

## **PARKING SMARTS BASED ON NODEMCU ESP8266 TELEGRAM NOTIFICATION**

*Ajeng Mutiara Charisma<sup>1</sup>, Isfahani Pramono Jati<sup>2</sup>, Muhammad Fikry Alifiansyah<sup>3</sup>*

*Sandy Rio Pratama<sup>4</sup>, Zulfa Safitri<sup>5</sup>*

### **Abstract**

*Parking is a common activity in everyday life. Parking is an activity in which the user stops the vehicle using a specified time and place. The need for parking for today's vehicles has seen an increase in both the capacity and the technology used. It cannot be denied that the need for parking lots has become an important part of daily life. The higher the need for parking lots also triggers high crime rates when parking is not equipped with maximum security. It is still found in some parking lots that do not have the proper security for vehicle maintenance. This is not something to be taken for granted because an estimated loss can be classified as a high value one.*

*The purpose of this device was created as a system to improve parking levels of safety so that the user of the parking lot felt more secure and relaxed when he parked his vehicle. The method used is an rfid sensor system application linked to nodemcu as input, processing using nodemcu as microcontroller and output using LCD and buzzer. What is achieved is that there is an automatic parking system that can be applied to parking lots.*

**Keywords:** auto-parking, security, nodemcu, LCD

## **Specifications table**

Hardware name	Smart Parking Based on Telegram Notification
Subject area	Environmental Engineering and Material Science
Hardware type	<ul style="list-style-type: none"><li>• Engineering and Material Science Environmental, Planetary, and Agricultural Sciences</li><li>• Educational Tools and Open Source Alternatives to Existing Infrastructure</li><li>• General</li></ul>
Closest commercial analog	"No commercial analog is available."
Open source license	-

Cost of hardware	Rp. 115.800,00
Source file repository	-
OSHOWA certification UID (OPTIONAL)	-

\* Corresponding author.

E-mail address: [ajengmutiarac@gmail.com](mailto:ajengmutiarac@gmail.com) (Ajeng Mutiara Charisma),  
[isfahanipj@gmail.com](mailto:isfahanipj@gmail.com) (Isfahani Pramono Jati), [muhammad.alfikal@gmail.com](mailto:muhammad.alfikal@gmail.com)  
(Muhammad Fikry Alifiansyah), [sandyrioprutama0@gmail.com](mailto:sandyrioprutama0@gmail.com) (Sandy Rio Pratama) ,  
[zulfasafitri2063@gmail.com](mailto:zulfasafitri2063@gmail.com) (Zulfa Safitri).

## 1. Hardware in context

Parking is a common activity in modern times. Parking is an activity where the vehicle user stops vehicles on a space speaker for a specified period of time. It is estimated to 30% of cars on the roads of main cities are looking used for a parking space every day, as well as it takes an mean of 7.8 minutes to find a parking space[1]. Parking lots are common areas, such as malls, schools, hospitals, and other public areas. In everyday life many applications of a parking system are used in parking lots. Most parking lots still haven't implemented a good and efficient parking system. Furthermore, the required parking system is also far from adequate security. Because of the gross lack of security in the parking system, there are frequent crimes of motor vehicle theft.

The security of the parking lot would be highly irregular. This is because there are so many parking spots that only security guards or parking attendants are left with no portals. This can certainly trigger the crime of theft of motor vehicles. From this problem can be developed a single device that can be used as security in a parking lot[2]. Parking doors can only be accessed by one vehicle. The parking door is located at the exit, which helps the attendant to control the flow of the vehicle. This parking door is accessible only to those who have a special id that is already connected to the parking door. Using this portal can be used as security media to prevent the theft of motor vehicles in parking lots.

In this research methodology using RFID, servo motor, LCD, and buzzer. RFID(Radio Frequently Identification) is a technology to a technology, whereby digital data encoded in RFID tags or smart labels (defined below) are captured by a reader via radio waves. RFID is similar to barcoding in that data from a tag or label are captured by a device that stores the data in a database[3]. RFID, however, has several advantages over systems that use barcode asset tracking software. The most notable is that RFID tag data can be read outside the line-of-sight, whereas barcodes must be aligned with an optical scanner.

