

ESP8266-based Child Monitoring Bracelet Based on Smartphone Connected to Parents Smartphones

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ABSTRACT

Indonesia of the country with diverse tourism destinations. This invites many tourists who come to Indonesia. In addition to promising tourism, safety and comfort are also one of the selling points that tourists consider in choosing a vacation place. Many cases of child loss in Indonesia occur in tourism places that are crowded with visitors, therefore this study aims to design, build, and analyze ESP8266-based child monitoring bracelets connected to smart phones. It can send the current location of the wristband to the smartphone so that the position of the missing child can be tracked by the parents. The test is carried out by measuring the distance between the two tools, if the distance between the parent and the child's bracelet reaches a maximum distance (50 meters) then the alarm on each bracelet will sound and within a radius below the maximum distance when the parent activates the switch, the alarm on the child will be active and vice versa. It's hoped that the existence of this smart bracelet can directly detect the location of children that are far from the reach of parents and can reduce cases of child loss that occur in tourism places crowded with visitors.

Keywords: *Bracelet, ESP8266, Monitoring, Technology, Tourism*

1. INTRODUCTION

Along with the advancement of innovation and science, lately the field of technology has experienced rapid progress. With these advancements, individuals generally seek to take advantage of existing innovations to make their lives simpler and easier, for example in terms of maintaining distance between parents and children to stay connected to each other, namely by using WiFi connections.

During school holidays or New Year, many parents invite their children to vacation, but sometimes parents forget their responsibilities in taking care of their children because they are engrossed in enjoying the holidays. As in the case of child loss that occurs in several regions of Indonesia. Every visitor must increase supervision of their children when invited to travel, lest our activities of exercising or taking cheerful pictures make us careless and forget the family we bring.

Based on the above problems, therefore the author wants to design a microcontroller-based distance measuring instrument as a gauge. This measuring device uses WiFi type ESP 8266 as a detector with a distance of 50 meters. It is hoped that in the future this tool can reduce cases of child loss in crowded tourism areas, where later this tool will be owned by every tourist location, then when there are families who enter the tourist area, this bracelet can be given to parents and children by officers as an identification as well as a tool for monitoring parents of their children.

2. RESEARCH AND METHODS

ESP8266 is a microcontroller introduced by Espressif System. Microcontrollers ESP8266 already have a WiFi module in their chip, which is very supportive for making Internet of Things application systems. The microcontroller ESP8266 has an operating voltage of 3.3 volts. Microcontrollers ESP8266 have more pin outs and analog pins and a larger amount of memory compared to the previous NodeMCU (Prafanto et al., 2021).



Figure 1. ESP8266

uBlox GPS NEO-6M Module is a module to track the location of the place where this module is located, with a high enough level of accuracy has up to 130 dBm tracking and navigation sensitivity, 0.25Hz – 10 MHz frequency of pulse time signals, and a maximum navigation increase of up to 10 Hz. Using data backup battery features, electronic compass integration, ceramic antenna integration to capture signals well. To communicate between GPS and Arduino, 4 libraries are needed named "TinyGPS++.h" in the Arduino IDE application (Romansyah & Supriyono, 2015).



Figure 2. uBlox GPS NEO-6M

The battery is a voltage source in an electronic circuit to be able to run the circuit as desired. The battery has a negative part and a positive part, the current in a battery will flow from the positive part to the negative part. Examples of using batteries as a voltage source for flashlights, laptops, and various circuits or electronic equipment that have other dc sources.



Figure 3. Battery



Figure 4. sim800L

The sim800L GSM module has a power pin and a data pin, where the data pin functions as a data receiver and as a data sender to be connected to a microcontroller, GND as grounding is connected to the negative pin of the middle source, and the VCC pin as a voltage source is connected to the Positive pin which has a middle source of 5 Volts.

Buzzers are commonly used as speakers that have a high-pitched sound output. Piezo is needed if Arduino is used in projects that require sound as an indicator (Hanafie et al., 2019). Buzzers work by utilizing a wavy electric current then converted into vibration and the vibration propagates through the air (turns into sound). In its use, buzzers are commonly applied to home security alarms, fire alarms, sensors for car parking, alarm clocks and others.



