Nat. Volatiles & Essent. Oils, 2021; 8(4): 13361-13374

NVEO
Natural Volatiles &
Essential Oils

Intelligent Transportation Supervision System On The Vehicle Wanted Using Arduino Equipment

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Abstract – This research is based on the problem of finding vehicles that are still using the manual method, so that with these problems, a vehicle search system is proposed using the MCU micro controller node, Wi-Fi Module ESP-01, CCTV, so that it can help the police in finding vehicles that are being used searched quickly. The method used in this study is to use the literature review method, and conduct trials on motorized vehicles that are being sought by the Police. The problem raised in this study is how to help the police who have not many members so they can find the vehicle that is being sought by the police because the vehicle is in trouble or is in legal proceedings. The purpose of this study is how to create a system that can assist the police in checking vehicles on the highway, without having to check the vehicles one by one and it can be seen that the vehicle is in the process of being searched by the authorities, therefore the test is successful and has 100% accuracy on all its table titles.

Keywords: Intelligent Transportation, Supervision System, Vehicle Wanted, Arduino, Equipment.

I. INTRODUCTION

Along with the development of technology, many systems have been created to help all parties, especially the Police, from the vehicle tax system to the motor vehicle search system, the system implemented will definitely assist the police in finding vehicles that are experiencing cases or being stolen, so that the vehicle can be found. Quickly because it uses technology, therefore the vehicle is secured at the nearest police station, to verify the data so that it can be found who has stolen the vehicle and can be held accountable before the law (Systems, 2020).

The problem raised in this research is how to find the vehicle you are looking for, using a system that can help the police quickly. Therefore, with the proposed system, it is hoped that it can help the police find the vehicle being sought or in legal proceedings (Gohar & Nencioni, 2021).

The research method adopted in this study is to use a literature review by reading many journals and books related to this research, after which a trial will be held on motorized vehicles whether this system is functioning properly so that it can be applied in the future (Wang et al., 2020).

This research resulted in a proposed system that can be applied by the police, to find the vehicle being sought by the police so that they can find the vehicle quickly (T. Kumar & Kushwaha, 2019).

With the start of construction and development of the city, light poles will become one of the most important objects in the development of urban infrastructure. The lamp post has the characteristics of multi-pole integration, not only technical integration but also reduces the number of vehicle accidents in conditions of lack of road lighting. Based on the finite element theory, combined theoretical design and simulation practice to perform analysis of static, dynamic and electromagnetic interference characteristics on lampposts (Putra & Warnars, 2019). On this basis, it is proposed to optimize multi-objective parameters and carry out a lightweight design of the lamppost. In the vehicle infrastructure system (CVIS) light poles are the key to the relationship to advance transportation, improve traffic efficiency and ensure traffic safety. The lamppost is modeled geometrically using digital modeling software and then a 3D model is obtained and then imported into the Hyper Mesh software. Through these steps mid-surface extraction, geometric simplification, mesh division, material use and connection simulation are formed. Through multi-parameter sensitivity analysis and optimization with materials and sizes, the lamp post will be as desired and according to statistical principles the lowest monastery solution will be chosen. The end result has a certain engineering value to effectively integrate resources and arrange materials as desired (Hermawan & Husni, 2020).

The purpose of this research is as a design and to build a vehicle with mobile security based on the Internet of Things (IoT) which will incorporate an Arduino-based microcontroller (Azwar et al., 2019).

Based on data from the Indonesian Statistical Data Center, cases of motor vehicle theft have increased a lot from 2011 to 2013. This is the background of this research.

This research was conducted for a vehicle security system using a vehicle tracking system such as using a GPS module and the Internet of Things (IoT) platform. The platform requires an internet connection using a GSM module. Previous researchers have developed a vehicle safety system that uses biometrics, the data can be visual and requires more memory to store the data. The method used in the journal or research is descriptive method, which is a research method that describes the characteristics of the population or phenomenon being studied. So that this research method is the main focus is to explain the object of research. So answer what events or phenomena that occur (George, n.d.).