At a simple level, RFID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader (also called an interrogator). The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communications interface to a host computer system[4], where the data can be stored in a database and analyzed at a later time. A motor's servo is an electrical device used on smart industrial machines that

serves to drive or rotate objects with high precision controls in angles, acceleration and speed, a skill not held by ordinary motors[5]. If you want to rotate and direct objects at some Angle or distance, then you must use the motor servo. It is possible with an ordinary combination of motors and an added sensor in this case of an encoder for position feedback. The controller of the servo motor better known as the servo drive is the most important and sophisticated part of a motor's servo, because it is designed for such high precision[6].

The buzzer was an electronic component that worked to convert electric vibrations into sound vibrations. Basically the principle of the buzzer's work is similar to that of a speaker loud, so the buzzer also consists of a coil attached to the diaphragm and then a current is channeled to an electromagnet, depending on the current and the polarity of the magnet, since the coil is attached to the diaphragm and its magnetic polarity, since the coil is attached to the diaphragm so that the air vibrates over and over again so that the air vibrates. Buzzer is commonly used as an indicator that the process is complete or that an alarm device is faulty.

Telegram bot is a third-party application that runs inside Telegram. Bot in Telegram can interact with users by sending messages. A telegram bot is a particular type of user that is not a human but a computer program that can serve companies or brands with many features such as sending out information, reminders, playing tunes, ordering, and more. Users can interact with the telegram bot by sending messages[7]. Out of all the four peer types, the Telegram bot comes with many useful features for businesses. Telegram provides an API to create bots for social interactions, productivity, gaming, and e-commerce services. Apart from these, Telegram bots can also provide customer support or collect leads by connecting them to a ticketing system, or a messaging platform.

## **2. Hardware description**

One of the main reasons for choosing this project is because the manufacturing costs are cheap and very useful for maintaining vehicle safety when in public parking lots. To achieve this, we designed a system using several components that we purchased through an online store. The most important part of this project is NodeMcu because we will connect this tool with other components and the Telegram Bot application in real time. Written in Arduino for hardware and Telegram Bot for give to provide notifications that there are vehicles coming out on the handphone of employees to make it easy to control and monitor vehicles coming out of the parking lot, Arduino is one of the most accessible and widely used programming languages for hardware. Control, making it easy to adapt the sampler to new use cases. This tool is different from the others because it is a prototype so that it can still be developed even better.

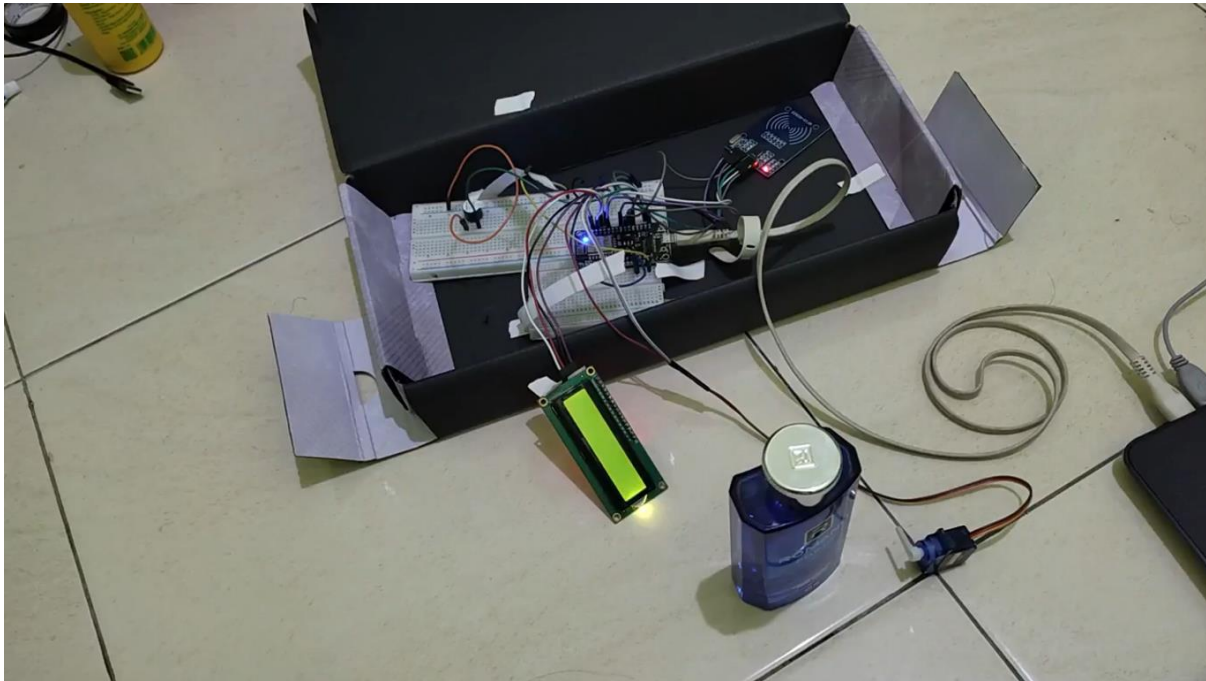
Our tool uses the IoT system, which combines hardware and software by connecting to the telegram bot application in real time by leveraging WiFi. Parking attendants can receive messages or notifications via the telegram application that has been installed on the smartphone when a vehicle is about to enter or leave. It uses RFID as an for controller opening a moving parking door using a servo motor, using a nodemcu as an input regulator component and there are rfid sensors as vehicle detectors to escape parking and LCD and buzzer as an output from the program's input. Once the vehicle goes through the parking door, the door will automatically close at a safe distance from the vehicle.