Figure 5. Buzzers

Arduino IDE is made for beginners who do not have skills in programming languages or beginners who just want to learn. Arduino uses the C ++ programming language which has been made easier by adding libraries as coding examples. Arduino uses processing software that is used to insert programs made into Arduino. Arduino IDE is used to create programs, compile into a binary number code, upload into memory, 6 and use a microcontroller as a program management tool (Fezari & Dahoud, 2018).



Figure 6. Arduino IDE

There are several previous studies that have become the author's reference and reference in the development of smart bracelets for children's location, namely as follows:

1. Sihombing (2017) conducted a study entitled "Design a 10-meter distance guard between mother and child utilizing Bluetooth HC-05 based on Atmega328 microcontroller" research seeks to make children with parents can be connected using HC-05 which is used as slave

and master, when the distance between slave and master exceeds 10 meters, the display will be cut off on the screen.

2. Susanto et al. (2019) designed with the title "Bracelets for the Deaf Based on the Internet of Things" in research utilizing sensor nodes that are used to connect to wifi automatically, using fire sensors to detect smoke and fire intensity, using security sensors to read the movement in front of the sensor and the rain sensor will detect rain conditions when there is water wetting the sensor. Any information from each sensor will be sent to the cloud server and will provide vibration information and will display writing according to the circumstances experienced.

Based on previous research and design, this scientific paper will discuss bracelets that can connect parents with ESP8266-based children used as slaves and masters so that the distance between parents and children can be farther than the research conducted by Sihombing (2017), because the study still uses the HC-05 Bluetooth module which has a shorter range and cannot operate when there is an obstacle in front. Whether it's people or walls, the level of accuracy is still not good when compared to using slaves and masters from ESP8266.

Method The design of child monitoring tools in this crowd uses ESP8266 as a microcontroller and becomes the control center, the ESP8266 owned by parents is connected to the ESP8266 owned by the child so that the two can be connected. The buzzer on the child's bracelet will sound if the mother presses the push button on the bracelet. Meanwhile, to detect where the child's location is using the Neo-6M GPS module to determine latitude and longitude will then be sent to parents' smart phones using the SIM800L GPS module or through the Telegram application.

The Data Capture Method for this distance measuring device uses a bracelet as a medium that has been equipped with a series of microcontrollers such as GPS, buzzers, and LEDs attached to the hands of parents and children, which aims to make smart bracelets can immediately detect the presence of children who are far from the reach of parents when in a crowd. Data collection is carried out on the wristbands of parents and children by interconnecting ESP8266 connectivity to parents' mobile phones. Then the location information data will be directly read through commands on the SMS on the parent's cellphone which will then be directed to google maps if the connectivity between the parent and child bracelets is not connected, and at that time the buzzer and LED will light up which indicates the child is far from the reach of the parents.

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After we prepared all the tools, materials, and references from several necessary literature studies, we began to design tools consisting of ESP8266, buzzers, and LEDs attached to the

Master bracelet worn by parents, while the Slave bracelet worn by children consisted of ESP8266, buzzer, LED, which was also equipped with Neo-6M GPS and 800L Sim Module. In addition, we also design the program so that testing can be carried out so that it can produce appropriate data. In this program we code so that the components contained in the bracelet can be synchronized with the mobile phone.

After the design and testing has been carried out, the data we have obtained will be analyzed to find out the current location point when 10 10 meters away from the range, the suitability of the tool design with the components used, and find out what errors occur during the manufacture and testing of the tools we make.

