Prototype of IoT-Based Administrative Service Visitor Counting Device in Cimone Jaya Village

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Abstract - Cimone Jaya Village is one of the government agencies tasked with providing services to the community for making correspondence. Every day many people come to the village to get correspondence services. Because of the large number of people who come to the village, the village wants to know the number of visitors who come to the village every day to get services because currently the village does not care how many people come to the village to get services so that the village does not know how many people visit the village to get services. This study created a visitor counting tool using an Arduino microcontroller, RFID Reader, RFID card and LCD (Liquid Crystal Display). This tool was created to find out the visitor counting system for administrative services in Cimone Jaya Village, to make it easier for the agency in recording administrative service calculations, to create accuracy in the method of calculating administrative services.
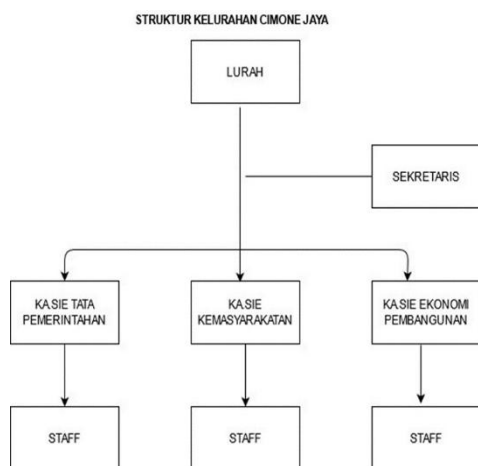
1. INTRODUCTION

Public administration services at the sub-district level are an important aspect of good governance. Cimone Jaya Sub-district, as one of the administrative units of government, has the responsibility to provide effective and efficient services to the community. However, the management of visitor data which is still done manually poses various challenges in optimizing administrative services. According to research conducted by Pratama et al. (2023), the manual visitor recording system in public service offices often faces problems such as data inaccuracy, difficulties in analyzing visit trends, and limitations in resource planning. This is in line with the findings of Ahmad and Susanto (2022) which stated that 67% of sub-district offices in the Tangerang area still use a manual recording system that is prone to errors and takes longer to process data.

The development of Internet of Things (IoT) technology opens up opportunities for modernizing public service systems. As stated by Widodo et al. (2023), the implementation of IoT in public services can increase operational efficiency by up to 45% and data recording accuracy by up to 98%. Rahman and Putri (2022) in their research added that IoT-based systems can help the government analyze community visit patterns and optimize resource allocation. In today's digital era, public demands for more efficient public services are increasing. The results of a survey conducted by the Ministry of State Apparatus Empowerment and Bureaucratic Reform (2023) showed that 78% of the public expects a modernization of the service system at the sub-district level. In line with this, Kusuma and Wicaksono (2023) emphasized the importance of digital transformation in public services to increase public satisfaction and the efficiency of the apparatus' work.

Cimone Jaya Village, with an average of 50-100 visitors per day (Data from Cimone Jaya Village, 2023), requires a more accurate and efficient visitor counting system. This is supported by research by Hidayat et al. (2023) which found that the implementation of an IoT-based visitor counting system can reduce service time by up to 40% and increase data recording accuracy by up to 95%. Based on these problems, the development of a prototype of an IoT-based visitor counting system in Cimone Jaya Village is very relevant and important. This system is expected to help in collecting more accurate data, better analyzing visiting patterns, and ultimately improving the quality of administrative services to the public.

1. CONCEPTUAL STAGE

2.1 Prototype

Ageng Setiani Rafika, et al, (2019), "A prototype is a rapid change in the design and construction of a prototype". Meanwhile, according to Simarmata, (2010:64) "A prototype is a product model that represents the actual production results".

2.2 Arduino

Sumarni Jupri, et al, (2021). Arduino is the name of a family of microcontrollers that were originally created by the Smart Projects company, one of the creators is Messimo Banzi. This board is an "Open source" hardware so that it can be made by anyone.