In this study, there are several attached such as Flowcharts regarding functional requirements, tables of system functional requirements, tables using explanatory code codes, system network architecture design drawings, hardware design drawings, and others. The conclusion of the research in my opinion is that the results of the research can be said to be successful in all existing scenarios, because of the design, implementation and evaluation process. The evaluation of the functionality is indicated by the successful evaluation of the system's response to the given control and the web application successfully monitors and controls the hardware remotely based on Internet of Things (IoT) (A. Kumar & Kumari, 2021).

Every vehicle owner usually has their own way to protect their vehicle from damage or loss, the case of losing a vehicle makes vehicle owners to always be vigilant, especially if a lost vehicle will be difficult to find, one of the reasons is the difficulty of tracking the whereabouts of the vehicle when theft occurs (Dhatrak & Gandhe, 2018).

The creation of a security system to warn when a vehicle is stolen aims to provide information to vehicle owners when the vehicle is in danger by sending coordinates using SMS and can be directly displayed with the Google Maps application to make it easier for vehicle owners to track or find out the vehicle's position. make it easier for users to use it, namely the Neo GPS Module, a minimum microcontroller system circuit on the Arduino uno atmega module, GSM 800L SIM module, Smartphone, Google maps application, SMS on Smartphone (Zaky & Soubra, 2021).

The purpose of this study is to produce a tool that is able to track the location of a lost vehicle with the GPS neo 6 module and can produce a software design that can display the location of the vehicle in the form of a map on the google maps application on the vehicle owner's smartphone (Tharunika et al., 2021).

Delay time, the farther the distance between the application and the provider will result in a greater delay time, this is because the distance traveled by data sent from the server to the SMS application or from the SMS application to the server is getting longer and affects the signal strength of the operator received by the smartphone. , where the operator's signal strength is getting smaller when the distance between the smartphone and the ISP is getting farther away (Allam & Newman, 2018).

In Indonesia, it is no stranger to online transportation as well as in Palembang, which is in the province of South Sumatra, online transportation is now very much needed. The purpose of this study is to describe the characteristics of online transportation workers in the city of Palembang. Behind that online transportation requires workers to drive land transportation and it can be seen that land transportation is often used. Due to technological advances, public transportation drivers such as motorcycle taxis are used and online motorcycle taxis are made (grab, gojek, maxim, etc.) (Amri & Setiawan, 2018). There are special applications for online motorcycle taxi drivers such as grab drivers. Many public transport drivers use the application to become online motorcycle taxi drivers. There are many online motorcycle taxi transportation in Indonesia, there are 50 cities, one of which is Palembang. There are many categories of online motorcycle taxi drivers based on age, gender, marital status, domicile, latest education, income, and vehicle ownership status. It can be concluded that age is a factor to declare as a teenager, adult or old which is dominated by teenagers with an age range of 18 – 28 years. For gender, there are male and female dominated by male (Alaidi et al., 2020). For the marital status category, there are married and unmarried which dominates are unmarried. For the domicile category, most of the immigrants come from various regions in Sumatra and Java. The last education is usually high school. For income or income of 3 million. And finally, in the category of vehicle ownership status, it is clear that the vehicle status is mostly private vehicles (Tharunika et al., 2021).

This journal was created because with the current technology to recognize license plates on vehicles, various application services are used such as: searching for stolen vehicles, criminal vehicles and parking management.

Furthermore, with the presence of a black box installed in the vehicle, it became common to use it to record the condition of the front or rear of the vehicle during the trip. Pictures or videos recorded can help reveal the facts in the event of a traffic accident. In that way the black box evolves into services like GPS, safe driving and more. Currently, to search for the desired vehicle, a method is used, namely stopping the vehicle being sought through a checkpoint which automatically recognizes the number plates of vehicles passing through the road and another method, namely vehicles that are parked or being driven are recognized by using a vehicle number plate recognition system installed on the road (Engineering, 2019). Police vehicle. However, with this method, the number of vehicle number plate recognition systems installed is not sufficient to allow the search for the vehicle being sought and the search area is very limited (Kavitha et al., 2020).