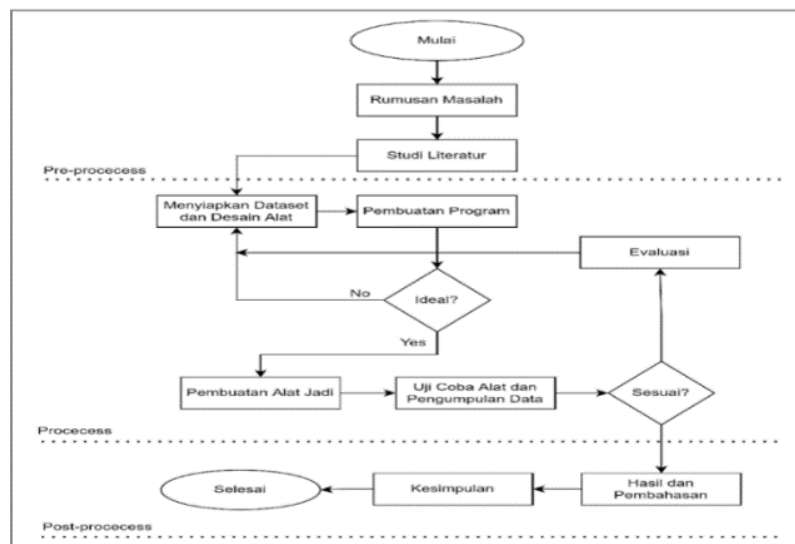


Figure 7. Research Flow

3. RESULTS AND DISCUSSION

This tool is shaped like a bracelet that has two types, namely bracelets as masters and bracelets as slaves, where bracelets as masters are used by parents as mentoring to slave bracelets used by their children. Both bracelets use a ESP8266 microcontroller that functions as a liaison between parents and children so that they are always within reach.

The bracelet is equipped with a switch on the parent's bracelet and the child's bracelet, when the parent activates the switch, the buzzer on the child will sound and vice versa, when the child activates the switch, the buzzer on the parent will sound, and the buzzer will also sound when the distance between the parent and the child is at the farthest point from the reach of the slave and master ESP8266, which is 50 meters.

On the child's slave bracelet there is a Neo-6M GPS module as a means of detecting latitude and longitude from the child's current location, latitude and longitude information will be processed by the microcontroller ESP8266 into a link that can be connected directly to Google

Maps. The link will be sent to the parents' smartphone using the SIM800L module via SMS message.

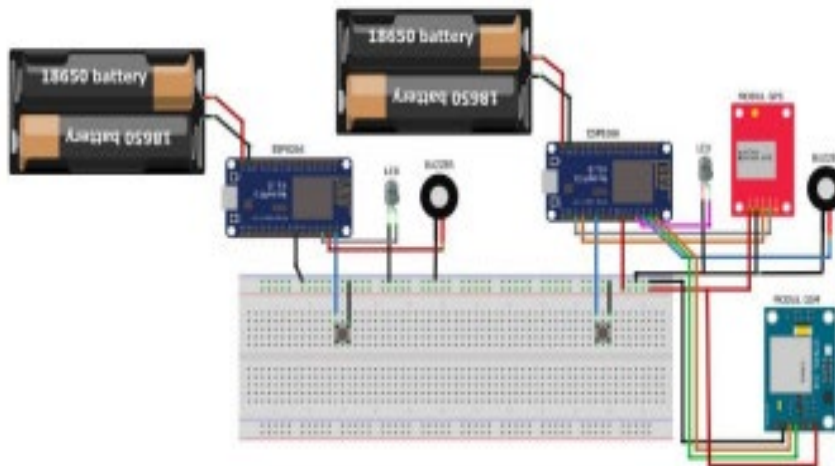


Figure 8. Suite of Tools

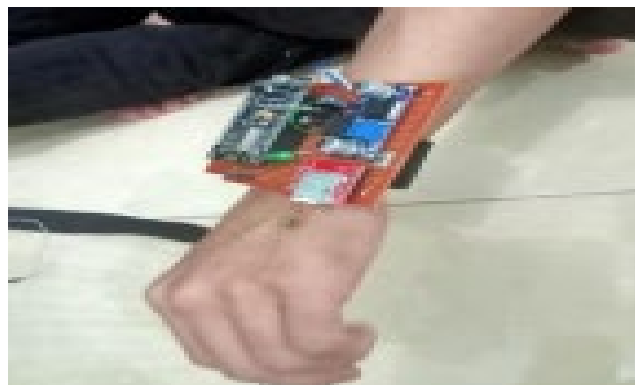


Figure 9. Tool Creation

The way the tool works is as follows:

Neo-6M which is a location tracking device used to detect latitude and longitude from the child's location. Latitude and longitude will be processed by ESP8266 so that it can become a link that can be connected directly to google maps. The link will be sent to the parents' smartphone using the SIM-800L module in the form of a short message. Parents can open the link sent by the tool so they can see the location of their child. This bracelet consists of two parts, namely the slave bracelet used by children, while the master bracelet is used by parents. When parents activate the switch on the bracelet, the alarm on the child will sound and vice versa. If the distance between the slave and master bracelets is at the farthest point, which is 50 meters, an alarm will sound indicating that parents and children are far apart.