2.3 IoT (Internet of Things)

According to Setiawardhana, et al. (2021), the Internet of Things (IoT) is a system for transmitting internet-based data or information on embedded devices, eliminating the need for large computers and laptops physically. The system is connected via sensors to monitor or monitor physical information from the environment. The system is connected to the actuator and provides a response or action to the status of the monitoring results.

2.4 Radio Frequency Identification (RFID)

Haryo Kusumo, et al, (2022). Radio Frequency Identification (RFID) is a wireless identification system that can perform non-contact data processing such as barcodes and magnetic cards such as ATMs. RFID technology is suitable for automatic processes because it is easy to use. RFID combines advantages not found in other identification technologies (Motroni et al., 2021).

2.5 Liquid Crystal Display (LCD)

According to Andrian Eko Widodo and Suleman (2020). "Liquid Crystal Display (LCD) 16x2 is a display made of liquid crystal material whose operation uses a dot matrix system.

2.6 *Black Box*

According to Agus Utomo, et al, (2020). The black box testing method focuses on the functional requirements of the software. Therefore, black box testing allows software developers to create a set of input conditions that will train all the functional requirements of a program.

3 IDENTIFICATION OF PROBLEMS AND SYSTEM NEEDS

Cimone Jaya Village is a regional expansion of Cimone Jaya Village in 1998 including the Administrative Area of one of 16 Villages in Karawaci District, Tangerang City. Flanked by 3 Protocol roads, namely Jl. Merdeka (provincial road), Jl. Teuku Umar and Jl. Proklamasi (City road), the distance from the Tangerang City Government Center is ± 6.3 KM and from the Karawaci District Office ± 0.7 KM.

Figure 1. Organizational Structure of Cimone Jaya Village

3.1 Flowchart of the Running System

Figure 2. Flowchart of the running system

The following is an explanation of the system flow that runs.

1. Start is the beginning of the process of visitors entering the village office.
2. Then the visitor submits a service.
2. The visitor enters the village office and the visitor wants to exit, then the visitor exits the village office.
3. End is the end of the process.

3.2 Hardware Design of Visitor Counting Device

The tools and materials used in the research are generally designed like the block diagram in the image below.
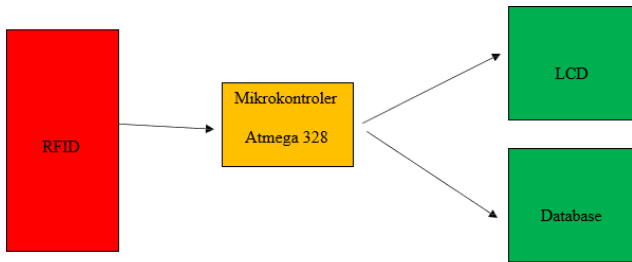

Figure 3. Visitor Counter Design Block Diagram

From the block diagram design above on the visitor counter as follows:

a. The microcontroller will read the input from the RFID Tag card then processed by the microcontroller.
b. Then the microcontroller will read the incoming card, then give a command to the LCD.
c. Then the LCD will display the number of numbers counted.
d. To print reports using the Mysql database.