Conclusion :

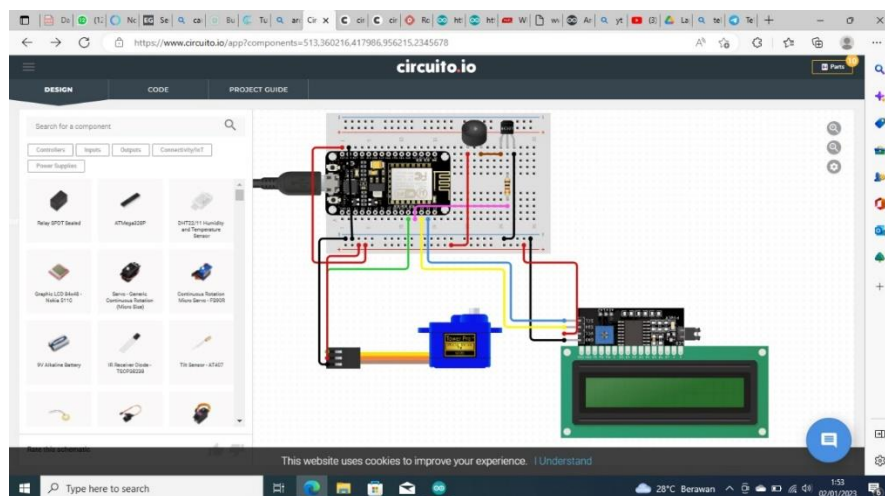
- This tool is very useful for maintaining parking security and is cheaper in terms of manufacture.
- Works well when testing Telegram tools and apps for give a notification for handphone of employees
- The tools use a simple design and widely available materials, so they can be easily developed and modified.

## ***Design files***

**Sensor Section :** Data collection for component compatibility is performed by providing program input to the NodeMCU ESP8266 (Fig. 1). All components are connected via pins on the NodeMCU ESP8266 so that output can be generated from program inputs processed by the NodeMCU ESP8266. For output we use buzzers, LEDs and servo motors. All output will light up when the ID Card is scanned.

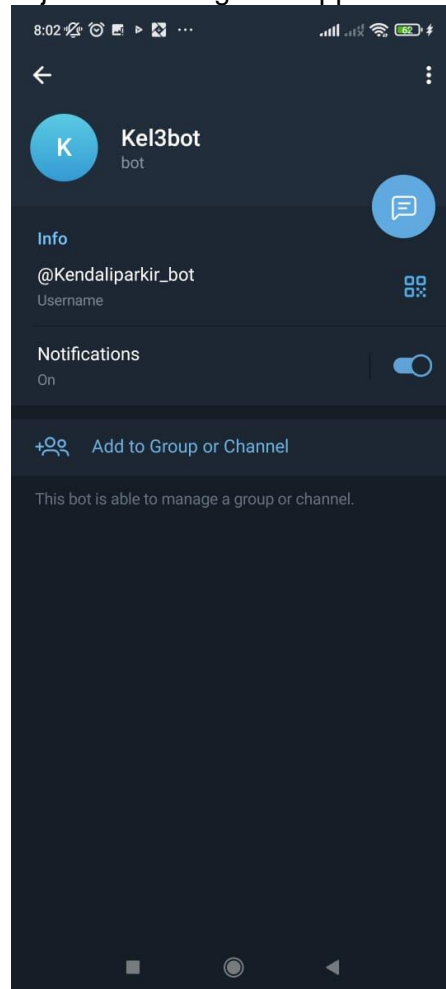


**Fig. 1.** NodeMcu and sensors used



**Fig. 2.** Electronic circuit schematic.

Application Section: In this application (Fig. 2), Parking Officers will receive status notifications on the telegram application when the vehicle scans its ID Card. Then if the ID card is registered, the servo motor as a substitute for the latch will open, if the ID card is not registered, the servo motor will remain closed and a rejected message will appear on the LCD.

