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# Motorcycle Anti-Theft System: Magnet Triggered Capturing Device In Real-time with Notification Feature

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## ABSTRACT

In this study, an innovative motorcycle anti-theft system (with Raspberry Pi and advanced sensors) is built to prevent the increasingly common problem of motorcycle theft. In the face of the growing prevalence of such crimes, the market had increasingly become ripe since security devices rarely provided early alerts and complete monitoring. This research aimed to prevent and detect unauthorized access, which will photographically record such an event and send real-time notifications to motorcycle owners. This will significantly affect the reclamation of said motorcycle and lessen its odds of ever being stolen. The Raspberry Pi uses a magnetic reed switch, a camera module, and a buzzer, forming a responsive and user-friendly prototype. When products are activated by tampering, the system takes pictures of the environment. It sends an alert message to the product owner through a mobile app, notifying him of the possible tampering. Experiment results suggest that this system distributed alerts promptly and effectively increased motorcycle security by detecting theft attempts. This indicates its viability, as this anti-theft solution can help fill an area of space among traditional security methods and modern technology advances in motorcycle defense, creating an overwhelming and thorough method. The study also demonstrates that further augmentation with features such as GPS tracking for car location and cloud storage of captured images can be achieved. This shows us that new technology can equip security systems with real world solutions and IoT applications and make motorcycles safer.

**Key words :** cloud storage, IoT, motorcycle security, real-time notifications.

## 1. INTRODUCTION

The Internet of Things (IoT) has transformed the usage of several security systems [11]. These solutions simplify staying connected, monitoring items in real-time, and accessing them remotely, increasing overall security. For example, IoT-based security systems may remotely monitor homes, offices, and other locations, allowing users to respond promptly to possible security concerns. Embedded technologies, such as the Raspberry Pi employed in this system, allow users to efficiently manage and control their devices in local and global contexts [9]. These systems are intended to execute specific functions and are incorporated into a more extensive system, making them perfect for IoT-based applications. The Internet of Things (IoT) has opened the way for services and networks by merging technologies such as cloud computing, mobile devices, sensors, data collecting, and alert generating. This study proposes a solution in the form of a motorcycle anti-theft system that uses an embedded system, Raspberry Pi, and smart sensors to create a solid security platform for bikes. It has movement detectors that use magnets, as well as intruder detection and prevention capabilities that alert bike owners to any unwanted activity as it occurs. [4]. The suggested design eliminates the need for new or additional mounting components due to its modular architecture and the straightforward and efficient operation of the sensor and display. It takes little time to master and control the gadget.

The study's findings improve embedded systems and Internet of Things-enabled security solutions for the following reasons: The researchers highlight the Raspberry Pi and sensor capabilities for building sophisticated motorcycle security systems. [12]. Security and monitoring applications can be used to describe the following real-world studies and advancements of embedded systems and IoT. Raspberry Pi features input and output pins, which may be used to power various devices. Serial communication on input/output digital pins is supported by a Software Serial library [7]. The motorbike security monitoring tool design incorporates GPS Neo 6 technology to determine the vehicle's distance and location while parked accurately. A Raspberry Pi is an essential component in the system's design, utilizing Internet of Things (IoT) technologies [6].

## 2. PURPOSE AND DESCRIPTION

The Motorcycle Anti-Theft is a theft and tamper-resistant protection device. With slight alterations to the motorbike, Raspberry Pi technology and powerful sensor technologies form a robust security framework. Emphasis on detecting and preventing unwanted access uses magnetic sensors, monitoring, and other elements. This system is unique because it informs the motorcycle owner in real-time should there be any potentially suspicious behavior. However, these warnings enable owners to take preventive measures against theft or vandalism immediately. It is integrated into the components of motorbikes so we can access and manage the system anytime. This study aimed to produce the Anti-Theft System, a modern security system for motorbike owners. This technology uses sophisticated detectors and presents complete security given the phenomenon of motorbike theft. The system should be easy to set up and use so that motorcycle riders can live freely, knowing that their most coveted belongings are safe from being accessed and stolen by unauthorized persons.

## 3. SYSTEM PERSPECTIVE

The motorcycle anti-theft system figure 1 shows incorporates sensors, a camera module, Raspberry Pi, and a third-party apex app to detect and respond to theft attempts. As can be seen from the diagram, first, the system has a magnetic reed switch sensor that detects motion and allows (or does not allow) motorbike interference or motion. Upon triggering the sensor, it sends a signal to the central controller, the Raspberry Pi. The Raspberry Pi processes this signal and initiates multiple actions: It then activates a passive buzzer to play the sound of an audible alert and capture real-time images of the event using a camera module and GPS coordinates to locate the motorcycle. Finally, as shown in the diagram, these outputs are relayed to the owner through a third-party application. The application also alerts the owner of theft events, locations, and pictures, and the owner can then send remote commands to control the system. In this block diagram, the integration and functionalities of those components are illustrated in detail, which, together with the components themselves, allow for robust theft prevention and recovery.