3.4 Visitor Counter Tool Flowchart
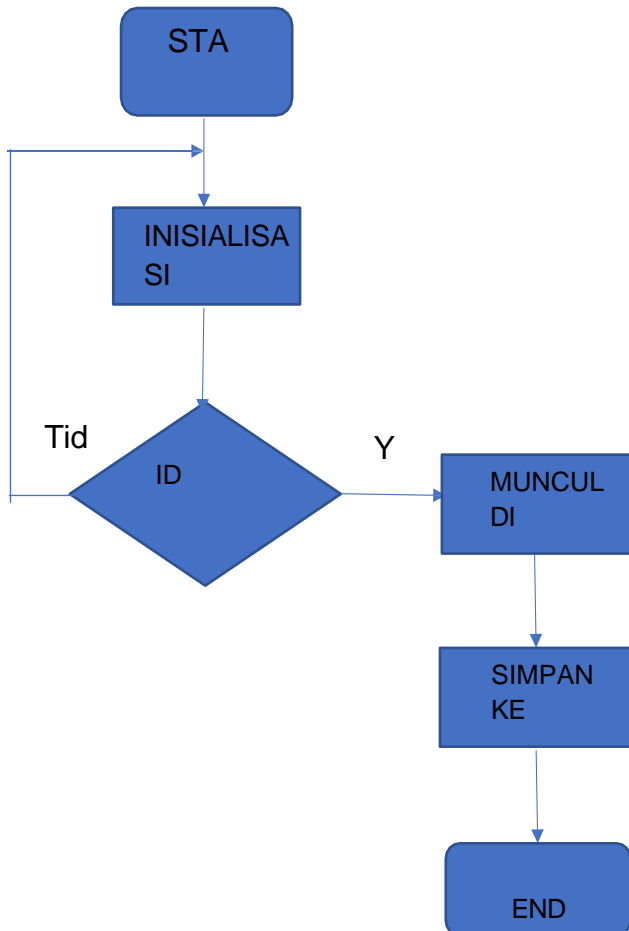
Figure 4. Visitor Counter Tool Flowchart

Visitor Counter Flowchart Explanation

a. Start is programmed in this section the new program starts.

b. Initialization, in this section the microcontroller checks all declarations.
c. In this section checks the condition of the card being read or not, if it is read it will appear on the LCD screen and or its value will increase. If not, then the number value on the LCD screen does not change.
d. End, in this section the execution program is complete.

3.5 New Procedure Proposal

After conducting research and analysis of the running system, several problems were found, namely the running system is still not optimal because the current visitor counting system process is still carried out by calculating the submission form for correspondence one by one. The proposed system design is made using an Arduino microcontroller, RFID Reader, RFID Tag, LCD screen and system analysis using Flowchart.

1. Identification of Needs

A. Hardware

The hardware of the door security device consists of:
1. Arduino uno microcontroller
2. RFID Reader
3. RFID Tag
4. LCD (Liquid Crystal Display)

Figure 5. Visitor Counter Hardware

Figure 6. Arduino microcontroller, RFID Reader, RFID Tag, LCD Screen

B. Software

The software used in the visitor counter is the Arduino IDE software which functions to enter programs on the Arduino Uno R3.
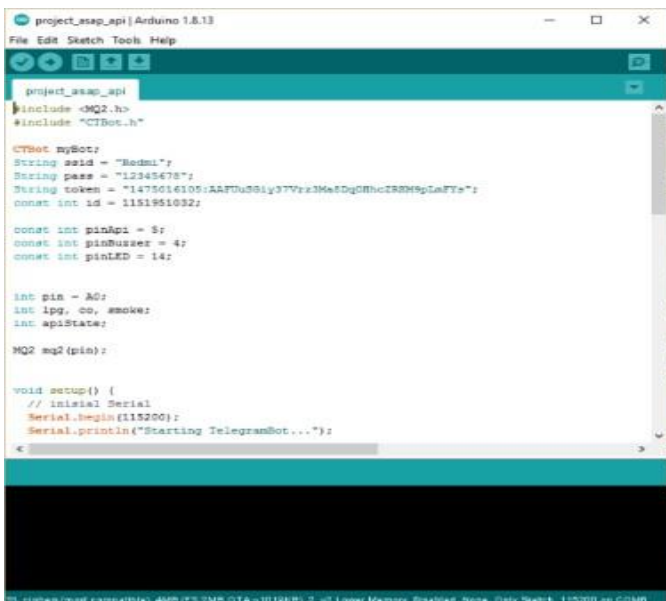

Figure 7. Software Arduino IDE

a. Visitor Counter Hardware Design
    The tools and materials used in the research are generally designed like a block diagram.
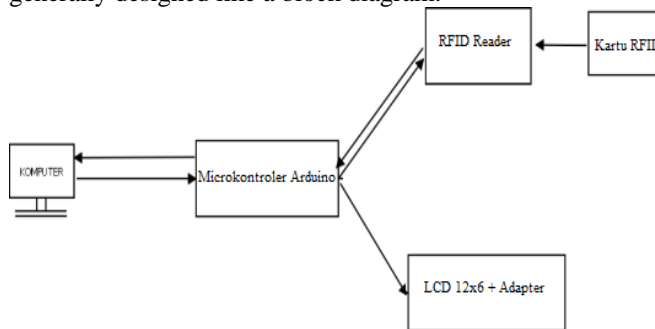