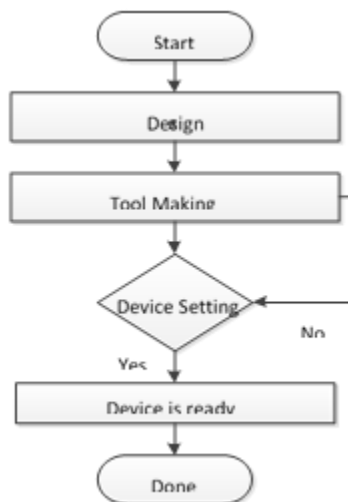


**Fig. 3.** Telegram Bot application that has been installed

Electronics: The schematic diagram of the smart parking electronics circuit is shown in Fig. 2. The components include NodeMcu ESP8266, Buzzer, LCD, jumper cables and circuit board. This circuit is powered by a 3 V DC power supply. Software and firmware: The software we use to make this program is Telegram Bot for give a notification and Arduino IDE for hardware. The Arduino IDE code is available on github (<https://github.com/sand9023/Smart-Parking-IOT>). The code loop function algorithm is shown in.

### **3. Design files summary**

Design file	File type	Open source license	Location of the file
NodeMC U code	INO	-	<a href="https://github.com/sand9023/Smart-Parking-IOT">https://github.com/sand9023/Smart-Parking-IOT</a>
Schematic	circuit.io	-	<a href="https://www.circuit.io/app?components=513,360216,417986,761981,956215,2345678">https://www.circuit.io/app?components=513,360216,417986,761981,956215,2345678</a>



