

Analysis Of Position Tracking Using Motorcycle GPS Tracking

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1. Introduction

1.1 Background

The number of motor vehicles in Indonesia more and more from year to year, especially for motorcycles. Until the year 2013 there were 84.8 million units of motorcycles in Indonesia (Data from the police station Indonesian republic in 2013). Unfortunately, an increasing number of motor vehicles is also followed by an increase in the number of motor vehicle theft. For example, in Bandung from 6,115 cases of motor vehicle theft that occurred between 2008 and 2012, only 537 cases, or only 0.9 percent of which managed to be revealed (<http://ntmc-korlantaspolri.blogspot.com/2013/02/942-jutamobil-and-bike-motor.html> accessed on February 26, 2017). While in East Jakarta who jumped dramatically throughout the year 2013 is a case of two-wheeled motor vehicle theft that occurred 422 cases, this number increased sharply compared to the year 2012 as many as 212 cases (<http://metro.sindonews.com/read/2013/12/30/31/822023/careless-theft-motor-bikes-in-Jaktim-jumped> accessed on February 26, 2017).

In addition to the city, a small town such as Malang city that is dominated by the theft of motor vehicles, especially motorcycles. Based on data from Malang Police, cases in 2012 reached 1,200 and in 2013 reached 1,188 reports of disappearances recorded. Compared to other criminal cases such as forgery, fraud, embezzlement, motorcycle theft case has a high rate. While the number of two-wheeled motor vehicle theft has the percentage of 99% of the data existing cases in 2012 and 2013. (Data from Malang Police in 2013). One way that can be used to secure the vehicle from theft criminal act is to apply the *Global Positioning System* (GPS) on our vehicles. GPS can be described as a global satellite navigation system based on space that provides location and time that is reliable in all weather conditions at all times and anywhere on or near the earth's surface, and where the line of sight are unimpeded from four or more GPS satellites (*Analysis of the Influence of Forest Environments on the Accuracy of GPS Measurements by Using Genetic Algorithms*. 2010. Ordonez Galan, C., et al). If the GPS device is applied to the motor vehicle, the position data from the GPS can be delivered simultaneously. When the bike is lost due to theft or for various other reasons, the motorcycle can be easily recovered.

GPS does not have a problem when tracking vehicles in the streets freely. However, in urban areas major problems need to be solved before using GPS as a solution to accurately track the vehicle. Accuracy of GPS in urban areas is not high enough to map the exact location of the vehicle on local streets. Because many high-rise buildings can block the satellite signals (*Vehicles with GPS Tracking: Is it a Feasible Solution ?*. Zheng Jianyang, Yin Hai Wang, Nancy L. Nihan). However amount tall buildings in Lampung city is still relatively small compared to other cities (https://id.wikipedia.org/wiki/Daftar_kota_Indonesia_menurut_gedung_tinggi accessed on February 26, 2017). So it is still possible to apply the GPS technology in Lampung city. Due to these reasons the author of lifting the title this study "**TRACKING POSITION INFORMATION ANALYSIS SYSTEM USING MOTORCYCLE GPS TRACKING**".

2. Basis Theory

2.1 Literature Review

2.1.1 *Research Artist, Irzal Sofyan Syahril Efendi entitled "Vehicle Distance Monitoring Based on General Packet Radio Service (GPRS), Global Positioning System (GPS) and Arduino" in 2016.*

This study uses Arduino Uno microcontroller GPS and GPRS module SIM908. Arduino Uno must receive a minimum electric current to light up a maximum of 5 volts and 12 volts. The electrical

current is received by Arduino must be stable to avoid further losses of electrical power during operation arduino. Electrical power source is derived from the vehicle's battery. Electric voltage on the vehicle's battery is 12 volts. Which is sufficient to ignite arduino system. The process begins when SIM908 perform initialization, which initiates a connection to the GSM telecommunication service providers to provide *the Access Point Name* (APN), user name, and password, if the telecom service providers need to be connected. Then, GPS devices on the module SIM908 tried to lock the GPS satellite signal. When the locking signal has occurred, the GPS will request data latitude and longitude, time, altitude and speed via satellite. Then the data will be sent to arduino via serial communication *Universal Synchronous Asynchronous Receiver Transmitter* (USART).

