ATV Car Rental Monitoring Using Android Based GPS Tracking

Shofiyul Irchami Romadlon[1], Moechammad Sarosa[2], Waluyo Waluyo[3]

[1,2,3] Telecommunication Engineering Study Program
Department of Electrical Engineering, State Polytechnic of Malang, 65141, Indonesia

[1]irchami.98@gmail.com, [2]msarosa@polinema.ac.id, [3]waluyo@polinema.ac.id

***Abstract* -- Observation of the ATV car rental that had been carried out at Cafe Sawah, officers monitored the ATV car using a monitoring tower. This system can replace the function of using a monitoring tower to make it easier to monitor ATV cars. This research will be carried out to design a tool for monitoring ATV cars that makes it easier for officers to monitor ATV cars remotely. By using Arduino ATmega 2560 which functions as a microcontroller, nodemcu is used to connect to the internet network and GPS Neo-6M to determine the position of the ATV car, and an android application that is used to monitor ATV cars.ß Based on 11 rounds of testing on the predetermined ATV car track, the results of the latitude and longitude coordinate points were obtained with Google Maps as a reference. By testing 11 rounds of the ATV car, accurate results were obtained at points 1,2,3,5,8,9,10,11 and inaccurate results were obtained at points 4,6,7 by comparing the coordinate points obtained in the car monitoring application ATV and the coordinates that get on google maps. By testing 11 rounds of the ATV car, accurate results were obtained at points 1,2,3,5,8,9,10,11 and inaccurate results were obtained at points 4,6,7 by comparing the coordinate points obtained in the car monitoring application ATV and the coordinates that get on google maps.**

Keywords: arduino atmega 2560, ATV, gps neo-6m, G-NetTrack Pro, nodeMCU

I. INTRODUCTION

Tourism is one of the industries that can improve the economy and people's welfare. One of the government's current focuses is the development of existing tourist destinations in each region. The aim is to improve the regional economy through optimal utilization of all elements related to the tourism industry itself [1][2]. Based on the conditions above, the authors conducted research on the tourism sector. The research was conducted at the tourist spot Cafe Sawah Pujon Kidul Malang. About ATV car transportation services which are in great demand by visitors at the rice field cafe. Before conducting research, the authors made observations of ATV car monitoring [3] carried out at the rice field cafe to find out when ATV car renters experienced trouble on their way. At the time of observation, monitoring was carried out through monitoring towers and this, according to the author, was less effective.

Therefore the authors conducted research to make a tool that was installed in the ATV car and connected to the android application so that officers were more effective in monitoring the ATV car remotely when the tenants experienced trouble on the way. The tool uses GPS components [4][5], nodemcu esp8266 [6] and arduino atmega 2560 [7][8] as microcontrollers and an Android application. Apart from being used for monitoring, this android application can be used to order ATV cars remotely and tenants can set their own playing hours so that tenants don't gather while waiting in line to play ATV cars during a pandemic. In addition, it is useful to facilitate the work of ATV car officers to monitor the whereabouts of ATV cars[9].

A. Theoretical Basis

1) *Arduino Atmega 2560:* Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet) which is programmed using Arduino software and can run both online and offline. Consists of 54 digital I/O pins, 16 analog inputs, 4 UARTs, USB connection, ICSP header, reset button and larger sketch space, making it suitable for projects that require a lot of input/output and memory [10].

Figure 1. Arduino Atmega 2560

2) *Nodemcu Esp8266:* NodeMCU is based on Esperessif ESP8266-12E WiFi System-On-Chip, loaded with open source, Arduino IDE based firmware. It's perfect for IoT applications, and other situations where wireless connectivity is required. The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capabilities. The ESP module allows the microcontroller to connect to a Wi-Fi network and establish a TCP/IP connection [11].

