Internet of Things Based Automatic Visitor Counter

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ABSTRACT
In modern times, there are many recreational areas including, Gunung Lampu Tapaktuan Tourism. This destination is very crowded with local and foreign tourists. This study aims to determine the number of visitors, optimize the place, evaluate the area's attractiveness, and know how the tool works using the experimental method. Furthermore, the Internet of Things (IoT) connects physical objects with electronics, software, sensors, and networks that make these objects collect and transmit data. From the results of the trials that have been carried out, every passing visitor is read by an ultrasonic sensor and then sent to the Thingspeak server using the internet network and the registered apikey. The ultrasonic sensor sends data that has been read to the thing peak channel that is connected to the device so that the results of the monitoring are the number of visitors in the form of graphs and tables. The results of testing the tool for seven days contained a total of 1,596 manual data, 1,582 people were detected, and 14 people were not detected. While visitors came out there were 1,559 people caught, and 37 people were not seen. From the seven days of testing, 99.12% of incoming visitors were detected and 97.68% of outgoing visitors were detected. So that it can be concluded, that this tool has been functioning correctly.

INTRODUCTION
In modern times, many tourist attractions are visited, one of which is the Mount of Lights tour which is located in the Gampong Pasar area, Tapaktuan District. South Aceh Regency with Tapaktuan as the capital city holds so many charms and unique stories behind it. This area is often referred to as Dragon City and is known for its beautiful marine tourism. One of the places that are legendary and is considered mystical by the local community is Tapaktuan nature tourism. This tour is located in Gampong Pasar, Tapaktuan District, South Aceh. Approximately 1.5 km from the center of Tapaktuan City. To visit it is not easy, visitors have to pass through rocks of various sizes. The time to visit the location starts from 08.00 - 18.00 WIB. Data on the number of visitors to a tourist place is very important to find out how many visitors are interested in visiting the place. Until now, to get data on the number of visitors, generally still use the manual method (Kusumo, 2019). With the rapid development of electronic technology and so rapidly experiencing a revolution through the means or media. Various types of equipment have been made by humans to meet the wants and needs in carrying out all activities. Advances in science and technology encourage humans to try to overcome the problems that arise around them and ease human work (Sulaiman, 2017).

The concept of the Internet of Things (IoT) is increasingly being discussed in various fields along with the development of the world in this information age. Among them is a rain monitoring system in the drying process (Ilham, 2021), Infusion out notification (Candra, 2020), Prototype of alcohol counter on fruit (Nursila, 2021). Lamp to calculate the number of visitors to Mount Lampu tourism in Tapaktuan, South Aceh based on the Internet of Things.

LITERATURE REVIEW
NodeMCU
NodeMCU is an electronic board based on the ESP8266 module chip with the ability to run microcontroller functions and also an internet connection (wifi). There are several I/O pins so that they can be developed into monitoring and controlling applications for IoT projects (Fauzi, et al, 2017).
Figure 1. NodeMCU

Ultrasonic sensor

An ultrasonic sensor is a sensor that functions to convert physical quantities (sound) into electrical quantities and vice versa. This sensor is a ready-to-use ultrasonic sensor, a device that functions as a sender, receiver, and controller of ultrasonic waves (Budiarto, 2021).

Figure 2. Ultrasonic sensor

LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) is one type of electronic display made with CMOS logic technology that works by not producing light but reflecting the light around it to the front-lit or transmitting light from the back-lit. LCD (Liquid Crystal Display) functions as a data viewer in the form of characters, letters, numbers, or graphics (Ahmadil, 2018).

Figure 3. LCD (Liquid Crystal Display)

ThingSpeak

ThingSpeak is an open source “Internet of Things” application and API for storing and retrieving data from things using HTTP over the Internet or via a Local Area Network.

Figure 4. ThingSpeak
METHOD

Hardware
The hardware used in the design of the Number of Visitors Counter on Mount Lampu Tapaktuan South Aceh tourism based on the Internet of Things, among others:

| No | Name             | Function                                                                 |
|----|------------------|--------------------------------------------------------------------------|
| 1  | NodeMCU          | Functions as a controller of components in calculating the number of visitors on the IOT-based Mount Lamps Tapaktuan South Aceh tourism |
| 2  | Ultrasonic sensor | Functions as an Object Detection Tool                                    |
| 3  | Smartphone       | Functions as a monitoring medium                                         |
| 4  | Adapter          | Functions as a voltage source                                            |
| 5  | Wire cable       | Serves as a liaison between one component and another component          |
| 6  | LCD              | Function to display the results of the number of visitors who pass by    |

