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Smart Anti-Theft System for Electric Vehicle

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Abstract: *The Smart Anti-Theft Car System is an innovative project designed to enhance the security features of conventional vehicles and mitigate the risks associated with unauthorized access and theft. In response to the growing challenges of automotive theft, this project introduces a comprehensive and intelligent anti-theft system integrated with cutting-edge technologies. The primary focus is leveraging IoT (Internet of Things) and real-time connectivity to create a robust security framework. The project incorporates various features to provide an advanced and proactive defense against car theft. Key components include GPS tracking, biometric authentication, and smart sensors, all seamlessly integrated into a centralized control system. The system detects suspicious activities and employs preventive measures to thwart theft attempts. In this project, a user-friendly mobile application serves as a central interface, allowing car owners to monitor and control the security status of their vehicles remotely. Real-time alerts and notifications provide instant updates on security breaches, enabling swift response actions. The integration of IoT enables the collection and analysis of data, contributing to the continuous improvement of the system's effectiveness. The Smart Anti-Theft Car System project represents a significant step forward in automotive security, aligning with the contemporary shift towards smart and connected vehicles. The implementation of this system aims to offer car owners peace of mind by providing a proactive, intelligent, and user-centric approach to preventing car theft. This project contributes to the evolving landscape of smart and secure transportation systems by integrating modern technologies*

Keywords: Electric vehicle (EV), Anti-theft system, Smart security, Remote monitoring, Emergency response integration, Vehicle Protection, Theft prevention, Real-time tracking, Mobile app control, GPS tracking, Vehicle security

I. INTRODUCTION

Currently, there is a significant increase in car burglary instances. Therefore, it is crucial to equip vehicles with a reliable and effective anti-theft device to ensure their protection. The vehicle central locking system provides the highest assurance in protecting your vehicle from various theft incidents. It is a highly effective device designed to provide exceptional security for the vehicle. However, this technology cannot provide complete protection and accessibility to the car during theft. A more sophisticated system utilizes an embedded system focused on GSM technology. The technology that was outlined and constructed is now showcased in the car. Whether own a vehicle or have more than 1000, the tracker device is a solution to locate, monitor, and protect your mobile assets. It involves planning to ensure accurate and uninterrupted tracking and of the vehicle, from any of location. Integrating highly sensitive GPS modulein vehicle tracking systems has enabled these devices to operate in various challenging environments, such as natural canyons, urban canyons, and even under dense foliage, as long as network coverage is strong.

Currently, GPS car tracking assures the safety of travelers during their journey. This car incorporates a theft prevention and recovery system inspired by the systems used in the client's automobiles. The vehicle supervisor or police should follow the tracking system's signal to bring a stolen car to a stop. This will involve reducing the engine speed of the stolen vehicle and turning it off. After trading on the engine, the motor cannot be restarted without authorization from a password. This system is designed for use in four-wheeled vehicles. It is primarily used in naval fleet management for coordination, dispatching, readiness, and security tasks. The applications combine monitoring a guardian's driving performance with a young driver's. The vehicle incorporates features inspired by those found in consumer automobiles,

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designed to prevent theft and aid recovery. The system will send an SMS to the car owner if a burglary is detected. Once the vehicle director sends an SMS to the GSM module connected to the microcontroller, it triggers the necessary signals to stop the burglary immediately. The primary objective of this show investigation is to outline and develop an intelligent and good security system for automobiles that can lower the number of thefts that happens and user could also get notified. The method implemented in the display work utilizes GPS and GSM technology and may be easily integrated into low-cost vehicles, including motorcycles.

II. METHODOLOGY

Hardware Requirement Specification

Designing equipment details for a Keen Anti-theft Framework for Electric Vehicles includes joining different components to guarantee vigorous security highlights while maintaining compatibility with electric vehicle systems.

GPS Module Neo 6-M: -One of the worldwide situating frameworks (GPS) gadgets utilizes satellite information to identify a certain point on the Soil in a trilateration method. Meanwhile, a GPS receiver measures the separations to satellites by applying radio waves to trilateration. Trilateration is a method similar to triangulation, which determines the positions of points, as seen in this diagram (Tim Gunther, 2020). GPS modules consist of small computers and dedicated RF antennas that receive data transmitted by satellites using specified radio frequencies. Subsequently, it will get a timestamp from each distinct satellite and other relevant data. If the module's radio wire can detect at least 4 satellites, it can accurately determine its position and time. The four globally recognized Global Navigation Satellite Systems (GNSS) include GPS, BDS (Beidou), GLONASS, and GALILEO. The most accurate positioning system in the United States is GPS (Global Positioning System), the most advanced technology available. BDS, GLONASS, and GALILEO have finished up the other largest toady route frameworks globally and are modernizing.