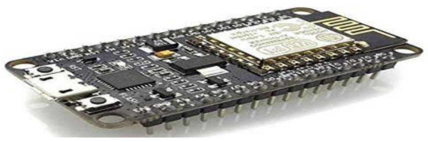


Figure 2. Nodemcu Esp8266

3) *Module GPS NEO-6M:* It is a GPS module that has been updated to get the best position information. The technical specifications are Standalone GPS receiver, SuperSense Indoor GPS: -162 dBm tracking sensitivity, Anti-jamming technology, Support SBAS (WAAS, EGNOS, MSAS, GAGAN), ublox 6 50 channel positioning engine with over 2 million effective correlators, Timepulse, 5Hz position update rate, Operating temperature range: -40 TO 85°C and UART TTL sockets [13].

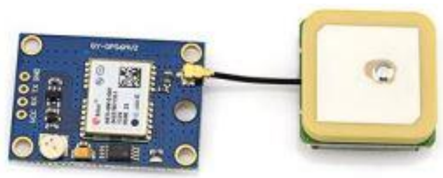


Figure 3. Module GPS NEO-6M

4) *Stepdown LM2596:* The LM2596 DC-DC stepdown is a step-down converter that converts the DC input voltage to DC voltage [14].

Figure 4. Stepdown LM2596

5) *Parameter RSRP (Reference Signal Received Power):* Is a signal strength parameter from the LTE network that is received by the user equipment. This parameter functions to determine the points when a handover occurs, and determines the coverage area of the antenna sector on an eNodeB. For the RSRP parameter range [15][16].

TABLE I
RSRP PARAMETERS

Color	RSRP Value (dBm)	Description
	< -60	Extraordinary
	-60 up to -70	Very good
	-70 up to -80	Good
	-80 up to -90	Normal
	-90 up to -110	Bad
	-110 up to -120	Very Bad

II. RESEARCH METHODS

A. Research Design

The research design was made to detail the stages of making the tools until testing was carried out so that the results obtained were sequential. The research design that will be carried out in making the system is shown in the figure below:

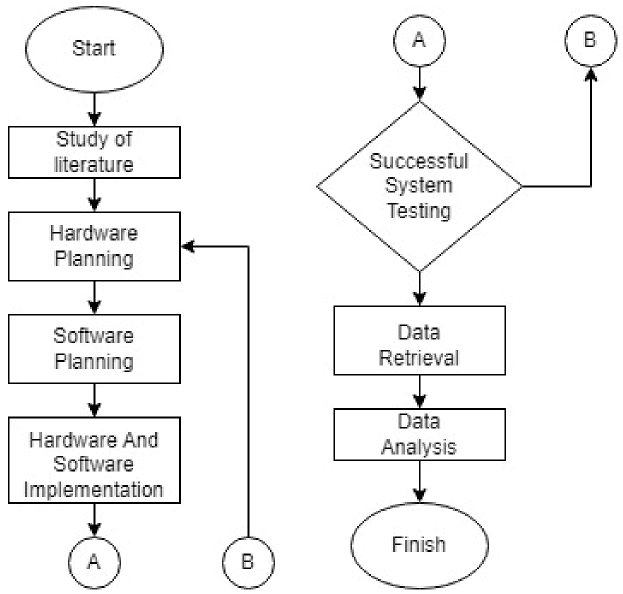


Figure 5. Flowchart

The picture above is the stages or flow of the research design methodology that will be applied in making this system. Explanation of each stage can be explained as follows:

1) The flow of the block diagram is to conduct a literature study on the meaning of the GPS module, nodemcu, arduino atmega 2560 and other supporting components. At this stage, the researcher also determines the specifications of the components and programs used to support the manufacture of the tool.

2) The second stage is planning the hardware and software that will be used. This plan includes making monitoring tools and designing monitoring application systems on Android Smartphones.

3) The third stage is to design the system. The system design includes the design of the GPS module, nodemcu, arduino atmega 2560.

4) The fourth stage is making tools. At this stage the researcher will make tools and implement the system according to the system design that has been made.

5) The fifth stage is to check whether the parameters on the system have been completed or not if you have not reconfigured the system, if you have finished testing.