The code below is used to track the location of the Neo-6M module which is used as a medium to determine the latitude and longitude of the module's existence. Latitude and longitude will be processed by ESP8266 into a link that can be connected to google maps.

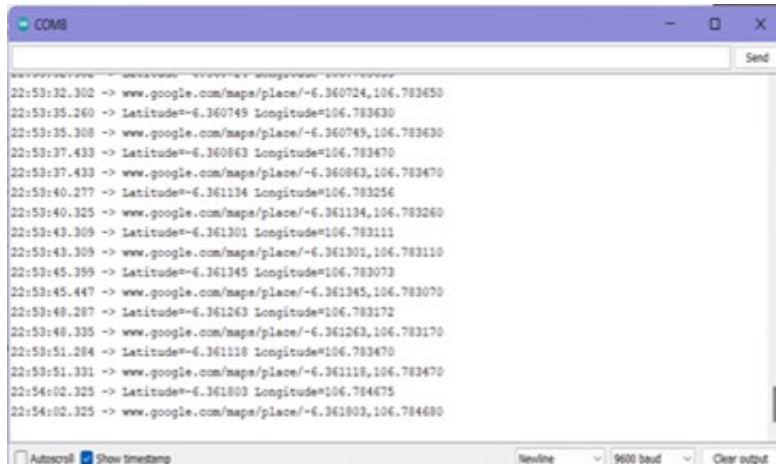


Figure 10. Serial monitor detects location

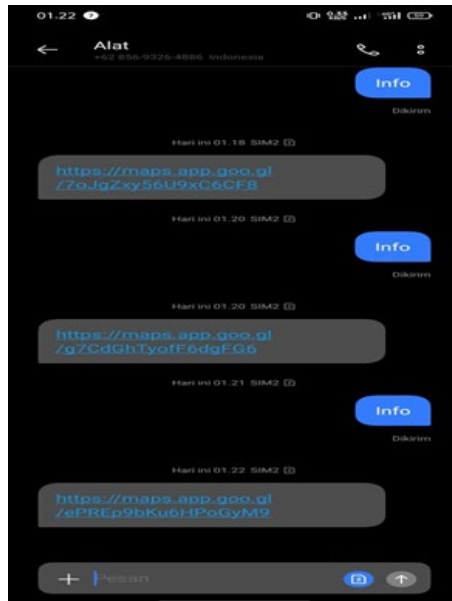


Figure 11. Message Location

This test is carried out to measure the work of the system in measuring a distance of 50 meters. The test is carried out by measuring the distance using a meter and separating the two tools as far as the measured distance. In this measurement, if the distance between TX (ESP8226 master) and RX (ESP8266 slave) is in good signal condition, the tool can measure distances up to 50 meters.

Table. 1 Tool Testing

Testing Distance(m)	Alarm Description
10 meter	Low
20 meter	Low
31 meter	Low
40 meter	Low
50 meter	High

Testing Distance(m)	Alarm Description
10 meter	Mati
20 meter	Mati
31 meter	Mati
40 meter	Mati
50 meter	Live
60 meter	Live

4. Conclusion

Cases of missing children in tourist locations crowded with visitors can occur today can even be fatal to the child. The child monitoring system using a bracelet connected to a smart phone is made with the aim of minimizing the loss of children in tourist attractions. This monitoring system ESP8266 by using Google Maps as a tracker of children's locations. As a form of alarm, we use buzzers and LEDs to indicate that children are out of range of bluetooth connections. If the ESP8266 on the master and slave are not connected then the alarm will sound and to find the child's location point, we use the Neo-6M GPS Module as a location tracker which later the Google Maps link will be given from the SMS message. In this way, it is hoped that there will be no more cases of child loss in crowded tourist locations

We recommend that to maximize the function of this tool, it is hoped that this tool can be expanded again the range of its bluetooth connection so that it can not only measure the distance within 50 meters, but can measure the distance between slave and master more than 50 meters. And also the material that will be used is a waterproof material so that this tool can continue to work even though it is exposed to water.

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