**Fig. 4.** Flowchart of the loop function of the Arduino code

## 4. Bill of materials summary

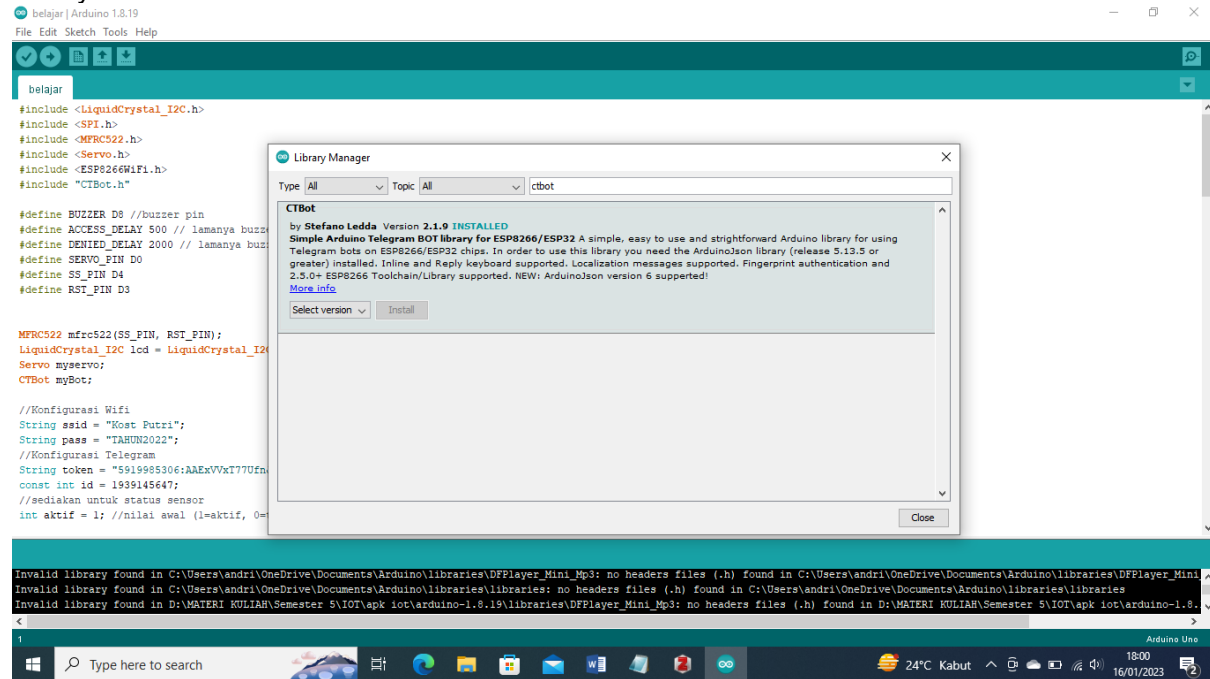
Designator	Component	Number	Cost per unit - currency	Total cost - currency	Source of materials	Material type
A01	NodeMCU	1	Rp. 34.000,00	Rp. 34.000,00	<a href="https://shopee.co.id/NodeMCU-V3-Lua-Arduino-Wifi-IoT-i.33163306.18868044881?sp_atk=e0758955-6dd0-497e-9f5c-b9893140e3cb&amp;xptdk=e0758955-6dd0-497e-9f5c-b9893140e3cb">https://shopee.co.id/NodeMCU-V3-Lua-Arduino-Wifi-IoT-i.33163306.18868044881?sp_atk=e0758955-6dd0-497e-9f5c-b9893140e3cb&amp;xptdk=e0758955-6dd0-497e-9f5c-b9893140e3cb</a>	Metal, Semiconductor
A02	Breadboard	1	Rp. 16.500,00	Rp. 16.500,00	<a href="https://shopee.co.id/500cylwY9h?share_channel_code=1">https://shopee.co.id/500cylwY9h?share_channel_code=1</a>	Polymer, Composite
A03	Jumper wires	40	Rp. 248,00	Rp. 9.900,00	<a href="https://shopee.co.id/1AnuPMcNP6?share_channel_code=1">https://shopee.co.id/1AnuPMcNP6?share_channel_code=1</a>	Metal, polymer
A04	RFID RC522	1	Rp. 15.000,00	Rp. 15.000,00	<a href="https://shopee.co.id/RC522-RFID-Reader-Writer-Arduino-Raspberry-Pi-(-MFRC522)-i.33163306.20668044153?sp_atk=8ae05574-b4dc-4ee9-a849-7542a91b01fa&amp;xptdk=8ae05574-b4dc-4ee9-a849-7542a91b01fa">https://shopee.co.id/RC522-RFID-Reader-Writer-Arduino-Raspberry-Pi-(-MFRC522)-i.33163306.20668044153?sp_atk=8ae05574-b4dc-4ee9-a849-7542a91b01fa&amp;xptdk=8ae05574-b4dc-4ee9-a849-7542a91b01fa</a>	Semi-conductor
A05	LCD 16x2	1	Rp. 39.000,00	Rp. 39.000,00	<a href="https://shopee.co.id/LCD-16x2-Biru-Dilengkapi-I2C-Modul-Sudah-Tersolder-Tinggal-Pakai-i.33163306.19268028822?sp_atk=0ece5a8c-c362-43f4-8e91-09e7cbe72e26&amp;xptdk=0ece5a8c-c362-43f4-8e91-09e7cbe72e26">https://shopee.co.id/LCD-16x2-Biru-Dilengkapi-I2C-Modul-Sudah-Tersolder-Tinggal-Pakai-i.33163306.19268028822?sp_atk=0ece5a8c-c362-43f4-8e91-09e7cbe72e26&amp;xptdk=0ece5a8c-c362-43f4-8e91-09e7cbe72e26</a>	Metal, polymer
A06	Servo	1	Rp. 39.000,00	Rp. 39.000,00	<a href="https://shopee.co.id/Motor-Servo-Tower-Pro-SG90-i.33163306.18768030367?sp_atk=6f0a5d64-b39e-4272-8991-8b65fe911d53&amp;xptdk=6f0a5d64-b39e-4272-8991-8b65fe911d53">https://shopee.co.id/Motor-Servo-Tower-Pro-SG90-i.33163306.18768030367?sp_atk=6f0a5d64-b39e-4272-8991-8b65fe911d53&amp;xptdk=6f0a5d64-b39e-4272-8991-8b65fe911d53</a>	Metal, polymer
A07	Buzzer	1	Rp. 1.400,00	Rp. 1.400,00	<a href="https://shopee.co.id/9zPlvehCeW?share_channel_code=1">https://shopee.co.id/9zPlvehCeW?share_channel_code=1</a>	Metal, Semiconductor

## 5. Build instructions

We will divide this project into two parts via Arduino/NodeMCU Programming and Creating Bot Telegram. Follow the instructions below to build the complete system.