The method used is to provide tools and ways to find the vehicle you are looking for, which is able to work together with the black box installed in the individual vehicle by recognizing and searching for the vehicle registration number near the black box in real time. The apparatus will search for the vehicle being sought by receiving a response or response according to the request and obtain the desired information and the location of the vehicle according to the vehicle registration number or vehicle registration area number (Sarrab et al., 2020). Here the recipient of the response can include whether the response is a response transmitted by a vehicle registration number recognized by a black box having a vehicle registration number recognition function or a response sent from a black box detecting a vehicle registration number area (Desai & Phadke, 2017).

The desired results in this study are to describe the relationship between vehicles installed with black boxes which have the function of recognizing other vehicle registration numbers, illustrating the environment in which the equipment to search for the vehicle being sought is in accordance with its application in this study, describing the constitution of the apparatus to search for the vehicle being sought through the box. The black box identifies the vehicle registration number and the vehicle registration area number and lastly depicts a diagram of the search method for the vehicle searched according to the embodiments of the present invention (Seminara et al., 2020).

The background of the present invention as described in this journal is generally related to an apparatus and method for searching for the desired vehicle. In the journal, the author wrote that the method used to search for the vehicle in question was by installing a black box installed in an unspecified individual vehicle. The box will look for the vehicle registration number in each box installed in real time, and identify the location of the searched vehicle in real time also using information about the location of the searched vehicle. With the method required by the tool to search for the desired vehicle, a black box is installed in at least one vehicle which is intended to find the registration number of the vehicle being sought (Putra, Warnars, Abbas, et al., 2019). After that, the tool will search for the location of the vehicle with the black box and the black box is also used as a tool to recognize the STNK number and detect the number from the STNK area. The current technology used to recognize vehicle number plates will usually be used as a tool to help find stolen vehicles and also as a tool to find vehicles from a criminal. This black box is also equipped with a camera so that it will continue to record the

front and back of the vehicle that is installed during the trip and after that the pictures can be used as evidence and become facts in the event of a traffic accident. So, the conclusion of this journal is that the tool was created with the aim of being a tool to facilitate the search for a stolen vehicle or as a tool to find a vehicle from a crime so that there is no need to bother looking for it in the midst of the existing crowd (Putra, Warnars, Gaol, et al., 2019).

Vehicle tracking systems are indispensable in today's times to track lost vehicles, view and manage traffic. Today number plate recognition and car identification are an important part of image processing and monitor monitoring. This system will take an image of the vehicle's license plate and use this image to track the journey of the vehicle that violates the traffic or also the stolen vehicle. This system uses the JAVA Optical Character Recognition (OCR) library in its manufacture. By using OCR software, the information obtained from the images will be easily converted into text format. The procedure for extracting text from images is as follows: image acquisition, image digitization and storage, character segmentation, optical character recognition, storage into a file, vehicle tracking. There are several obstacles in running this system including: poor camera quality, unclear images, and poor lighting. In conclusion, this application system is useful for tracking stolen vehicles, monitoring traffic, managing parking, and traffic light violations. The main purpose of this paper is to produce a better tracking application that can overcome the obstacles that have been found previously (Mo Khin & Nyein Oo, 2018).

Journal that talks about IVI comprehension analysis through smartphones. IVI stands for In Vehicle Infotainment. In Vehicle Infotainment is a term from the automotive industry that refers to a vehicle system that combines entertainment and information delivery to drivers and passengers. Currently, many industries have integrated applications via smartphones with the In Vehicle Infotainment (IVI) system. This integration is usually facilitated with a pair of applications. One is run on a smartphone and the other is run on In Vehicle Infotainment which is connected to the Vehicle Controller Area Network (CAN) bus. This journal analyzes the security protocols and frameworks that implement this application on In Vehicle Infotainment (Madisa & Joseph, 2018). This journal analyzes the extent to which applications, protocols, and implementations of In Vehicle Infotainment are vulnerable to attackers who may be able to control or hack the driver's smartphone. Based on the analysis, the authors will document and demonstrate insecurity in the Mirror Link protocol and the implementation of In Vehicle Infotainment that could potentially trigger an attacker to control the driver's smartphone with the aim of sending malicious messages in the vehicle's internal network (Benhamadi et al., 2019).

This journal talks about vehicle users who are sleepy while driving a vehicle. In every country there are certainly many drivers who sleepy and cause accidents, for example, the incident occurred in the United States, Israel, Germany, Sweden. Usually accidents caused by sleepy drivers are caused by drivers who are drinking alcoholic beverages, losing focus or daydreaming while driving, to using illegal drugs such as drugs, and so on (Furqan Durrani et al., 2019).