6) The sixth stage is that the researcher will test the tool, in order to find out whether the tool works according to the plan made. If the results of the tool testing are in accordance

with the design, the next step will be data collection.

7) The seventh stage is to analyze the data obtained during the testing of the tool.

8) The eighth stage is to make an analysis based on the data that has been obtained.

B. System planning

The system block diagram from the study entitled "Monitoring ATV Car [...]sing Android-Based GPS Tra[...]s shown in Figure as follows:

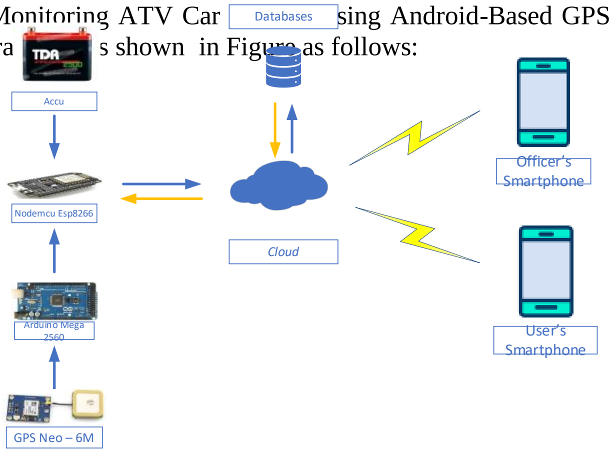


Figure 6. System Block Diagram

From the picture there is a block diagram of the system. This system block diagram explains system planning in research with the title "Monitoring ATV Car Rentals Using Arduino-Based GPS Tracking". In this system there is a battery that supplies nodemcu, arduino mega 2560 and gps neo-6m, after that the GPS sends information to nodemcu via arduino mega 2560 which has installed nodemcu which will send messages via the android application, the message contains information on latitude and longitude coordinate data which determines the position of the ATV car. Furthermore, the latitude and longitude coordinate data will be implemented into Google Maps to find out the detailed position of the ATV car.

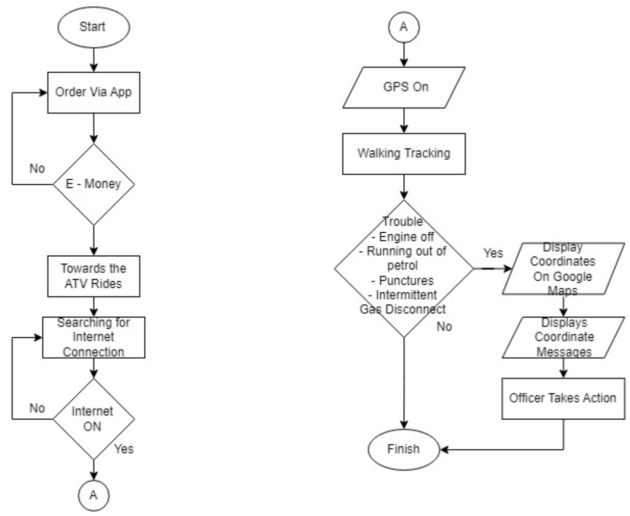


Figure 7. System Flow Chart

In the picture above is a system flow diagram that is carried out in making the system, with the following explanation:

1) Tenants can order ATV car rides remotely.

2) When the tenant is going to order an ATV car, the tenant is required to top up E-money first.

3) Furthermore, if the tenant has already top up E-money, the tenant can order an ATV car and set the hours as desired.

4) After the tenant arrives and starts operating the ATV car, the tracking device will start working.

5) Nodemcu will search for an internet network so it can start tracking.

6) After the GPS is on, the device can do tracking.

7) When a tenant uses an ATV car and experiences trouble, the tenant can report the trouble through the error feature in the application.

8) And the officer will receive latitude and longitude data to determine the position of the ATV car that is in trouble.

9) Then the officer will go to the location of the ATV car and bring technical equipment to repair the ATV car according to the trouble report that has been received by the officer.