Figure 8. Hardware Tool Design Block Diagram

Explanation of the block diagram of the visitor counter hardware design as follows:

1. The RFID card is attached to the RFID Reader
2. Then the Arduino Uno will read the input from the RFID Reader and then provide information on the number of visitors on the LCD screen.

b. System Design Flowchart
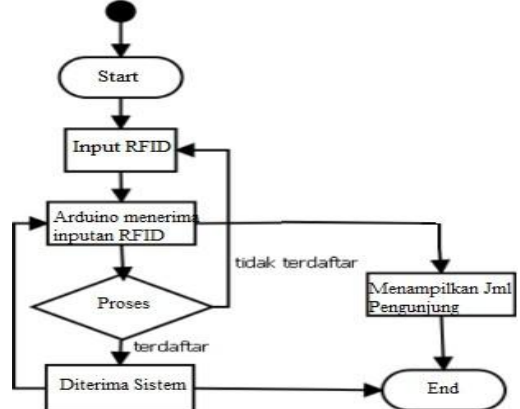
Figure 9. System Design Flowchart

there is an explanation of the visitor counter flowchart as follows:
1. The start process then by attaching the tag card to the rfid then it will be connected to the arduino from the arduino it will be processed to the system.
2. if the card data does not exist then it will return to the rfid and if it is registered then it will continue to the system to save the data.
3. From the system the data will be sent back to the arduino and display on the lcd the information on the number of visitors and if the card is not registered then the lcd will provide information that the card was rejected.

c. Arduino Circuit Design
    Design of visitor counting device circuit using Arduino microcontroller, RFID Reader, RFID Tag, LCD Screen. Overall circuit diagram of visitor counting device consisting of Arduino microcontroller, RFID Reader, RFID Tag, LCD Screen
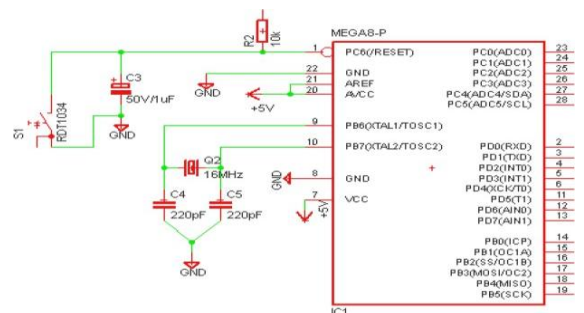

Figure 10. Administrative Service Visitor Counter Tool Series
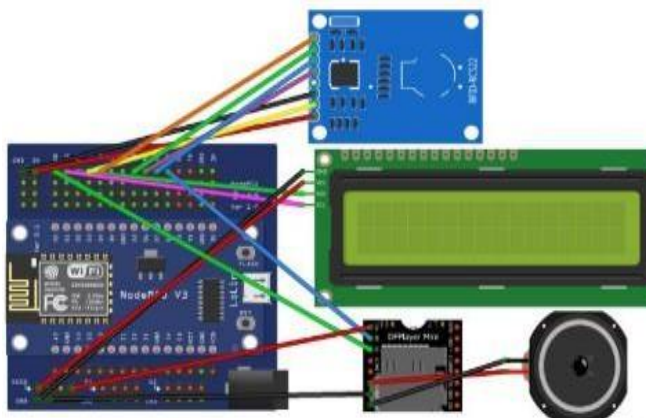
d. Entire Circuit Creation

Figure 11. Overall circuit

This image shows the circuit diagram of the visitor counting system using RFID with Arduino Uno R3.