Such data will be processed by the arduino in accordance with the programs that have been downloaded to arduino. Here the data speed and the time used to get the value of the vehicle mileage. Then the data is sent mileage obtained using SIM908 GPRS module to the *web* server ,and then passed to *the database*. The application system is a system of web-based applications using the programming language *Personal Home Page* (PHP), which monitors the movement of the user in order to obtain information to locate the user, who piloted the vehicle speed and mileage of the vehicle. *Web server* will function as a service and data processing between arduino, *database*, and client. *Web server* will receive the data sent by the mileage arduino. The mileage data are stored into *a database* and ready to be processed to be represented back to the *client*. Mileage vehicles will be displayed in a particular time frame. This data will be updated every second automatically for arduino sends data mile age to the system. *Client* will access a web page on *a web server* for monitoring and only *client* specific get permission to access the page. This page will contain the value of the vehicle mile age and vehicle last position on the map. Information mile age and the final position of this vehicle will always keep updated automatically every second, without the *client* needs to do the reloading of the web page.

2.1.2 The study of the Supreme Pangestu, Sumardi, Sudjadi entitled "Protection Equipment Design and Vehicle Tracking Motorcycle Using Atmega Microcontroller 644PA" in 2014.

The design of the hardware in the study include circuit *the main board* consisting of 5 Volt regulator and microcontroller, circuit *driver* automotive relay12 v, U-blox GPS moduls NEO 6M, and a GSM module SIM900 from ITEAD Studio. GPS module will retrieve the data from the satellite and then process them and generate the data in NMEA format. The microcontroller will then take the data in the form of date and time, latitude and longitude, altitude, speed, and direction of motion. By the microcontroller of data were then sent to the GSM module. GSM module will send the data to the orange-trace server via TCP. Server orange-trace will then display the data on its website, so as to monitor the vehicle position the user can open a web browser and enter your username and password. Besides GSM module also serves to receive messages from the vehicle owner. The contents of the text will be read by the microcontroller, then if the contents in accordance with a predetermined format microcontroller will activate the motor relay and cut off the electricity of the motorcycle through the outlet, so that the motorcycle will die. The design of this software in this study using the C language as a programming language and Code Vision AVR as compilers. Code Vision AVR will change the C language is made into a .hex file that can be embedded into the microcontroller using the downloader. Software design by using CVAVR will be divided into two parts, namely the UART1 use the GPS module and a GSM module that uses a part of UART0.