### 5.1 Arduino/NodeMCU Programming

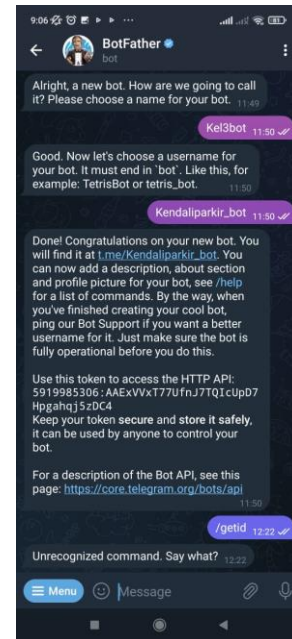
To be able to connect and provide messages from the Telegram Bot, we first installed a library called CTBot. Assemble the hardware according to the schematic in Fig. 2. Install the CTBot library on the Arduino IDE.



**Fig. 5.** Install the CTBot library

- In the Arduino IDE, go to the Sketch menu -> Include Library -> Manage Libraries...
- In the Library Manager Window, search for "ctbot" in the search form then select "CTBot".
- Click the "Install" button.
- Write the program code on the Arduino IDE (<https://github.com/sand9023/Smart-Parking-IOT>). Then upload it to NodeMCU.
- Fetch Bot Token from connect Bot Telegram to Account Telegram, again enter it with no https://





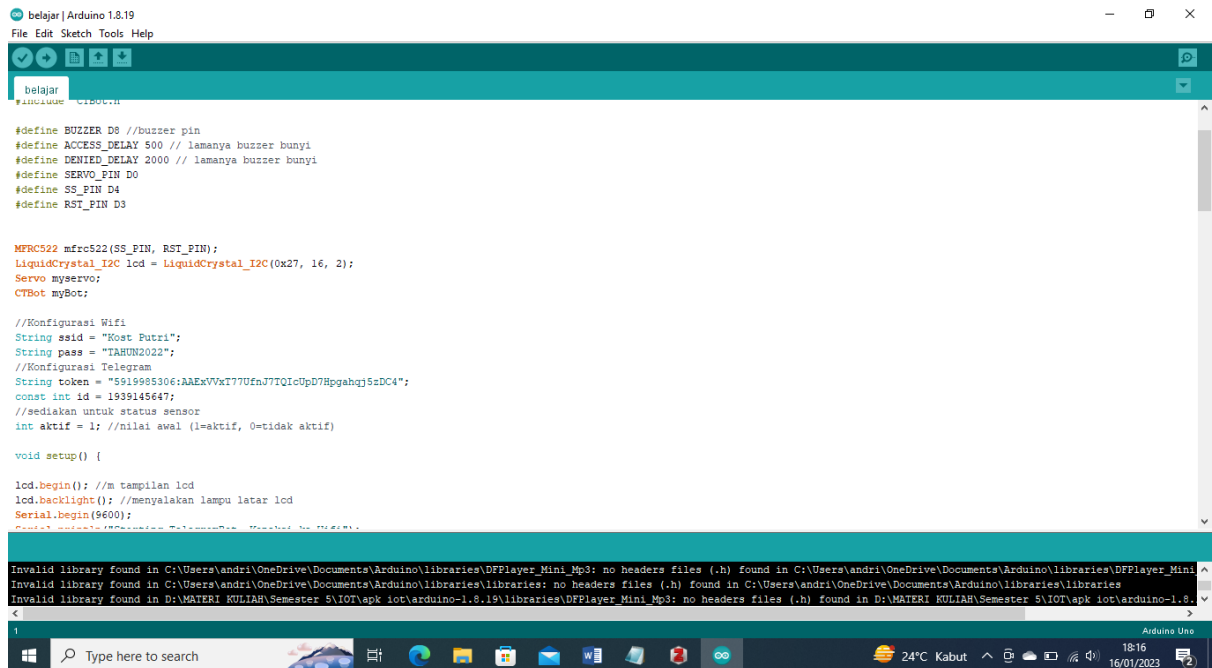
**Fig. 6. Copy Token Bot Telegram**

- Take Token Bot , find the API from the Telegram bot by using this link <https://api.telegram.org/botTOKENBOT/getupdates> to find the id of the user account to be connected to the Telegram Bot