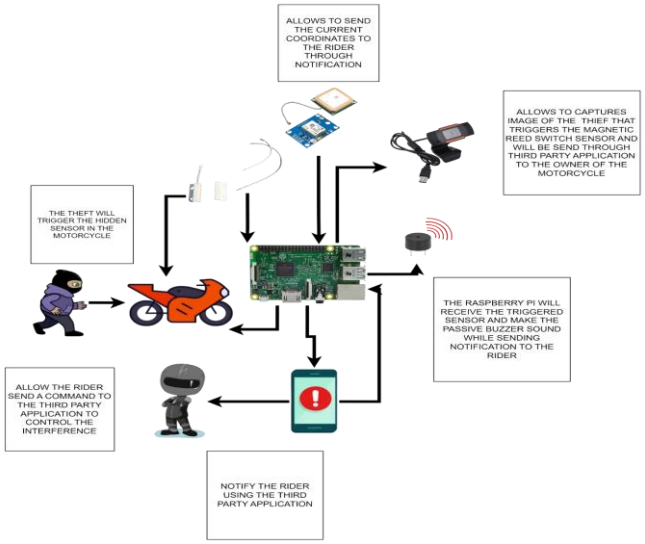


**Figure 1:.** Block Diagram

### a. Flow Chart

The figure 2 shows and describes the steps involved when users are notified of a magnet's status and provides additional features. It starts with the user opening the Telegram app and starting the system with the command ( /start ). Then, the system runs, checking for GPS signal availability. The system sends the user's current coordinates if a signal is detected. Without a GPS signal, the system continues its primary function. Users receive magnet notifications via Telegram from a system continuously monitoring a magnet. The continuous buzz sound and a picture of the magnet are sent to the user when the magnet comes loose, meaning the user is no longer part of the detecting magnet system. Once this is sent, the system can then stop the notification and buzzer by sending the "/off" command to the system. The system stays in a nagging mode, which notifies the user every 2 seconds until the magnet is detached. After reattaching the magnet, the system stops the notifications and the buzzer. The system allows the user to use "/photo" to take a photo of the magnet, which the user's Telegram account receives. The "/stop" command can stop the buzzer and all notifications.

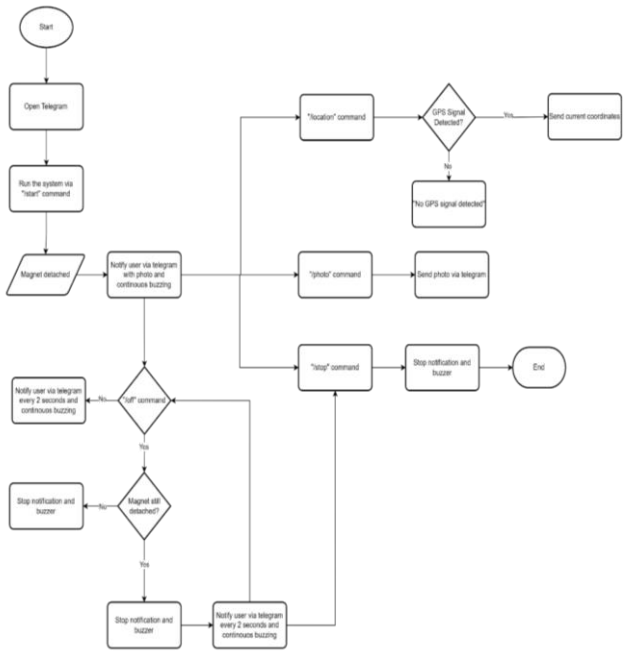


**Figure 2:** System Flowchart

## 4. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 4.1 Summary

Raspberry Pi and state-of-the-art sensors organize the Motorcycle Anti-Theft System to discourage motorcycle theft and tampering. With a magnetic sensor and surveillance, it is easy to integrate with minimal changes and detects unauthorized access. Owners get real-time alerts about suspicious activity and can take action quickly. It is user-friendly to set and use and provides fairly comprehensive

security to motorcycle owners. Researchers collected data, defined requirements, and acquired hardware (Raspberry et al. Module, Buzzer) and software tools (Python IDLE 3, Telegram, Command Prompt) in the Requirements Specifications phase. Hardware components were assembled and integrated during the prototyping and development phase, and Python IDLE 3 was used to program them. The Algorithm Implementation phase combines existing algorithms and modifies codes to make them compatible. The code undergoes some experimentation, rewriting, and debugging to match the project objectives and ensure it works entirely inside the system. The effectiveness and reliability of the anti-theft system were shown experimentally. However, even with all these, this innovation can still eliminate motorcycle theft cases, allowing motorcycle owners to rest easy so that motorcycle thieves will not steal their motorcycles.