Fig.1. GPS Module Neo6M

Gsm Module-900la: -A GSM module or GPRS module is circuit that establishes communication between a portable device and a GSM or GPRS network. The modem, modulator-demodulator, is an essential component in this context. A GSM module works by interfacing with the GSM organized through a SIM card. The SIM card gives the module a one-of-a-kind distinguishing proof number, which is utilized to recognize the gadget on the arrange. At that point, the GSM module communicates with the arranger utilizing a set of conventions, which permits it to send and get information. The GSM arranges an advanced cellular arrangement that employments a set of conventions to empower communication between gadgets. The arrangement is partitioned into cells, each adjusted by a base station. The base station communicates with the gadgets in its cell, which are interconnected to shape and arrange. The GSM module is pivotal in communicating gadgets and organizing the GSM. It is mindful of building up and keeping up the communication between the gadget and the arrangement. The module moreover handles the encryption and unscrambling of information, which guarantees the security of the communication. There are distinctive sorts of GSM modules, each with its functionalities. A few modules are outlined to handle voice communication, whereas others are planned for information communication. A few modules have built-in GPS, allowing them to give area information.

Fig.2.GSM Module 900a

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Voltage Sensor: This fundamental voltage sensor module degrees the voltage over two terminals. The module works in 5V and can degree voltage from 0V to 25V utilizing a potential divider circuit. A match of tall precession resistors shapes a voltage divider circuit, which changes over the input 0-25V to 0-5V on the yield stick of the sensor. A microcontroller like Arduino can, at that point, measure this 0-5V. Do not supply more than 25V to this module, as the yield voltage will surpass 5V and harm the microcontroller. Arduino AVR chips have 10-bit Advertisement, so this module reenacts a determination of 0.00489V (5V/1023), so the least voltage of the input voltage discovery module is 0.00489Vx5=0.02445V.

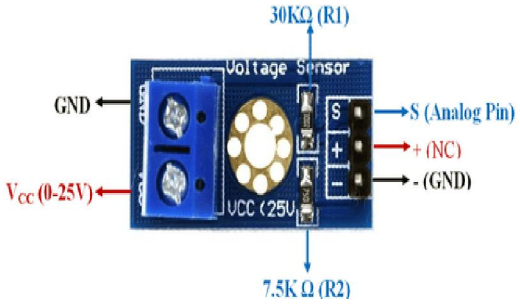

Fig.4.Voltage Sensor

Current sensor: In most IoT gadgets and battery administration frameworks, measuring how much current is streaming in the circuit is foremost. It chooses the battery capacity to be utilized and foresees the run time of the battery pack. It is too pivotal in the plan of security frameworks or any circuit to guarantee the redress rating of the components is chosen. The ACS712-5A Current Sensor Module is a Corridor Impact-based sensor module that decides the current streaming in a given line. It can degree AC and DC up to 5A in both headings. Its yield when no current is streaming through it is 2.5V, and its scale figure is 185mV/A, i.e., if 2A current is streaming through it, at that point, its yield will be 2.87V. The yield gets to be zero if the max 5A current streams are in the invert heading, and if 5A streams are in the forward heading, the yield will tend to be 5V. It also gives confinement from the stack as it is Lobby Impact Based sensor, so it needs to stress approximately putting an additional stack in the circuit to degree current. It should choose the current sensor module based on the maximum current it needs to measure. It may also examine the 20A Current Sensor and 30A Current Sensor. In order to communicate with the ACS712 Current Measuring Module, it needs to initially power with a 5V power supply, which may be provided by a battery or controller such as Arduino. Connect the sensor in parallel with the current-carrying wire want to measure. The output of this module is in analog form. Thus, it needs to be connected to the controller's ADC pins.