Many vehicles are targeted by the police because of their negligence when driving, usually adults or office workers who often experience sleepiness while driving, because they are too tired while driving. Surveys show that drivers who are sleepy and cause accidents usually occur in male drivers, and on average they are driving a car. And it also happens a lot to truck or bus drivers. Where the average number of victims is higher than that of a car, many suffered minor injuries, serious injuries, and even death. The police also followed up to impose penalties and fines on the driver. The police also appealed to motorists to be careful when driving, if you are tired of driving, you are expected to rest for a while (Soha et al., 2018).

II. RESEARCH METHOD

The method used in this study reads a lot of journals and books, so that it can be the basis of good research, in this study the number of journals read is 150 and books are 50, with the basis of that much research, the latest research problems can be formulated so that they can confirmed the novelty of this study.

The software used in this study is Java software combined with database MySQL so that it can provide good data and display so that it can assist users in monitoring the data obtained through the MCU node tool.

The hardware used in this research is to use a microcontroller device, such as the MCU node and the SP 01 Wi-Fi module, as well as CCTV, which is used to take pictures of the vehicle to be worked on by the system, using vehicle and driver data placed on the device with a combination of With these three tools, detecting the vehicle you are looking for will be much faster, and can prove that the vehicle is in the search process because of a case.

Based on the picture of the research method below, it can be explained that the first stage in this research is to conduct a literature review, then conduct a test run on the vehicle to be checked for data, and finally produce a data that can be processed for further research, so that the data can be used in finding the vehicle being sought by the Police.

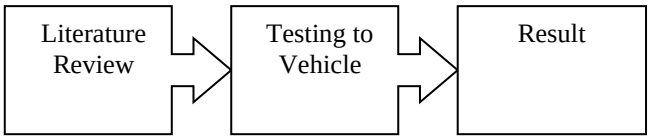

Fig 1. Research method

III. MODEL PROPOSED

In this section, it will be explained that this system will be proposed in this research. The pictures and explanations will be explained below. The first stage is to discuss how the concept of a smart city is first said to be smart in Jakarta, after that discussing smaller things. Such as discussing smart transportation in Jakarta, this research is reduced to finding problematic vehicles on the police side, so the police are looking for these vehicles to check their whereabouts and documents. Therefore, by searching for vehicles at red lights using smart technology, will greatly assist the Police in conducting a search for the vehicle.

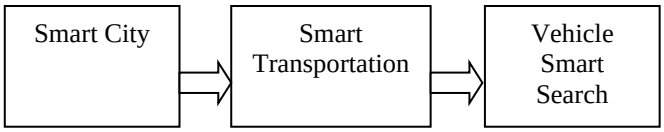

Fig 2. Model Framework Smart Transportation

Based on the picture 3 below, it can be explained that the picture below is an image of the MCU node microcontroller, the MCU node is used to store vehicle data and driver data, the MCU node tool is placed on the vehicle so that the vehicle can be monitored by the police anywhere and anytime, so that if you commit a violation will be given immediate action in the form of a fine.

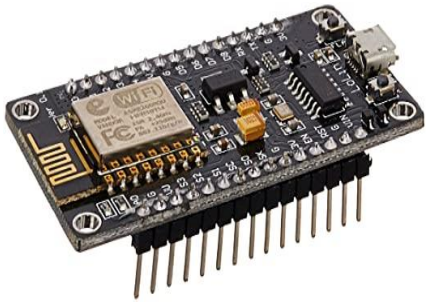

Fig 3. Node MCU

Based on the picture 4 below is an image of the Wi-Fi Module ESP-01 microcontroller, this tool is used to read the data on the MCU node tool, with this tool, the vehicle installed with the MCU node tool will be able to detect vehicle data and vehicle driver data, therefore this tool will help a lot in sending data to the police database.