**Fig. 7. Find id Telegram User**

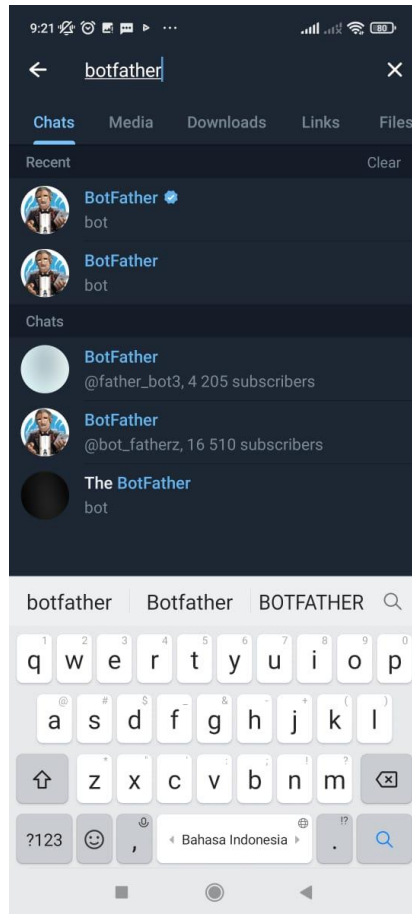
- Enter on id telegram user and token bot Telegram in source code



**Fig. 8.** Copy Id Telegram and Token Bot Telegram to Source Code

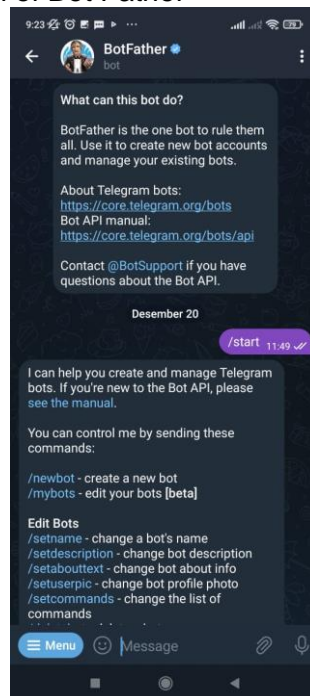
## 5.2 Creating Apps

- Open the Telegram App
- search for the name @botfather to create a telegram bot that has been verified blue tick