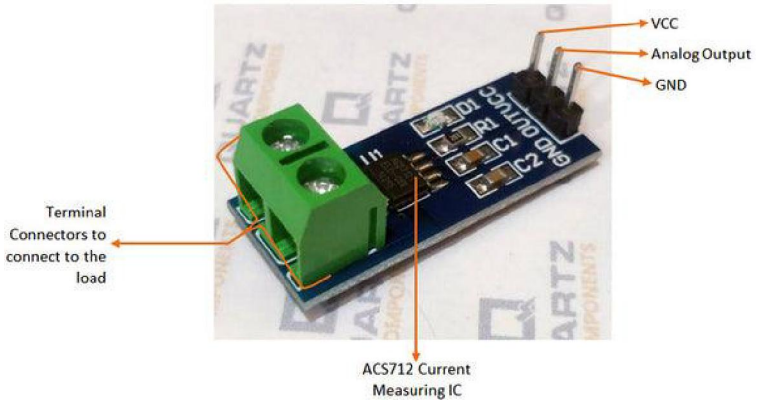

Fig.5.Current Sensor

Esp32 Microcontroller: - The ESP32 is a collection of affordable, low powerSOC microcontrollers with Wi-Fi and Bluetooth. The ESP32 system employs a Ten silica Xtensa LX6 chip in both dual-core and single-core configurations, an Xtensa LX7 dual-core chip, or a single-core RISC-V chip. It also integrates built-in antenna switches, RF balun, power amplifiers, low-noise amplifiers, filters, and power management modules. The ESP32 is manufactured by

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Expressive Frameworks, a Chinese firm headquartered in Shanghai, using TSMC's 40 nm manufacturing process. The user's text is enclosed in tags. This new device has replaced the ESP8266 microcontroller. ESP32provides Wi-Fi and Bluetooth networks for implanted gadgets. Whereas ESP32 is fair to the chip, the modules and improvement sheets containing this chip are regularly alluded to as "ESP32" by the producer.

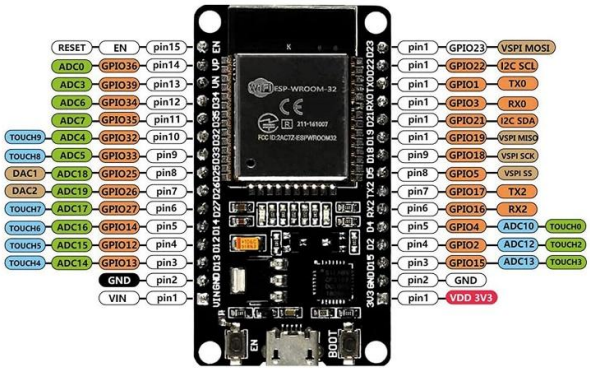

Fig.6.Esp32 Microcontroller

The unique ESP32 chip had a single center Ten silica Xtensa LX6 chip. The processor had a clock rate of over 240 MHz, which made for a moderately tall information preparation speed. More recently, modern models have been included, counting the ESP32-C and -S arrangement, which incorporate single and double-center varieties. These two arrangements, moreover, depend on a Risc-V CPU show instead of Xtensa. Risc-V is comparable to the ARM design, which is well-supported and well-known, but Risc-V is open-source and simple to utilize. Risc-V and ARM have great support from GNU compilers, whereas Xtensa requires additional support and improvement to work with the compilers.

Buzzer: -It is a device that converts electrical signal into sound signal. It needs DC voltage and is used in clocks,printers, alarms, etc. Depending on the many plans available, it canproducevarioustones such as alerts, chimes, and sirens. The stick setup ofbuzzer has appeared underneath. It incorporates two pins to be specific,anode and cathode. The anode terminal with the '+' image or a longer terminalis given 6Volts, while the cathode terminalwith the '-' imageis associated with the ground. Working voltage ranges from 3V to 24V DC. This buzzer can be interfered with a DC control source with a voltage extending from 4V to 9V. An essential 9V battery can also control it, but utilizing a directed +5V or +6V DC supply is superior for ideal execution. Ordinarily, the buzzer is combined with an exchanging circuit to control when it turns on or off as required, either at particular times or intervals.