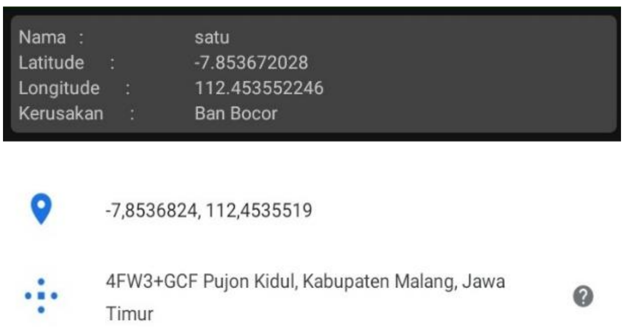
The test parameters used on the system are as follows:

1) Signal test using the G-NetTrack application at 10 track points.

2) Do a 10 round ATV car test.

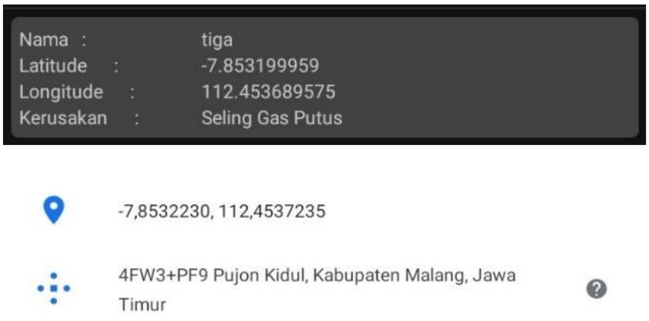
III. RESULTS AND DISCUSSION

This test was carried out on the ATV car track located at Café Sawah Pujon Kidul. This test was carried out to test the ATV car monitoring tool with a 10 lap experiment on the track, and when there is trouble on the ATV car, the user will report the trouble through the android application used by the user. When the user reports trouble, the results of the coordinates of the location where the ATV is experiencing trouble and the trouble will be compared with Google maps to find out the GPS on the ATV car monitoring tool shows acute or inaccurate.



The test results in the first round of the ATV car monitoring application used by the admin found trouble from the user at the latitude coordinate point: -7.853672028 and the longitude coordinate point: 112.453552246 while through monitoring Google Maps the latitude coordinate point: -7.8536824 and the longitude coordinate point: 112.4535519. Based on the data obtained, it shows that the data from the ATV car monitoring application and Google maps are the same which shows that the ATV car monitoring application is accurate.

The test results in the second round of the ATV car monitoring application used by the admin found trouble from the user at the latitude coordinate point: -7.853455067 and the longitude coordinate point: 112.453720093 while through monitoring Google Maps the latitude coordinate point: -7.8534200 and the longitude coordinate point: 112.4537242. Based on the data obtained, it shows that the data from the ATV car monitoring application and Google maps are the same which shows that the ATV car monitoring application is accurate.



The test results in the third round of the ATV car monitoring application used by the admin found trouble from the user at the latitude coordinate point: -7.853199959 and the longitude coordinate point: 112.453689575 while through monitoring Google Maps the latitude coordinate point: -7.8532230 and the longitude coordinate point: 112.4537235. Based on the data obtained, it shows that the data from the ATV car monitoring application and Google maps are the same which shows that the ATV car monitoring application is accurate.