e. Program Creation
Program creation (coding) using Arduino software. Arduino is an open source physical computing platform. Arduino is not only a development tool, but a combination of hardware, programming languages and a sophisticated Integrated Development Environment (IDE). Arduino IDE is software that functions to write programs, compile them into binary code and upload them into microcontroller memory.
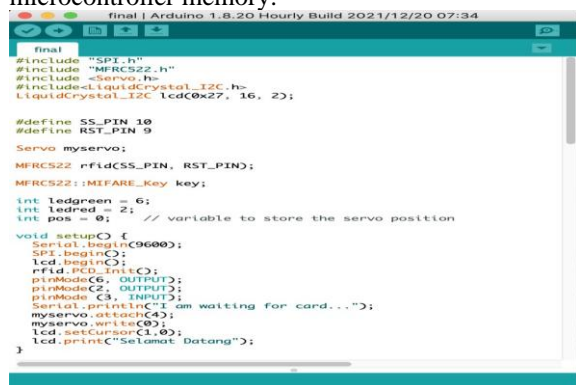
Figure 12. Visitor Counting Program

4 CONCLUSIONS

Based on the research and observations that have been carried out, several conclusions were obtained, as follows:

1. In making this tool, the components used are Arduino Microcontroller, RFID Reader, RFID Tag, LCD (Liquid Crystal Display) and MySQL as the database report.
2. The microcontroller will read the input from the RFID tag card. Then the data read by the microcontroller will be sent to the LCD, which will display the number of visitors.
3. When the officer attaches the RFID tag to the RFID reader, the data will automatically be read and appear on the LCD screen and its value will increase.

5 SUGGESTION

1. Training needs to be provided to users who will use the system as users, so that it can be utilized properly.
2. If the new system is running, it is necessary to pay attention and conduct periodic evaluations of the system to then make improvements according to the changes and developments of the system needed.
3. In the future, it is hoped that students who take the same thesis title can develop this system to be much better by adding a voice reader that functions to inform the number of visitors.

6 ACKNOWLEDGEMENT

BIBLIOGRAPHY

[1] Ahmad, R., & Susanto, B. (2022). "Analysis of Visitor Recording System at Village Office in Tangerang Area: Case Study of Public Service Modernization." Journal of Public Administration and Bureaucracy.

[2] Agus Utomo, et al. (2020). "Black Box Testing Method." Journal of Information Systems.

[3] Andrian Eko Widodo and Suleman. (2020). "Liquid Crystal Display (LCD) 16x2." Journal of Electronic Engineering.

[4] Ageng Setiani Rafika, et al. (2019). "Prototype Development." Journal of Information Systems.

[5] Haryo Kusumo, et al. (2022). "Radio Frequency Identification (RFID) System." Journal of Information Technology.

[6] Hidayat, S., Nugroho, A., & Wijaya, R. (2023). "Implementation of IoT System to Optimize Public

Service: Case Study in Village Area of Jakarta." Journal of Information and Communication Technology.

[7] Kusuma, D., & Wicaksono, P. (2023). "Digital Transformation in Public Services: Challenges and Opportunities in the Era of Society 5.0." Journal of Public Administration Innovation.

[8] Motroni, et al. (2021). "RFID Technology Implementation." International Journal of Engineering and Technology.

[9] Pratama, A., Wijaya, S., & Sari, R. (2023). "Evaluation of Manual Recording Systems in Public Services: Analysis of Effectiveness and Efficiency." Journal of Information Systems and Technology.

[10] Rahman, M., & Putri, L. (2022). "Utilization of IoT in Optimizing Public Services: A Systematic Study." Journal of Informatics and Systems Engineering.

[11] Setiawardhana, et al. (2021). "Internet of Things (IoT) Systems." Journal of Information Technology.

[12] Simarmata. (2010). Software Engineering. Yogyakarta: Andi Offset.

[13] Sumarni Jupri, et al. (2021). "Arduino Microcontroller Implementation." Journal of Electrical Engineering.

Widodo, A., Santoso, H., & Purnomo, R. (2023). "Analysis of the Effectiveness of IoT Implementation in Public Administration Services." Journal of Technology and Information Systems.