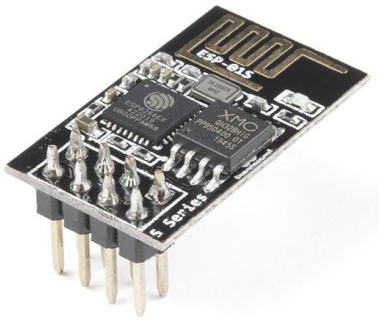

Fig 4. Wi-Fi Module ESP-01

Based on Fig 5 below, it will be explained that the image is a CCTV image that is used to take pictures of motorized vehicles that pass a red light, so that it can be used as evidence for the police to take legal action against the vehicle being sought, the data can be used as a legal basis because the vehicle is in the legal process.

Fig 5. CCTV

Based on Fig 6 below, it is known that the image is a model image of the proposed system, the proposed system is How to detect the vehicle being sought at a red light, so that the police can take faster action to arrest the driver of the vehicle being sought, on suspicion of the vehicle. Is having a legal process, or is in trouble. The system is a vehicle that is usually attached. A device called the MCU node is then detected by CCTV and the sp-01 Wi-Fi module, after which the data is sent to the database to be checked. If it is being sought, it will be reported immediately to the authorities, and the police can immediately pursue the vehicle because it is indicated that there is a crime in the vehicle.

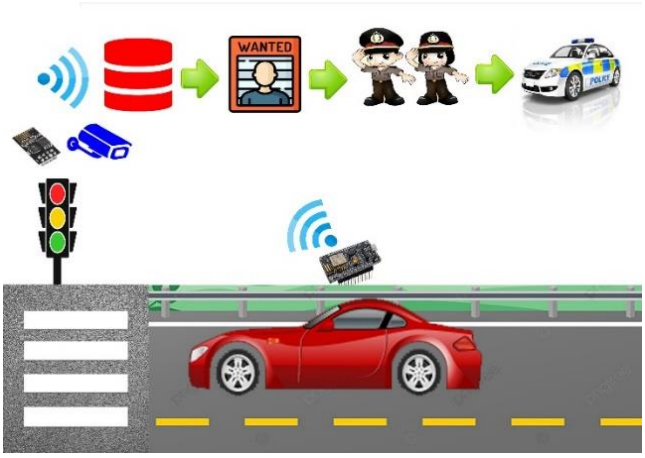

Fig 6. Model framework

Based on Fig 7 below, it can be explained that the image is a flowchart of the proposed system, in this study the flowchart system starts from the start, then the vehicle is at a red light, there are two options yes or no, if you select yes then the vehicle will detected, then the data will be obtained and the data will be recorded to the police database, then if the vehicle is not detected, the data will be checked into the database, it will immediately be reported to the police, to chase the vehicle then the vehicle will be verified. If there is a problem in the law, the police will check, so that it can be known whether the vehicle is in trouble or not.

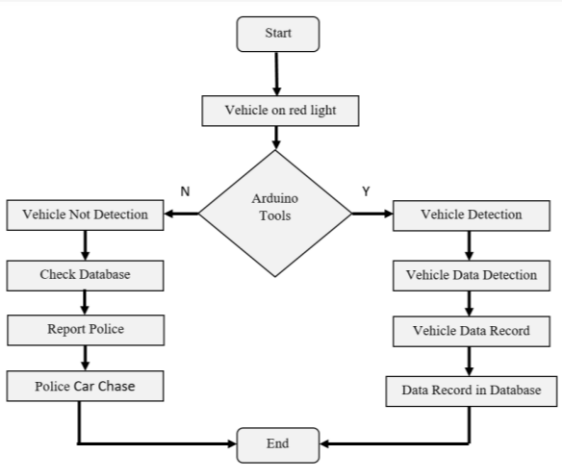

Fig 7. Flowchart

Based on Fig 8 below, is a picture of a use case diagram in the system offered in this study, the use case diagram consists of two actors, the first is the driver, the second actor is the system, has a use case vehicle, use case data checking, use case vehicle checking and a ticket, and the system also has the same use case if the vehicle is driving it will be checked by the system and then the vehicle will be checked, so if you have a problem you will get a ticket.