Fig.7.Buzzer

LEDs: - Driven stands for light-emitting diode, a semiconductor gadget whose work is to transmit light if there is a stream of an electric current. It works on the rule of electroluminescence, where the recombination of electrons and gaps creates photons of light inside the semiconductor fabric. LEDs are energy-efficient and solid, thus making them a well-known choice for different applications such as lighting, shows, and pointers. LEDs have lower control utilization and longer life expectancy, creating various colors. Their development incorporates intensely doped p-n intersections, where doping levels decide the proficiency and color of the emanated light. LEDs are typified with a straightforward cover to make the radiated light obvious. LEDs specifically change electrical vitality into light; this coordinate

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transformation comes about in a productive light era with negligible power wasted.Here, in the extend, two LEDs are utilized, one green colored and the other is a ruddy Driven. The green and the ruddy Driven illustrate the two distinctive forms in the extent. One appears to be the expansion of an item into the framework by gleaming green, whereas the other appears to be an invalid card that is checked and has no records in the framework by gleaming red.

Fig. 8. Green and Red LEDs

Relay: -A transfer module is a circuit board that houses one or more transfers. These modules come in differing shapes and sizes, with the most common setups being rectangular sheets containing 2, 4, or 8 transfers. Each transfer module has different components, such as pointer LEDs, assurance diodes, transistors, and resistors. The essential data around a transfer module, counting its input voltage rating, switch voltage, and current restrain, is ordinarily printed on its surface for simple reference. At its center, a transfer is an electrical switch that works beneath the control of an electromagnet. When this electromagnet is enacted, it can open or near the switch, permitting or avoiding the current stream through the circuit. The convenience of transfer modules expands distant past the effortlessness of their work. From the consolation of domestic robotization frameworks that brighten rooms at a clap to the immovable exactness of mechanical apparatus that carves out showstoppers, hand-off modules demonstrate significance. They are essential in guaranteeing that the different components inside a framework can consistently and securely communicate, handle loads, and perform assignments with synchronized nimbleness. The essential work of a transfer module is to switch electrical gadgets or frameworks on and off. It, too, serves to separate control circuits, guaranteeing that low-power gadgets, such as microcontrollers, can securely control higher voltages and streams. This capability is especially advantageous in scenarios where a little control flag from a microcontroller needs to switch to higher streams. A hand-off module opens up this control flag in quintessence, empowering it to oversee more considerable electrical loads. It is fundamental to separate between a transfer and a transfer module. Whereas a transfer is a single gadget comprising an electromagnet and a switch, a hand-off module includes numerous transfers and extra components. These additional components included layers of segregation and security, guaranteeing the module's secure andproficient operation.

Fig. 9. Relay

Software Necessity Specification:

Arduino IDE: In our venture, we utilized the Arduino IDE program to code for our framework. This user-friendly stage encouraged composing, compiling, and uploading code to the Arduino microcontroller. With its instinctive interface and broad library of capacities and illustrations, the Arduino IDE streamlined the improvement handle, permitting quick

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prototyping and emphasis on our plans. Besides, its investigating instruments and real-time observing capabilities are priceless for investigating and refining our code. Generally, the Arduino IDE was instrumental in effectively using our framework, empowering effective coding and consistent integration of equipment and program components.

Block Diagram of the system

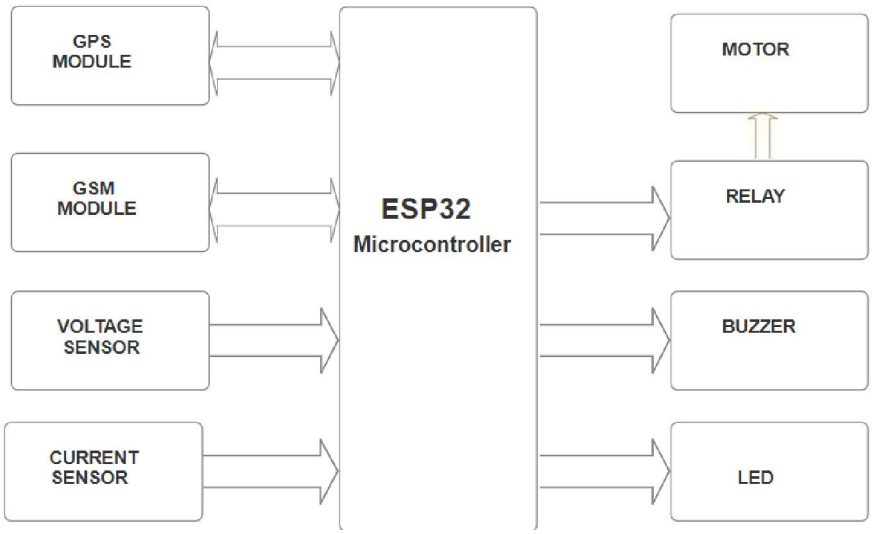

Fig. 9. Block Diagram of the system.

