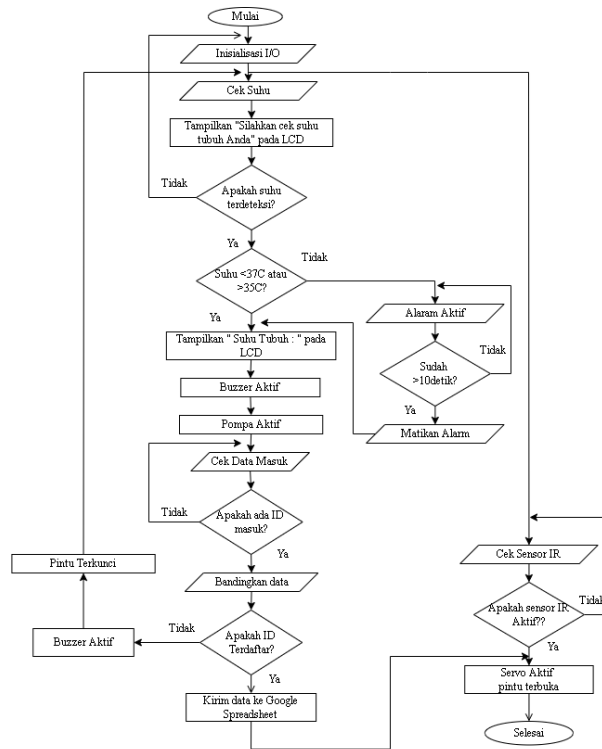


Figure 1. Flowchart System

3. RESULTS AND DISCUSSIONS

Testing aims to prove whether the designed system has fulfilled the previously planned functions. The test results are utilized to improve system performance in further system development. The test method is selected based on the functional and some parameters that the system wants to know. The data obtained through testing will provide information that can be used for system improvement.

Application Connectivity Testing with the System. Testing is done by connecting the system via Bluetooth to the Locker app that has been created with the system. At the beginning, the display condition in the Locker application is Disconnect, to connect it is enough to press turn on Bluetooth and connect it with Bluetooth on the system. If connectivity is successful, then disconnect will change to Connect.

Testing via google spreadsheets aims to input attendance data when KTM barcodes are scanned through the Locker app. The test results are shown in Table 1. System testing is the result of testing systems that have been made. Barcode Entry and Scan Attendance Test Results are shown in Table 2.

Based on the tests carried out, it was obtained that the system will work when the system has been connected to the Locker application via Bluetooth and connected to the internet so that the Locker application can scan the KTM barcode and send the data to google spreadsheet as a form of attendance. In addition, the scan results will also be checked by the microcontroller, if the data is registered, the microcontroller will signal the servo motor to open the door. However, if the KTM barcode is not registered then the servo motor cannot be driven to open the door.

In the attendance test on google sheets the data sent is in the form of time, ID, name, and status. Attendance times submitted to google sheets include dates, hours, minutes, and seconds. The ID displayed on the google spreadsheet shows the information on the KTM barcode. When testing barcode scans, the author found that, when the lighting is lacking on smartphone barcodes, it takes time and is difficult to scan. Therefore, a supportive light is needed so that the barcode can be read by the Locker application on a smartphone.

Table 2 shows the test results of the system, the door will not open if an error is detected. Normal temperature conditions and registered NIM indicate successful temperature readings, and temperature measurement results are displayed on the LCD, buzzer as an active detectable temperature indicator and active hand sanitizer pump. The attendance that went through google sheets was successful. At normal temperature conditions and NIM not registered indicates a successful temperature reading, the temperature is displayed on the LCD, the buzzer is active. However, the attendance is not inputted because the NIM is not registered. Entrance and exit access cannot be done. The system will stop if an error is detected.

Table 1. Google sheets attendance testing with polmed locker app

No.	TIME	ID	NAME	STATUS
1	7/7/2022 20:31:39	1905061025	Prima	IN
2	7/7/2022 20:32:13	1905061025	Prima	IN
3	7/7/2022 20:41:59	1905061025	Prima	IN
4	7/7/2022 20:41:59	1905061025	Prima	IN
5	7/8/2022 4:13:51	1905061025	Prima	IN
6	7/8/2022 4:19:03	1905061025	Prima	IN
7	7/8/2022 4:20:28	1905061025	Prima	IN
8	7/8/2022 4:21:18	1905061025	Prima	IN
9	7/8/2022 4:22:35	1905061025	Prima	IN
10	7/8/2022 4:25:26	1905061025	Prima	IN

Table 2. System Testing

FIRST EXPERIMENT → Conditions: Normal temperature and NIM Registered	
Temperature Read	Successfully
Buzzer	Active
Temperature Value on LCD 16x2	35,69 ⁰ C
Hand sanitizer Pump	Active
Student Name	Prima
Attendance Time	7/7/2022 20:31:39
Entrance	Active
Exit	Active
SECOND EXPERIMENT → Conditions: Normal temperature and NIM Registered	
Temperature Read	Successfully
Buzzer	Active
Temperature Value on LCD 16x2	35,13 ⁰ C
Hand sanitizer Pump	Active
Student Name	Prima
Attendance Time	7/7/2022 20:41:59
Entrance	Active
Exit	Active
THIRD EXPERIMENT → Conditions: Normal temperature and NIM Registered	

Temperature Read	Successfully
Buzzer	Successfully
Temperature Value on LCD 16x2	Active
Hand sanitizer Pump	35,49 ⁰ C
Student Name	Prima
Attendance Time	7/7/2022 20:41:59
Entrance	Active
Exit	Active