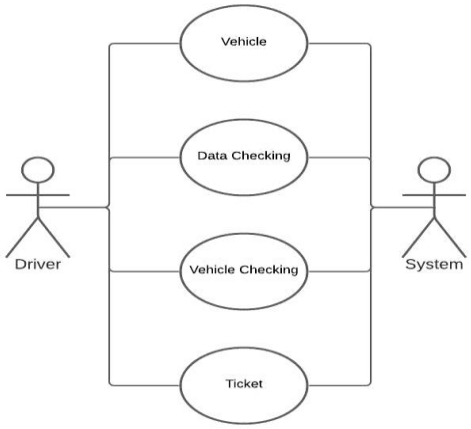

Fig 8. Use Case Diagram

Based on Fig 9 below, it will be explained that the image is an activity diagram image from this research, the image explains that there are two systems, namely vehicle and system, which starts from the vehicle, the vehicle is at a red light, and the vehicle will the data is checked by the system, then the vehicle passes a red light, if the vehicle is not in the database and is in the process of being searched, the system will call the police so that the vehicle will be stopped, to verify the data whether the vehicle has a problem.

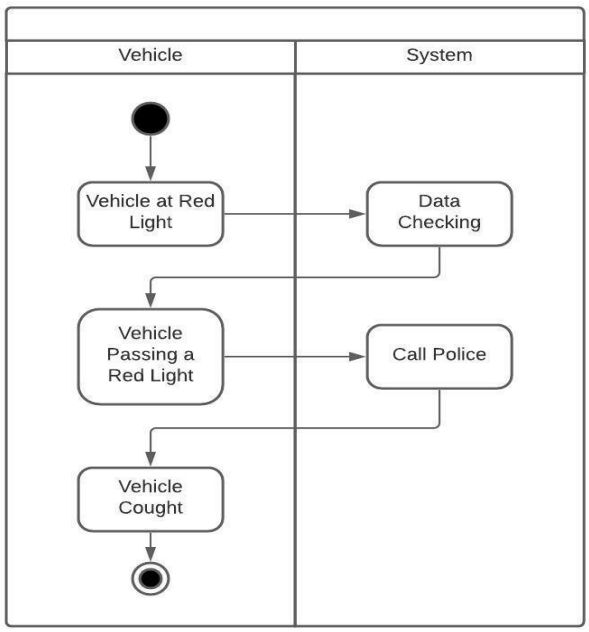

Fig 9. Activity Diagram

Based on Fig 10 below, it will be explained that the image is a picture of a two-wheeled vehicle that will be tested in this study, the vehicle is a 110 cc Honda Spacy vehicle, which will place the node MCU microcontroller which contains vehicle data and vehicle owners.

Fig 10. Plat Number Test

Based on Fig 11 below, it will be explained that the image is an image taken from the system, which was created to obtain vehicle data and driver data, so that the data can be used as the basis for the Police in making decisions, whether the vehicle is being sought or is in trouble. in the legal process, from the display it can be seen that the data that can be retrieved are license plate data, name, engine number, frame number, vehicle registration data, the date the data was taken, balance, vehicle violations, vehicles sought, and serious violations.

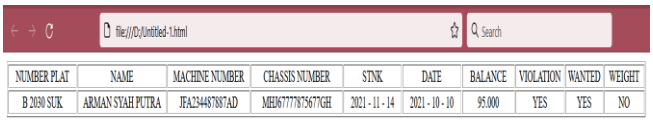

Fig 11. Vehicle Data Record by System

Based on Fig 11 below, it will be explained that the image is an image taken from the system, which was created to obtain vehicle data and driver data, so that the data can be used as the basis for the Police in making decisions, whether the vehicle is being sought or is in trouble. In the legal process, from the display it can be seen that the data that can be retrieved are license plate data, name, engine number, frame number, vehicle registration data, the date the data was taken, balance, vehicle violations, vehicles sought, and serious violations.

Based on table 1 below, it will be explained that from the display it can be seen that the data that can be taken are license plate data having 100% accuracy, names having 100% accuracy, machine numbers having 100% accuracy, frame numbers having 100% accuracy, vehicle registration data has 100% accuracy, the date the data was taken has 100% accuracy, balances have 100% accuracy, vehicle violations have 100% accuracy, the vehicle sought has 100% accuracy, and commits serious violations has 100% accuracy, therefore the test is successful and has 100% accuracy on all its table titles.