III. IMPLEMENTATION

Working of the system

The execution of the Shrewd Anti-Theft Car Framework includes the integration of equipment and program components, guaranteeing consistent communication and usefulness. The framework is planned to highlight progressed security while prioritizing vitality effectiveness. The Shrewd Anti-Theft Vehicle Extend stands at the bleeding edge of car security, showing a perplexing and comprehensive framework planned to obstruct unauthorized get-to and potential burglary, especially custom-fitted for electric vehicles (EVs). The complexities of its usefulness unfurl when the EV is fueled down, starting the energetic foundation of a virtual boundary with a fastidious confinement of 10 meters around its final known position. This virtual edge becomes the core of the system's watchful security convention, ceaselessly observed by executingthe progressed Worldwide Situating Framework (GPS) following innovation. The GPS framework guarantees a real-time, granular understanding of the EV's correct area, shaping the spine of its strong anti-theft highlights.Upon any recognized development past the predefined 10-meter boundary, the framework coordinates a synchronized reaction to check potential robbery. An advanced caution framework, fastidiously outlined for greatest adequacy, is activated. This caution emanates an unmistakable and attention-grabbing caution flag, serving as both a sound-related obstacle and an implication to alarm adjacent people to the security breach. At the same time, the framework utilizes its GPS capabilities to alert a quick and point-by-point caution message specifically to the user's assigned gadget. This alarm is a signal of data, giving the client the exact subtle elements around the security breach, counting the real-time area of the occurrence. Engaged with this data, clients can take quick and educated activity, such as informing law requirements, to check the burglary in advance. Past its impressive anti-theft highlights, the Shrewd Anti-Theft Vehicle extends coordinating modern Web of Things (IoT) innovation, raising its utility to an unused echelon. This IoT integration encourages inaccessible and real-time checking of the EV's battery status, advertising clients a comprehensive information set for educated decision-making. Clients learn about the battery's well-being, proficiency, and remaining charge. Strikingly, the framework takes a proactive position by issuing cautions if the battery level slips underneath a predefined limit.This forward-thinking highlight guarantees that clients are not as well-informed about the EV's control status butcan take opportune activities, such as starting an energize or actualizing

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energy-efficient hones. In quintessence, the Shrewd Anti-Theft Vehicle rises above ordinary security ideal models, advertising an all-encompassing and mechanically progressed arrangement for the assurance and productive administration of electric vehicles. The consistent integration of GPS following, state-of-the-art caution frameworks, and real-time battery observing represents an advantageous interaction of security and common sense. By setting a premium on real-time communication and user-friendly interfacing, this venture enables clients with an increased sense of security and control over their EVs, reflecting the advancement of car security in a period where mechanical ability is paramount.