Software
The software used in the design of the Number of Visitors Counting Tool on the Mount Lampu Tapaktuan South Aceh tour based on the Internet of Things is:

1. Arduino idea
   Used for programming inside NodeMCU
2. Thingspeak
   Used to store and retrieve data from the Visitor Counting Tool on the Mount Lampu Tapaktuan South Aceh tour based on the Internet of Things

System Design Diagram
This design was made to simplify the process of designing a tool to calculate the number of visitors on the Mount Lampu tourism in Tapaktuan, South Aceh based on the Internet of Things. The following is a system design as shown in Figure 5.

![System Design Diagram](image-url)

Figure 5. System Design Diagram

Function:
1. Thingspeak functions to store and retrieve data on the number of visitors who come to Mount Lampu Tapaktuan, South Aceh
2. Ultrasonic sensor serves to detect objects that are running
3. Smartphone works as a device to run Thingspeak
4. WIFI serves to connect clients with access points
5. NodeMCU functions as a microcontroller enhancement
From Figure 6. above, it can be seen that when the system starts, the pins are initialized and the NodeMCU is connected to wifi, then it is connected to two ultrasonic sensors at the entrance and exit to detect running objects. If no object is running, the sensor does not detect it, if the sensor detects it, the NodeMCU will send visitor data to the Internet of Things Thingspeak Database.

**Design Scheme**

The whole series of tools for calculating the number of visitors on the Mount Lampu Tapaktuan South Aceh tour based on the Internet of Things can be seen in Figure 7.
RESULTS AND DISCUSSION

Overall Toolkit

Figure 8. Overall Toolkit

Thingspeak Display

Figure 9. Thingspeak Display

Every passing visitor will be read by ultrasonic sensors and sent to the thingspeak server using the internet network and API key that has been registered. The ultrasonic sensor will send data that has been read to the thingpeak channel that is connected to the device so that the results of the number of visitors can be monitored in the form of graphs and tables making it easier to find out the number of visitors entering and leaving the Mount Lampu Tapaktuan tour, South Aceh.

Test Table

Table 2. Test results of incoming visitors and outgoing visitors

| No | Date     | Manual Quantity | Visitors Login | Outgoing Visitors |
|----|----------|-----------------|----------------|------------------|
|    |          |                 | Detected       | Not detected     | Detected       | Not detected |
| 1  | 27-07-2021 | 211 people     | 208 people     | 3 people        | 208 people     | 3 people    |
| 2  | 28-07-2021 | 176 people     | 176 people     | 0 people        | 164 people     | 0 people    |
| 3  | 29-07-2021 | 202 people     | 199 people     | 3 people        | 193 people     | 3 people    |
| 4  | 30-07-2021 | 149 people     | 149 people     | 0 people        | 149 people     | 0 people    |
| 5  | 31-07-2021 | 350 people     | 346 people     | 4 people        | 346 people     | 4 people    |
| 6  | 01-08-2021 | 398 people     | 396 people     | 2 people        | 394 people     | 4 people    |
| 7  | 02-08-2021 | 110 people     | 108 people     | 2 people        | 105 people     | 5 people    |
|    | Amount    | 1,596 people   | 1,582 people   | 14 people       | 1,559 people   | 37 people   |
From table 2. Test results for seven days there are several manual data 1,596 people. In Visitors, Login found 1,582 people were detected, and 14 people were not detected. Meanwhile, for outbound visitors, 1,559 people were detected, and 37 people were not detected. Of the seven days of testing on incoming visitors, 99.12% were detected and 97.68% were detected for outgoing visitors.

CONCLUSIONS

1. From the results of testing the tool for seven days, there are 1,596 people from manual data. On Login Visitors found 1,582 people who were successfully detected, and 14 people were not detected. Meanwhile, for outgoing visitors, 1,559 people were detected, and 37 people were not detected. Of the seven days of testing on incoming visitors, 99.12% were detected and 97.68% were detected for outgoing visitors.

2. The designed number of visitors can be viewed directly from the LCD (Liquid Crystal Display), where the LCD (Liquid Crystal Display) will provide data on the number of incoming and outgoing visitors that have been received by the Ultrasonic Sensor.

3. Every visitor who is read by the ultrasonic sensor can be monitored via the Thingspeak web.

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