TABLE II
DATA ON THE RESULTS OF TESTING THE ATV CAR MONITORING TOOL IN 4-10

Number	**ATV Car Monitoring Tool Test Results**		
	Error Report Results From the ATV Car Monitoring Application	**Coordinate Results From Google Maps**	**Information**
4	Latitudes = -7.853043079 Longitude = 112.453521729	Latitudes = -7.85308898 Longitude = 112.4534925	There is a distance 10m
5	Latitudes = -7.853223801 Longitude = 112.453323364	Latitudes = -7.8532383 Longitude = 112.4532471	Accurate
6	Latitudes = -7.853173733 Longitude = 112.453620911	Latitudes = -7.8531659 Longitude = 112.4535311	There is a distance 10m
7	Latitudes = -7.85311985 Longitude = 112.453620911	Latitudes = -7.8534897 Longitude = 112.4536528	There is a distance 10m
8	Latitudes = -7.85327673 Longitude = 112.453529358	Latitudes = -7.8532875 Longitude = 112.4535244	Accurate
9	Latitudes = -7.853300095 Longitude = 112.453353882	Latitudes = -7.8533150 Longitude = 112.4533467	Accurate
10	Latitudes = -7.853323936 Longitude = 112.453643799	Latitudes = -7.8533781 Longitude = 112.4535529	Accurate

In testing at points 4-10 get accurate results at points 5,8,9,10 and at points 4,6,7 get inaccurate results with the distance from the touble point of the ATV car as far as 10 meters.

IV. CONCLUSION

Based on the results of the research that has been done, it be concluded as follows; the ATV car monitoring system is designed using arduino atmega 2560 components, neo-6m gps module, nodemcu esp8266, stepdown, rectifier and connected to the android application. When an ATV car user experiences trouble, the officer can come to the ATV car user at the position indicated by the tool at the coordinate point. The ATV car monitoring work system when the user is tracking and experiencing trouble, the user can report through the Android application, from this report the officer will get information on the coordinates where the ATV car is at that time from the monitoring device installed on the ATV car.

REFERENCES

[1] Diane Tangian, Hendry, “Introduction to Tourism,” 2020.
[2] Ita Fitriati, Muliansani, “Coordinate Tracking with SMS-Tracking using the My GPS Coordinate App,” Vol. 1 No. 2, 2016.
[3] Yuliana Setyowati, Ahmad Syauqi Ahsan, “Car

Tracking Application in Car Rental Information System," 2017

[4] Bambang Wahyudi, I Made Sukarsa, "Design and Build Patrol Car Tracking Based on GPS Technology and SMS Gateway," Vol. 4, No. 1, 2017.

[5] Siswanto, M. Anif, "Room Door Security Using Android-Based Arduino Mega 2560, MQ-2, DHT-11," Vol. 3 No. 1, 2019.

[6] Yudi Muchtar PK Siregar, "Design and Manufacture of a Home Security System Using Sms Gateway Based on Arduino Atmega 2560 Microcontroller," 2018.

[7] Anuradha Patel, Dr. P. Devaki, "Survey on NodeMCU and Raspberry pi: IoT," 2019.

[8] I Ketut Resika Arthana, I Made Ardwi Pradnyana, "Heart Rate Monitoring System And Patient Location," Vol. 15, No. 1, 2018.

[9] Putu Lingga Dharma, Salmawaty Tansa, "Design of Automatic Paddy Field Water Gate Controller with SIM800l Based on Arduino Uno Microcontroller," Vol. 17, No.1, 2019.

[10] Erma Susanti, Joko Triyono, "Development of a Vehicle Monitoring and Control System Using Raspberry Pi and Firebase," 2016.

[11] Senri Ali Said, Andani, "Solar Panel Configuration Control System for Microcontroller-Based Battery Charging Efficiency," 2016.

[12] Riyan Hamdani, Ibu Heni Puspita, "Development of a Radio Frequency Identification (RFID) Based Motorized Vehicle Security System," Vol. 8, No.2, 2019.

[13] Astrid A. A. Makiolor, Alicia A. E. Sinsuw, "Design and Build Search for the Nearest Hospital, Health Center and Doctor Practicing in the Manado Area Based," Vol 10, No.1, 2017.

[14] Khalilul'afif, "Route Optimization Using Statistical Techniques Based on G-Net Track Pro Drivetest Results," 2020.

[15] https://www.builder.id/apa-itu-atv/.

[16] I Dw Gd Paramartha warsika, N.M.A.E. Dewi Wirastuti, "Analysis of 4G Lte Network Throughput and Drive Test Results on the Renon Cluster," Vol. 6, No. 1, 2019.