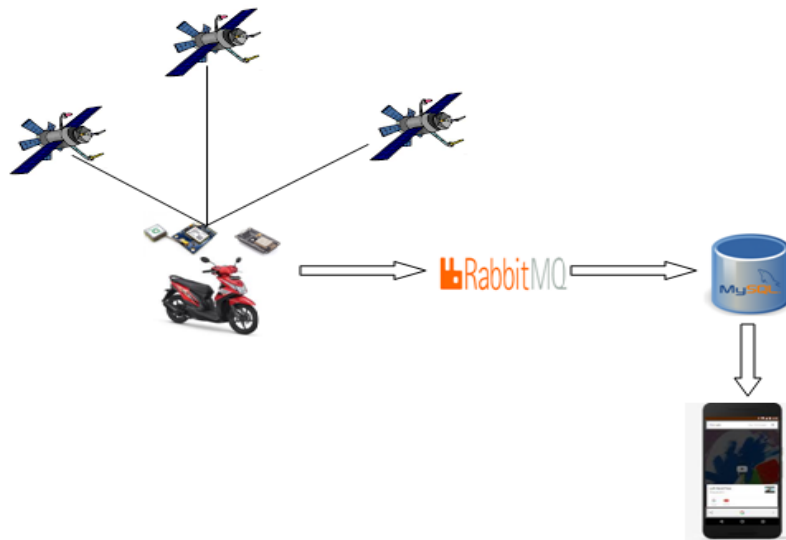


Figure 1 Data Transmission

Having obtained the position of the vehicle through a GPS module and then the micro will send the data to the server using the GSM module. Programs in this section begins with the initialization of the GSM modul. Initialization begins by turning on GSM module, namely by providing a logic 1 (high) for 2 seconds on PORTD.5 connected to the GSM module power connector. Then the microcontroller will wait until ready to use GSM module which is characterized by sent phrase "call ready". After the GSM module is ready for the microcontroller will begin sending commands to the GSM module to run the TCP / IP connection, then connects to the server orange-trace and can log. The commands are sent by the micro to the GSM module using AT Command format.

2.1.3 The study of Humaid Alshamsi, Veton Këpuska, Hazza Alshamsi entitled "Real Time Vehicle Tracking Using Arduino Mega" in 2016.

This study built on GPS and GSM platform which consists of an Arduino microcontroller MEGA2560 energy sources, A fruit Shield 808 Fona - Mini Cellular GSM + GPS for Arduino as a GPS module and GSM, Lithium Ion Polymer Battery, Passive GPS Antenna UFL - 15mm x 15mm 1 dB gain, Slim Sticker-type GSM / Cellular Quad-Band Antenna - 3dBi UFL, Ethernet Shield, SIM Card (2G network), micro SD card (2GB). Arduino MEGA2560 used as a link to a variety of the component software. Proposed design would allow continuous monitoring of the status of the vehicle and provide reports in accordance with the request. To make this report Arduino bias MEGA2560 connected to a GSM modem and GPS receiver. This modem is used to transmit the vehicle location from distant places. GPS modem will continually presents data showing the position of the vehicle. Fona a fruit Shield 808 is a GSM + GPS mobile phone module package that allows an individual to add location tracking, voice, text, SMS and data into a format that is easy to use Arduino shield.

3. Analysis Of Results And Discussion

3.1 The Concept of GPS Tracking

First module will capture the GPS satellite signal. Once the GPS module captures at least 3 satellite signals the GPS module will be able to determine its position based *Latitude* (latitude) and *longitude* (longitude). For mapping data in the form of numbers, *speed*, time, *date*, and *mac* address. These data are sent by Node MCU to Rabbit MQ by connecting entire GPS tracking device with wifi modem. Rabbit MQ will save data while replace it based on the principle of FIFO(*First In First Out*).Then the server gave the order to take the existing data on Rabbit MQ using the API data is stored on a database server My SQL. Android device will display information about the location of data such as longitude, latitude, *speed*, time, *date* by taking existing data on the database server.

3.2 Hardware Used

Computer hardware used to implement the design of information systems in GPS Tracking include:

1. Node MCU ESP8266 CP2102
2. GPS U-Blox Neo 6M
3. Battery
4. Transformer step down
5. Modem wifi

3.3 Software Used

The software that is used as a support system among other information:

1. Arduino IDE
2. My SQL Database
3. Rabbit MQ
4. web

3.4 This Series GPS Tracking



Figure 2 GPS Tracking This Series

Circuit is composed of NodeMCU, U-Blox Neo 6M, a step-down transformer. NodeMCU serves as a microcontroller to turn the U-Blox Neo 6M by connecting wires in U-Blox Neo 6M to NodeMCU her, the GND pin and VCC of the U-Blox Neo 6M is connected to GND pin and VCC on NodeMCU her. Pin TX danRX in U-Blox Neo 6M useful for transferring data and this pin is connected to the pin on the D6 and D7 pin NodeMCU her. In this study, using a GPS Tracking device power and battery bank as a power source and USB to connect to a modem function to send data latitude, longitude, *speed*, time, *date*, and *Mac Address* to RabbitMQ. RabbitMQ to data updates made 1 minutes.