### 4.2 Conclusion

These robust sensors, powered by Raspberry Pi, help the Motorcycle Anti-Theft System send real-time alerts to potentially suspicious activity. When integrated, they combine seamlessly with the pros of cutting-edge security features to provide complete protection and peace of mind. The research findings concluded that the promise of the Motorcycle Anti-Theft System was quite promising. However, the Magnet Triggered Capturing Device in Real-time with a Notification Feature is a crucial factor for many stakeholders in the motorcycle safety system. This creates a sense of trust and provides better security in high-risk areas, which is also suitable for riders (and the general public). One more thing, owning a motorcycle with an anti-theft system, motorcycle insurance companies will reward the rider with a discount on the motorcycle's ownership. Participation in the system in the fight against theft and vandalism as something visible enhances the deterrence aspect and protects the integrity and value of the motorcycle. This allows technology developers and practitioners to guess how security technologies (or crime prevention) might be designed. Ultimately, by using the data, students who study related fields can use these results to expand their knowledge of their studies and enhance security and technology. It improves security, and it offers more significant economic and social benefits.

### 4.2 Recommendations

- GPS Integration and Tracking Features: The GPS integration will include accurate time tracking by the owner at their location, geo-fencing to notify the owner when the bike has left its predefined area, remote engine immobilization, allowing the owner to kill the engine remotely, and GPS-assisted recovery to assist with recovering the bike in a time frame to make it available to law enforcement.

- Microcontroller Upgrade: System performance will be improved, and AI algorithms (e.g., anomaly detection) will be supported. Upgrading to a more powerful microcontroller will future-proof the system for features such as pattern recognition and Python responses.

- Camera and Visual Monitoring Enhancements: It will have a 12.3 MP higher resolution, protection on the shell, making it more demanding, real-time video streaming to the owner device (as a video surveillance and faster response). Owner-Controlled Engine Disabling: Your bike is remotely immobilized, so the owner can turn it off if it is stolen or damaged. This is a strong deterrent, as the thief cannot use the motorcycle and is likely to be recovered.

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## REFERENCES

1. Byerley, S. (2023). *Motorcycle theft on the rise – NICB report.* Insurance Business.

2. Ding, J., Nemati, M., & Ranaweera, C. (2020). IoT Connectivity Technologies and Applications: A Survey. *IEEE Access*, 1-1. doi:10.1109/ACCESS.2020.2985932

3. Gupta, A., & Johari, R. (2019). *IOT based Electrical Device Surveillance and Control System.* doi:10.1109/IoT-SIU.2019.8777342

4. Indah, I. a.-K. (2023). Implementation And Design of Security System On Motorcycle Vehicles Using Raspberry Pi3-Based GPS Tracker And Facedetection. *Sinkron, 8*, 2003-2007. doi:10.33395/sinkron.v8i3.12935

5. M, B., S, V., T, V., & P, N. (2020). Machine Learning Trained Face Recognition based Automotive Ignition System. *International Journal of Engineering Research and, V9*. doi:10.17577/IJERTV9IS040488

6. Muzawi, R., Irawan, Y., Akhiyar, D., & Setiawan, D. (2022). Pattern Lock and GPS-Based Motorcycle Security System. *International Journal of Engineering Trends and Technology, 70*, 185-194. doi:10.14445/22315381/IJETT-V70I3P221

7. Pham, Q.-Q., Ta, Q.-B., Park, J.-H., & Kim, J.-T. (2022). Raspberry Pi Platform Wireless Sensor Node for Low-Frequency Impedance Responses of PZT Interface. *Sensors, 22*, 9592. doi:10.3390/s22249592

8. Qian, M., Gao, H., & Liu, W. (2018). Android Based Vehicle Anti-Theft Alarm and Tracking System in Hand-Held Communication Terminal. *2018 IEEE International Conference on Consumer Electronics-Taiwan (ICCE-TW)*, 1-2. doi:10.1109/icce-china.2018.8448426

9. Sathiyanarayanan, M., Mahendra, S., & Vasu, R. (2018). *Smart Security System for Vehicles using Internet of Things (IoT).* doi:10.1109/ICGCIoT.2018.8753073

10. Sehrawat, D., & Gill, N. (2019). Smart Sensors: Analysis of Different Types of IoT Sensors. 523-528. doi:10.1109/ICOEI.2019.8862778

11. Suri, B., Taneja, S., Sahni, N., Varshney, A., Sharma, A., & Vidhani, R. (2017). *Smart threat alert system using IoT*. doi:10.1109/CCAA.2017.8230006

12. Vujovic, V., & Maksimovic, M. (2014). Raspberry Pi as a Wireless Sensor node: Performances and constraints. 1013-1018. doi:10.1109/MIPRO.2014.6859717