Circuit Diagram

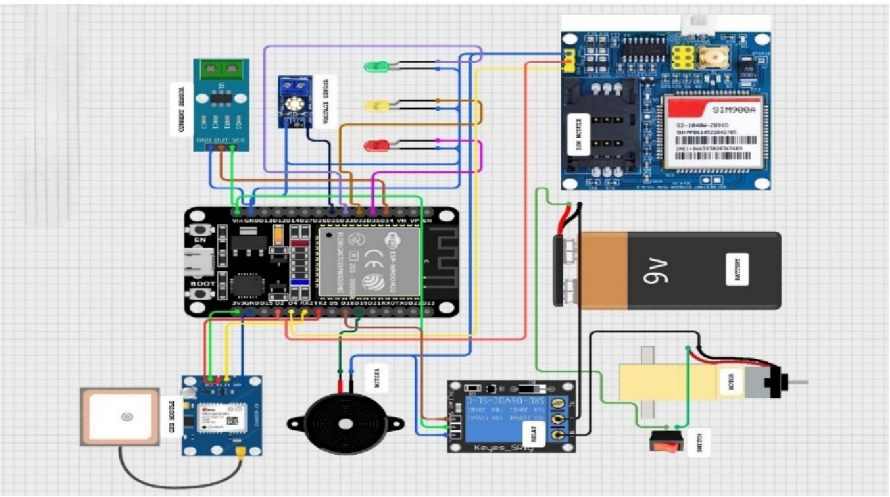

Fig. 10. Circuit Diagram of the proposed system

IV. RESULT AND DISCUSSION

- Confirm the exactness of the GPS/GNSS module following the vehicle's location.
- Comparison of real-time area information with genuine vehicle movements.
- The versatile application evaluates the responsiveness and unwavering quality of inaccessible observing capabilities.
- Assessment of inaccessible control functionalities, such as locking/unlocking entryways and disabling/enabling ignition.
- Input from clients concerning their general involvement with the Shrewd Anti-theft System.
- Assessment of client fulfillment with the system's ease of utilization, unwavering quality, and adequacy in upgrading vehicle security.
- Talk of any watched impediments or regions for enhancement in framework performance.
- Examine the system's viability in hindering burglary and unauthorized access.
- Examination of client input and fulfillment appraisals concerning the system's ease of use, comfort, and reliability.
- Distinguishing proof of client concerns or recommendations for progressing the system's usefulness and client experience.
- Discuss the down-to-earth suggestions for actualizing the Savvy Anti-theft Framework for Electric Vehicles in genuine-world scenarios.
- Consideration of potential challenges, administrative prerequisites, and appropriation barriers.
- Exploration of the future investigates headings and openings for improving the system's capabilities.
- Discuss potential advancements, such as integration with rising advances or associations with car manufacturers.

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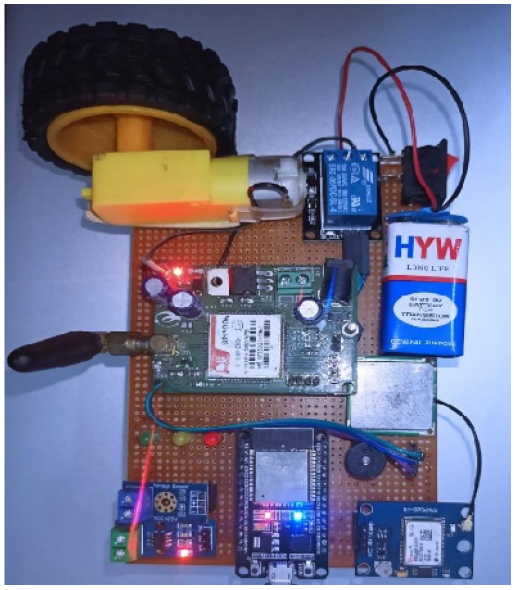

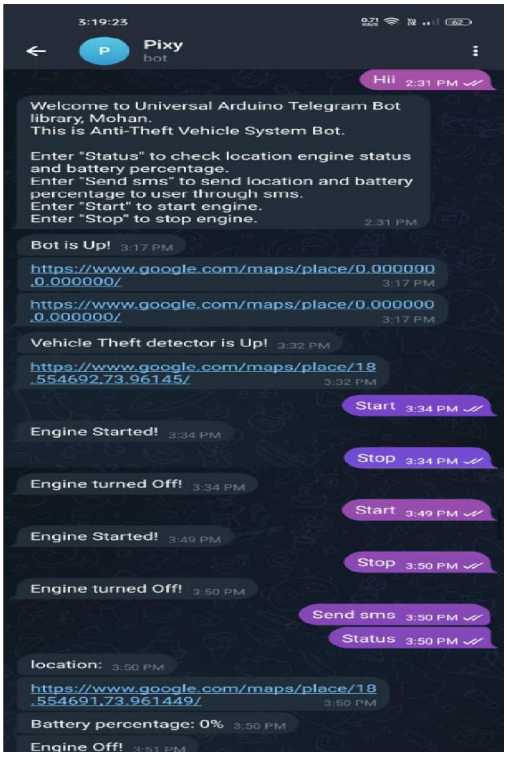

V. CONCLUSION

In conclusion, the talks of the Savvy Anti-theft Framework for Electric Vehicles highlight its viability in providing vigorous security, upgrading client comfort, and moderating the hazard of robbery and unauthorized get-to. By assessing execution measurements, client fulfillment, and viable suggestions, this consideration contributes to the progression of vehicle security innovation and illuminates future inquiry and improvement efforts.

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