3.5 Coding The Arduino IDE

```
#include <PubSubClient.h> // to send a message to the RabbitMQ
#include <ESP8266WiFi.h> // for connection NodeMCU / Wifi module
#include <ArduinoJson.h> // change the format of the data into the json
// #include <TinyGPS++.h> // for GPS connection
#include <SoftwareSerial.h> //for serial communication
// updatewith Reviews These values suitable for your network
const char * ssid = "BSTs";
// filled with wifi modem name
const char * password = "gpspptikitb";
// filled with a wifi password
const char * mqtt_server = "167.203.7.226";
// IP address of the server in RabbitMQ
const char * mqtt_user = "/ ant: ant";
// (/ ant) is VirtualHost, (ant) user name
const char * mqtt_pass = "Ants";
// password for the virtual host
WiFiClient espClient;
```

```

PubSubClient client (espClient);
mac byte [6]; // data type tomac
String MACAddressaddress;// data type changed to astring
longlastMsg = 0; // last message
char msg [50];
int value = 0;
static const int RXPin = 12 TXPin = 13;
SoftwareSerial GPSSerial (RXPin, TXPin);
TinyGPSPlus gps; // renamed so gps
void setup_wifi ()
{delay(10); // 0.0001waiting time calculati
//we start by connecting to a WiFi network
Serial.println ();
Serial.print ( "Connecting to");
Serial.println (SSID);
WiFi.begin (SSID, password); // id take ssid and password
while (Wifi.status () != WL_CONNECTED)
{delay(500);
Serial.print ( ".");
}
Serial.println ( "");
Serial.println ( "WiFi connected");
Serial.println ( "IP");
Serial.println (Wifi.localIP ());
}
String mac2String (ar byte [])
{Strings; // repetitions
for (byte i = 0; i <6; ++ i)
{charbuff [3]; // languageprogram
sprintf(buf, "% 2X", ar [i]); //% 2X to print
s += buf;
if (i <5) s += ' ';
}
Return s;
MACAddress}
void print () { // create a new class
WiFi.macAddress (mac);
MACAddress = mac2String (mac);
Serial.println (MACAddress);
}
Void callback (char * topic, payload bytes *, unsigned int length)
{Serial.print( "Message arrived [");
Serial.print (topic);
Serial.print ( "]);
for (int i = 0; i <length; i ++)
{Serial.print((char) payload [i]);
}
Serial.println ();
// switch on the LED if an 1was received as first character
If ((char) payload [0] == '1')
{digitalWrite(BUILTIN_LED, LOW);

```

Menentukan
pin NodeMCU

untuk membangun
koneksi wifi

batas akhir untuk membuat
koneksi wifi

untuk mencari/mengetahui
mac address

Library
yang
dibutuhkan
untuk
perangkat
GPS

Variabel untuk moneksi

Variabel untuk koneksi ke
RabbitMQ

untuk pembuatan
variabel

```

// turn the LED on (Note that LOW is the voltage
level)}else
{digitalWrite(BUILTIN_LED, HIGH);
// turn the LED off by making the voltage
HIGH}}
void reconnect ()
{printMACAddress();
const char * CL;
CL = MAC Address.c_str ();
Serial.println (CL);
While (! Client.connected)
Serial.print ( "Attention" );
If (client.connect (CL))
{Serial.println( "connected");
} Else
{Serial.print( "failed, rc = ");
Serial.print (client.state ());
Serial.println ( "try again" );
ESP.restart (); // NodeMCU restart
delay (5000);
}
Void GPS ()
{smartDelay(1000);
if (millis ()> 5000 && gps.charsProcessed () <10)
Serial.println (F ( "No GPS Data received: check wiring"));
}
Static void smartDelay (unsigned long ms)
// this custom version of delay () ensures that the GPS object is being "fed"
{unsigned
long start = millis ();
do
{while
(GPSSerial.available ())
if (gps.encode (GPSSerial.read ())) displayInfo ();
}
While (millis () - start <ms);
}
Void displayInfo ()
{Serial.print
(F ( "Location:"));
If (gps.location.isValid ())
{Serial.print
(gps.location.lat (), 6);
Serial.print (F ( ","));
Serial.print (gps.location.lng (), 6);
}
Else
{Serial.print
(F ( "INVALID"));
}
Serial.print (F ( "Speed"));
}