Table 1. Identified Data of the Two wheeler

No	Detection	Status	Accuracy of Data
1	License plate	Detected	100%
2	Name	Detected	100%
3	Machine	Detected	100%
4	Frame	Detected	100%
5	Vehicle Registration	Detected	100%
6	Listing Date	Detected	100%
7	Balance	Detected	100%
8	Violation	Detected	100%
9	Wanted	Detected	100%
10	Weight	Detected	100%

V. CONCLUTION

Based on the test results above, it can be concluded that all data obtained on the MCU node microcontroller can be read properly so that it has an accuracy rate of 100%, which is in the data stored in the MCU node, with this high level of accuracy the vehicle search lost will be easier because the results are accurate, and can help the police in acting to get the vehicle that is being sought, and can immediately process the vehicle so that the case can be resolved, future research is how to develop software that is on the police so that it can be developed moreover, there are many things that can be obtained. Apart from searching for lost vehicles, therefore software development must be carried out continuously every year so that the shortcomings of the software can be improved continuously.

REFERENCES

Alaidi, A. H. M., Aljazaery, I. A., AlRikabi, H. T. S., Mahmood, I. N., & Abed, F. T. (2020). Design and implementation of a smart traffic light management system controlled wirelessly by arduino. International Journal of Interactive Mobile Technologies, 14(7), 32–40. https://doi.org/10.3991/ijim.v14i07.12823

Allam, Z., & Newman, P. (2018). Redefining the Smart City: Culture, Metabolism and Governance. Smart Cities, 1(1), 4–25. https://doi.org/10.3390/smartcities1010002

Amri, Y., & Setiawan, M. A. (2018). Improving Smart Home Concept with the Internet of Things Concept Using RaspberryPi and NodeMCU. IOP Conference Series: Materials Science and Engineering, 325(1). https://doi.org/10.1088/1757-899X/325/1/012021

Azwar, A. G., Haviani Laluma, R., Halim, R. P., Nurwathi, Gunawansyah, & Gunawan. (2019). Smart Trash Monitoring System Design Using NodeMCU-based IoT. TSSA 2019 - 13th International Conference on Telecommunication Systems, Services, and Applications, Proceedings, 67–71. https://doi.org/10.1109/TSSA48701.2019.8985517

Benhamadi, R., Bouhedda, M., Bengherbia, B., Benyezza, H., & Benzineb, O. (2019). IoT-Based System for Supervision and Control of a Transmission Center. Proceedings - 2019 3rd International Conference on Applied Automation and Industrial Diagnostics, ICAAID 2019, 1(September), 1–5. https://doi.org/10.1109/ICAAID.2019.8934953

Desai, M., & Phadke, A. (2017). Internet of Things based vehicle monitoring system. IFIP International Conference on Wireless and Optical Communications Networks, WOCN, 1–3. https://doi.org/10.1109/WOCN.2017.8065840

Dhatrak, A. S., & Gandhe, S. T. (2018). Automatic Traffic Signals in Smart Cities for Speedy Clearance of Emergency Vehicles. Proceedings - 2018 4th International Conference on Computing, Communication Control and Automation, ICCUBEA 2018, 1–6. https://doi.org/10.1109/ICCUBEA.2018.8697720

Engineering, F. O. F. (2019). ESTIMATION OF OVER WEIGHT IN WATER VEHICLES This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

Submitted By ID : 152-15-6115 ID : 152-15-482 Submitted To Md Zahid Hasa.

Furqan Durrani, A. M., Rehman, A. U., Farooq, A., Meo, J. A., & Sadiq, M. T. (2019). An automated waste control management system (AWCMS) by using Arduino. 2019 International Conference on Engineering and Emerging Technologies, ICEET 2019, 1–6. https://doi.org/10.1109/CEET1.2019.8711844

George, S. (n.d.). An IoT based Active Building Surveillance System using Raspberry Pi and NodeMCU. 1–9.