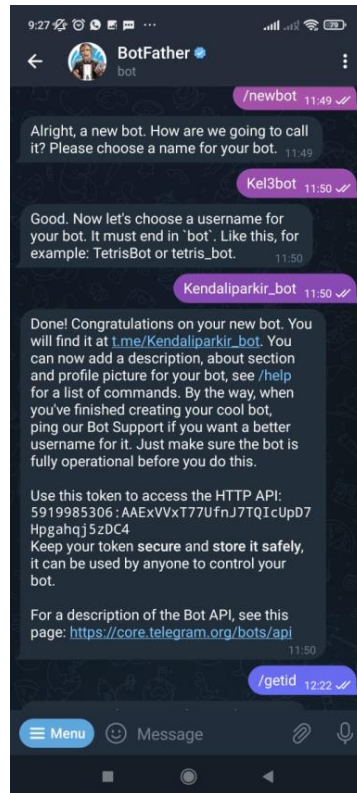
**Fig. 8. BotFather**

- Typing to `/start` to run the function of Bot Father



**Fig. 9.** BotFather has running

- Typing to /newbot for create a bot for give notification



**Fig. 10.** Creating a bot

- Create a new name and link for telegram bot

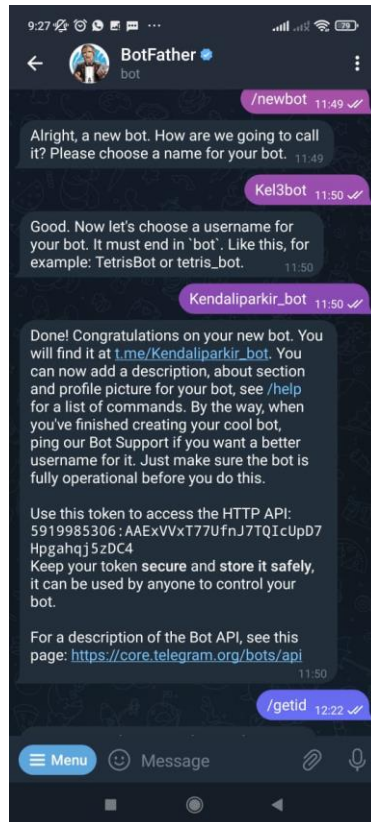
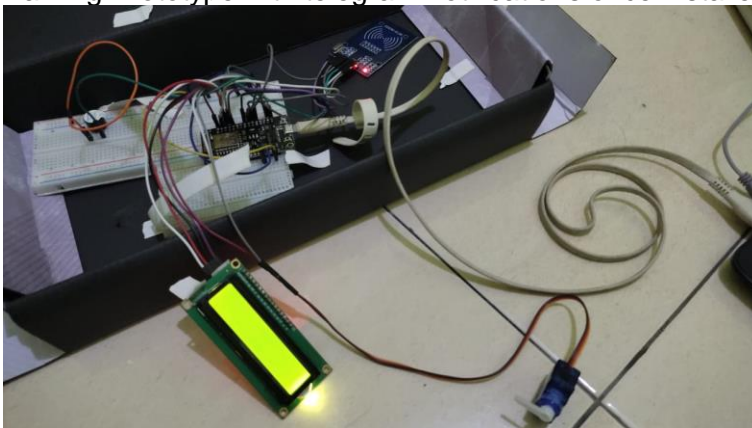


Fig. 11. Create A name and link telegram Bot

## 6. Operation instructions

Below is a step-by-step guide for using the Nodemcu ESP8266-Based Smart Parking Prototype with telegram notifications once installed



**Fig. 17.**Automatic Parking Circuit

1. Connect NodeMCU to a power source
2. Affix the RFID card to the sensor
3. If the sensor accepts or reads the RFID card, the buzzer and LCD will light up simultaneously and the LCD will display the message "Registered ID".
4. In the Telegram application a message notification will appear, the ID is registered, if the card is not registered a notification will appear rejected.
5. After that, the servo motor as a barrier to enter the vehicle will open if the card has been registered.

## 7. Validation and characterization

Based on the tests carried out above, some data can be generated as follows:

Number	Component	Indicator	Results
1	NodeMCU	Responds to other components	Corresponding
2	LCD 16x2	Showing Information	Corresponding
3	RFID RC522	Read Card Tags	Corresponding
3	Servo SG950	Able to open and close	Corresponding
4	Buzzer	Issues an alarm sound	Corresponding

Based on the table above, all components can work according to the program written. Starting from the detection of vibrations around by the sensor, then the output is in the form of an LCD that can display a message and a buzzer that sounds an alarm when the ID card is attached to the sensor. And there is also a notification on the application when a vehicle will enter the parking area. The drawback of this tool is that there is no record of the time or hour when the vehicle enters and when the vehicle exits. It can only receive a scan of the ID Card RFID and then send notifications that the ID Card RFID is read or not.

## 8. Conclusion

A microcontroller (nodemcu esp8266) as a data processing center that receives input results from an rfid sensor detector. Detection will be processed by rfid so that the rfid tag can be used as a parking door mover. Once the parking door opens, there will be output views on LCD and sounds from the buzzer as well as alert views on the telegram application. From the results the above has been

obtained that this automatic parking system is capable of maximum and good work. Here is a more comprehensive description of the performance of the components in the automatic parking system that have already been done.

1. RFID responds well according to the tag and reader preset
2. The servo motor works well and can open and close according to the given input
3. The LCD can display the desired output results without any constraint
4. The noise on the buzzer works without interference according to the input given to it
5. All the components can work systematically without any constraints consistent with the desired wishes
6. This doorknob system is used to get out of parking Spaces and can open bars automatically using id CARDS attached to the rfid reader.
7. This doorstop can be used as a passkey to the parking lot and a parking lot easier.

This automatic parking system can be improved so that it can be applied in real life as an innovation in parking lot security so that it can address crime in parking Spaces.

## Credit author statement

**Ajeng Mutiara Charisma:** Data curation, Writing- Original draft preparation. **Isfahani Pramono Jati:** Conceptualization, Methodology, **Muhammad Fikry Alifiansyah:** Visualization, Investigation. **Sandy Rio Pratama:** Supervision, Bots Telegram. **Zulfa Safitri:** Hardware, Validation.

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