```

untuk menampilkan mac address

untuk memanggil RabbitMQ

untuk mengecek kembali koneksi pada RabbitMQ

untuk menampilkan jika client tidak connect

untuk mengecek GPS sudah aktif atau belum

```

Serial.print (gps.speed.mph (), 2);
Serial.print (F ( "Date / Time:"));
If (gps.date.isValid ())
{Serial.print
(gps.date.month ();
Serial.print (F ( ""));
Serial.print (gps.date.day ());
Serial. print (F ( ""));
Serial.print (gps.date.year
());}
else
{Serial.print
(F (
"INVALID"));}
int a = 7;
Serial.print (F ( ""));
If (gps.time.isValid ())
{//
if (gps.time.hour () <10)
Serial.print (gps.time. ho
Serial.print (F ( ":"));
If (gps.time.minute () <10) Serial.print (F ( "0"));
Serial.print (gps.time .minute ());
Serial.print (F ( ":"));
If (gps.time.second () <10) Serial.print (F ( "0"));
Serial.print (gps.time. second
Serial.print (F (
"."));}
else
{Serial.print
(F (INVALID
));}
Serial.println
());}
void setup ()
{pinMode(BUILTIN_LED, OUTPUT) ;
// initialize the BUILTIN_LED pin as an output
Serial.begin (115200);
setup_wifi ();
print MACAddress ();
GPSSerial.begin (9600);
client.setServer (mqtt_server, 1883);
client.setCallback
(callback);}
void loop ()
{Stringpubmsg = "";
float speed;
char time [32];
char date [32];
if (! client.connected ())
{reconnect

```

untuk menampilkan lokasi informasi dari GPS berupa lat, long, speed, date, time

mencetak date & time
mencetak speed
mencetak hari & tahun

mencetak waktu berupa jam menit dan detik

```

    );}
    client.loop ();
    // delay (1000);
    GPS ();
    delay (1000);
    speed = gps.speed.mph ();
    sprint (date, "% 02d /% 02d /% 02d", gps.date.day (), gps.date.month (), gps.date.year ());
    sprint (time, "% 02d:% 02d:% 02d", gps.time.hour () + 7 gps.time.minute (), gps.time.second ());
    StaticJsonBuffer, 200. jsonBuffer;
    JsonObject & root = jsonBuffer.createObject ();
    root [ "MAC" ] = MACAddress;
    root [ "Speed" ] = speed;
    root [ "date" ] = date;
    root [ "time" ] = time;
    JsonArray & data = root.createNestedArray ();
    // end of parsing the data
    data.add (gps.location.lat (), 6);
    data.add (gps.location.lng (), 6);
    long now = millis ();
    if (now - lastMsg > 60000)
    {lastMsg = now;
    ++ value;
    Serial.print ( "Publish message:");
    root.printTo (pubmsg);
    Serial.println (pubmsg);
    client.publish ( "semut.gps", pubmsg.c_str ());
    // (semut.gps) is a routing key in RabbitMQ

```

untuk memanggil
 untuk pengulangan data

untuk parsing data
 ke format json

untuk mengirim data
 ke RabbitMQ

4. Conclusions And Recommendations

4.1 Conclusion

Based on research from the GPS tracking device can be deduced, among others:

- a. To produce an accurate position tracking system, reliable, and efficient, it takes a software that can the acquisition of GPS position data, and combine positioning data in the form of digital maps with the vehicle position data.
- b. Position tracking information system motorbikes can be used as a tool to provide information about the position of the presence of motorcycles.
- c. With this information system is expected to prevent the crime of theft of motor vehicles.

4.2 Suggestions

After conducting an analysis of Tracking Systems Position Motorcycles by Using GPS Tracking there are some suggestions that can be submitted, namely:

- a. Follow-up which can be used as a reference system development namely, the need for calculations more details about the GPS signal reception by the GPS receiver to get the position coordinates more accurate and valid if it is in an area easily arise multipath effects.
- b. The use of a fast internet connection and stable both on the GPS Tracker to the user.

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