FOURTH EXPERIMENT → Conditions: Normal temperature and NIM Not Registered

Temperature Read	Successfully
Buzzer	Successfully
Temperature Value on LCD 16x2	35,49 ⁰ C
Hand sanitizer Pump	Active
Student Name	-
Attendance Time	-
Entrance	No active
Exit	No active

FIFTH EXPERIMENT → Conditions: Abnormal temperature and NIM Registered

Temperature Read	Successfully
Buzzer	Successfully
Temperature Value on LCD 16x2	Active
Hand sanitizer Pump	37,2 ⁰ C
Student Name	-
Attendance Time	-
Entrance	No active
Exit	No active

4. CONCLUSION

The test results of the system show that the system can work properly according to the purpose for which the system was designed. The system will not open the door if an unmet entry requirement is detected, namely abnormal temperature and NIM is not registered in that class. Then the conclusion is obtained: (a). The Gy906 temperature sensor is effectively used to measure body temperature and can detect objects at 3-6 cm. When the sensor detects the temperature of the object, the temperature will be measured, the buzzer will sound, and the pump will work to provide a hand sanitizer, (b). Access the entrance using the scan barcode results, when the barcode is registered on the system, the door will be opened, (c). Proximity IR sensor can detect objects at a maximum distance of 7 cm from the sensor, when the sensor detects an object then the exit door opens, (d). By using this system, it can be more effective to implement health protocols on campus because all processes are carried out contactless.

ACKNOWLEDGEMENTS

The author would like to thank Universitas Muhammadiyah Sumatera Utara (UMSU) and the University of Muhammadiyah North Sumatra (UMSU) and Politeknik Negeri Medan (POLMED) for supporting this research activity.

REFERENCES

- Amelia Chandra, D., Santosa, F., Wahyudi, S., Teknologi Informasi, P., Rokania, S., Raya Pasir Pengaraian, J., Samo, R., & Rokan Hulu, K. (2021). Penerapan Metode Item Based Collaborative Filtering Berbasis Web Pada Recommender System Laptop. *Engineering And Technology International Journal Juli*, 3(2), 2714–2755. <https://doi.org/10.55642/eatij.v3i02>
- Daniati, S., Saputri, N., & Gatrimananda, Z. (2022). Efektivitas Model Pembelajaran Collaborative Teamwork Learning (CTL) Berbasis Praktikum pada Mata Kuliah Rias Fantasi untuk Meningkatkan Softskill
- Faisal Lubis, Implementation of Attendance Machine for Entrance Access System Based on Barcode Scanning*

- Mahasiswa. *TEKNOBUGA: Jurnal Teknologi Busana Dan Boga*, 10(2), 140–149. <https://doi.org/10.15294/teknobuga.v10i2.37277>
- Fitriyanti, F., Laras, I. S., Khasanah, K., Anita, I. D., & Rahmawati, F. (2021). Implementasi Metode Collaborative Learning Dalam Pembelajaran Statistika Untuk Meningkatkan Keterampilan 4C (Critical And Problem Solving Skills, Collaboration Skills, Communication Skills, And Creativity And Innovation Skills) Pada Siswa Kelas XI. *Edunesia: Jurnal Ilmiah Pendidikan*, 2(1), 249–259. <https://doi.org/10.51276/edu.v2i1.115>
- I. S. Joyosemito and N. M. Nasir, "Gelombang kedua pandemi menuju endemi covid-19: Analisis kebijakan vaksinasi dan pembatasan kegiatan masyarakat di Indonesia," *Jurnal Sains Teknologi Dalam Pemberdayaan Masyarakat*, vol. 2, no. 1, pp. 55-66, 2021.
- Maqbulin, A. (2020). The Use of Information and Communication Technology (ICT) in English Teaching for Islamic Senior High Schools in Nganjuk. *Inovasi-Jurnal Diklat Keagamaan*, 14(3), 170–179. <https://doi.org/10.52048/inovasi.v14i3.163>
- Marfuah, M. (2017). Improving Students' Communications Skills Through Cooperative Learning Models Type Jigsaw. *Jurnal Pendidikan Ilmu Sosial*, 26(2), 148. <https://doi.org/10.17509/jpis.v26i2.8313>
- N. S. Tanuwijaya and W. Tambunan, "Alternatif solusi model pembelajaran untuk mengatasi resiko penurunan capaian belajar dalam pembelajaran tatap muka terbatas di masa pandemic covid 19," *Jurnal Manajemen Pendidikan*, vol. 10, no. 2, pp. 80-90, 2021.
- N. Hasanah, "Dampak Pandemi Covid-19 terhadap Proses Pembelajaran di Taman Pendidikan Al-Qur'an (TPQ)," *Jurnal Riset Dan Pengabdian Masyarakat*, vol. 1, no. 1, pp. 70-88, 2021.
- N. D. PUTRA, "IMPLEMENTASI RFID UNTUK MENGIDENTIFIKASI KEHADIRAN TERVERIFIKASI PADA SISTEM PRESENSI ONLINE BERBASIS ANDROID."
- Y. P. Utama and J. Sutopo, "KENDALI HAK AKSES PINTU MASUK MENGGUNAKAN QR-CODE," University of Technology Yogyakarta, 2019.
- S. N. Wirna, "Rancang Bangun Sistem Infrared Thermometer dan Antiseptic Hand Sanitizer Otomatis Untuk Memutus Rantai Penyebaran Covid-19," Universitas Andalas, 2021.