Gohar, A., & Nencioni, G. (2021). The Role of 5G Technologies in a Smart City: The Case for Intelligent Transportation System. Sustainability, 13(9), 5188. https://doi.org/10.3390/su13095188

Hermawan, G., & Husni, E. (2020). Acquisition, Modeling, and Evaluating Method of Driving Behavior Based on OBD-II: A Literature Survey. IOP Conference Series: Materials Science and Engineering, 879(1). https://doi.org/10.1088/1757-899X/879/1/012030

Kavitha, V., Dharani, E., Golda, G., Hemalatha, K., & Kalaiarasi, A. (2020). User Interference Intelligence Smart Transportation using IOT. 8(07), 7–8.

Kumar, A., & Kumari, M. (2021). Design and implementation of AI Based Robotic Car for Surveillance and transportation. IOP Conference Series: Materials Science and Engineering, 1116(1), 012123. https://doi.org/10.1088/1757-899x/1116/1/012123

Kumar, T., & Kushwaha, D. S. (2019). An intelligent surveillance system based on IoT for internal security of a nation. International Journal of Information Security and Privacy, 13(3), 1–30. https://doi.org/10.4018/IJISP.201907010101

Madisa, M. K., & Joseph, M. K. (2018). Android and Cloud Based Traffic Control System. 2018 International Conference on Advances in Big Data, Computing and Data Communication Systems, IcABCD 2018, 1–4. https://doi.org/10.1109/ICABCD.2018.8465443

Mo Khin, J. M., & Nyein Oo, D. N. (2018). Real-Time Vehicle Tracking System Using Arduino, GPS, GSM and Web-Based Technologies. International Journal of Science and Engineering Applications, 7(11), 433–436. https://doi.org/10.7753/ijsea0711.1006

Putra, A. S., & Warnars, H. L. H. S. (2019). Intelligent Traffic Monitoring System (ITMS) for Smart City Based on IoT Monitoring. 1st 2018 Indonesian Association for Pattern Recognition International Conference, INAPR 2018 - Proceedings, 161–165. https://doi.org/10.1109/INAPR.2018.8626855

Putra, A. S., Warnars, H. L. H. S., Abbas, B. S., Trisetyarso, A., Suparta, W., & Kang, C. H. (2019). Gamification in the e-Learning Process for children with Attention Deficit Hyperactivity Disorder (ADHD). 1st 2018 Indonesian Association for Pattern Recognition International Conference, INAPR 2018 - Proceedings, 182–185. https://doi.org/10.1109/INAPR.2018.8627047

Putra, A. S., Warnars, H. L. H. S., Gaol, F. L., Soewito, B., & Abdurachman, E. (2019). A Proposed surveillance model in an Intelligent Transportation System (ITS). 1st 2018 Indonesian Association for Pattern Recognition International Conference, INAPR 2018 - Proceedings, 156–160. https://doi.org/10.1109/INAPR.2018.8627013

Sarrab, M., Pulparambil, S., & Awadalla, M. (2020). Development of an IoT based real-time traffic monitoring system for city governance. Global Transitions, 2, 230–245. https://doi.org/10.1016/j.glt.2020.09.004

Seminara, M., Nawaz, T., Caputo, S., Mucchi, L., & Catani, J. (2020). Optical Characterization of Ultra-Low latency Visible Light Communication System for Intelligent Transportation Systems. xx(xx), 1–16.

Soha, C. B., Tan, J. J., Tseng, K. J., Woo, W. L., & Teo, J. W. R. (2018). Intelligent Street Lighting for Smart Cities. International Conference on Innovative Smart Grid Technologies, ISGT Asia 2018, 138634(138683), 1027–1031. https://doi.org/10.1109/ISGT-Asia.2018.8467767

Systems, T. (2020). Blockchain-based Reputation for Intelligent Transportation Systems. https://doi.org/10.3390/s20030791

Tharunika, B., Kumar, H. D., ShaliniReddy, K., & SatishKumar, D. R. G. A. E. (2021). Accident and Alcohol Detection for Two Wheelers Using Node Mcu. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(6), 4404–4411.

Wang, H., Adam, A., & Han, F. (2020). Improving efficiency of customer requirements classification on autonomous vehicle by natural language processing. International Journal of Computing and Digital Systems, 9(6), 1213–1219. https://doi.org/10.12785/ijcds/0906018

Zaky, M., & Soubra, H. (2021). An Intelligent Transportation System for Air and Noise Pollution Management in Cities. April, 333–340. https://doi.org/10.5220/0010403403330340