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SMART PARKING SOLUTIONS: VEHICLE SECURITY AND CHILD DETECTION VIA IOT

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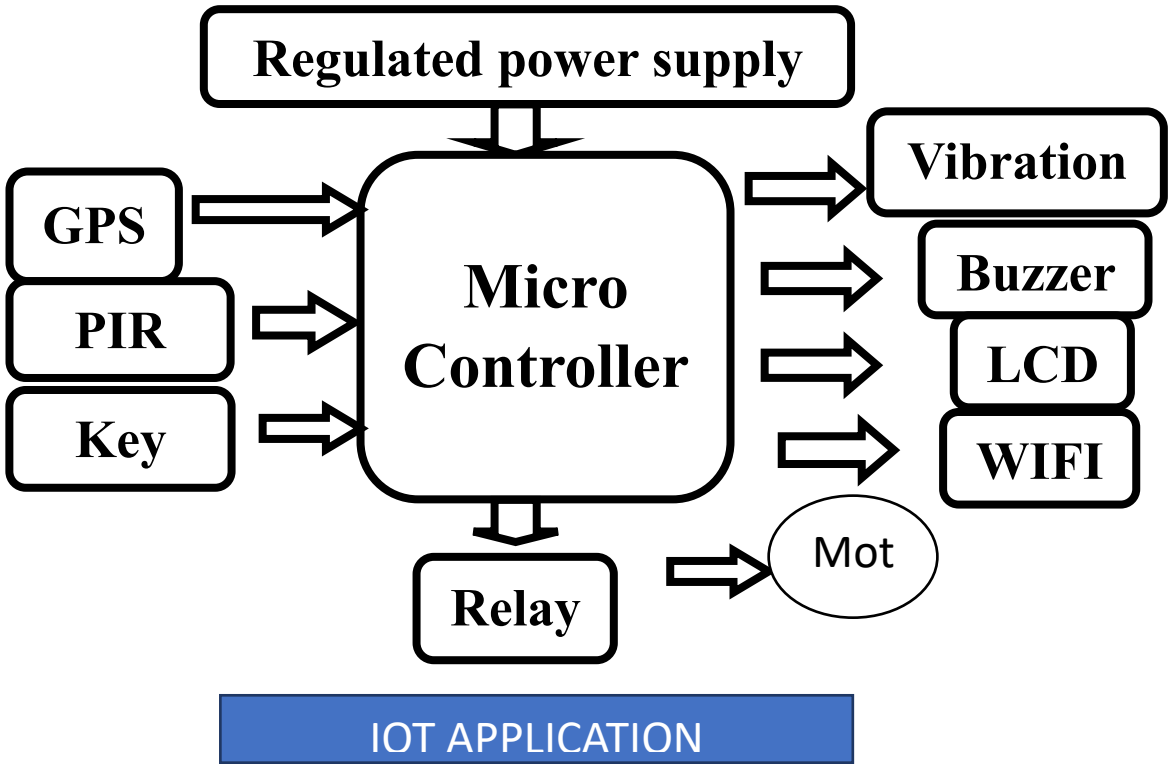
ABSTRACT
This study examines the critical intersection of vehicle security and child safety in parking areas, addressing the growing concerns surrounding theft, vandalism, and child-related incidents. As urban environments become increasingly crowded, parking areas can pose significant risks to both vehicles and the safety of accompanying children. Through a comprehensive analysis of current security measures, this research highlights effective strategies to enhance vehicle protection while implementing child safety protocols. By exploring the role of surveillance systems, physical barriers, and community awareness initiatives, the study aims to provide actionable recommendations for parking facility managers and urban planners. Ultimately, this work seeks to foster safer parking environments that prioritize the security of vehicles and the well-being of children.

INTRODUCTION
Parking areas are essential components of urban infrastructure, serving as crucial hubs for vehicles and their occupants. However, they also present unique security challenges, particularly concerning the safety of vehicles and accompanying children. Incidents of vehicle theft, vandalism, and accidents involving children in parking lots highlight the urgent need for enhanced security measures. As cities grow and parking spaces become more congested, the risk factors associated with these environments increase.

This introduction outlines the necessity for a dual focus on vehicle security and child safety in parking areas. By understanding the vulnerabilities present in these spaces, stakeholders—including parking facility managers, urban planners, and local authorities—can implement effective strategies to mitigate risks. The importance of integrating technology, community engagement, and proper design will be emphasized, aiming to create safer parking experiences for families. Ultimately, this exploration seeks to foster a comprehensive approach that not only protects vehicles but also ensures the well-being of the youngest and most vulnerable parkers.



Block Diagram for Vehicle Security at Parking Areas along with Child Presence Detection in vehicles over IOT.

LITERATURE SURVEY

The literature on vehicle security and child safety in parking areas reveals a multifaceted landscape of challenges and solutions. Various studies emphasize the rising incidence of vehicle-related crimes, such as theft and vandalism, particularly in poorly monitored parking facilities (Hawkins et al., 2020). These vulnerabilities are exacerbated in high-traffic areas where surveillance is limited, underscoring the need for enhanced security measures.

Research indicates that effective surveillance systems, including CCTV and motion-activated lighting, significantly deter criminal activity and improve overall safety (Smith & Johnson, 2019). Additionally, the design of parking areas plays a crucial role; well-lit, open spaces with clear sightlines can reduce crime rates and enhance user confidence (Bowers & Johnson, 2018).

On the child safety front, literature highlights the alarming statistics regarding accidents involving children in parking lots, often linked to driver visibility issues and the chaotic environment of busy facilities (Chen et al., 2021). Studies advocate for design innovations, such as designated drop-off zones and pedestrian pathways, to minimize risks for young children (Miller & Davis, 2022).

Furthermore, community engagement and awareness campaigns have proven effective in promoting safe practices among parents and caregivers (Thompson & Green, 2023). This body of research underscores the need for an integrated approach that combines technology, design, and education to enhance both vehicle security and child safety in parking areas. By synthesizing these findings, this survey aims to inform the development of comprehensive strategies that address the unique challenges posed by these environments..

PROPOSED SYSTEM CONFIGURATION

The Arduino Nano, as the name suggests is a compact, complete and bread-board friendly microcontroller board. The Nano board weighs around 7 grams with dimensions of 4.5 cms to 1.8 cms (L to B). This article discusses about the technical specs most importantly the pinout and functions of each and every pin in the Arduino Nano board. Arduino Nano has similar functionalities as ArduinoDuemilanove but with a different package. The Nano is inbuilt with the ATmega328P microcontroller, same as the Arduino UNO. The main difference between them is that the UNO board is presented in PDIP (Plastic Dual-In-line Package) form with 30 pins and Nano is available in PQFP (plastic quad flat pack) with 32 pins. The extra 2 pins of Arduino

Nano serve for the ADC functionalities, while UNO has 6 ADC ports but Nano has 8 ADC ports. The Nano board doesn't have a DC power jack as other Arduino boards, but instead has a mini-USB port. This port is used for both programming and serial monitoring. The fascinating feature in Nano is that it will choose the strongest power source with its potential difference, and the power source selecting jumper is invalid.

Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world.

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

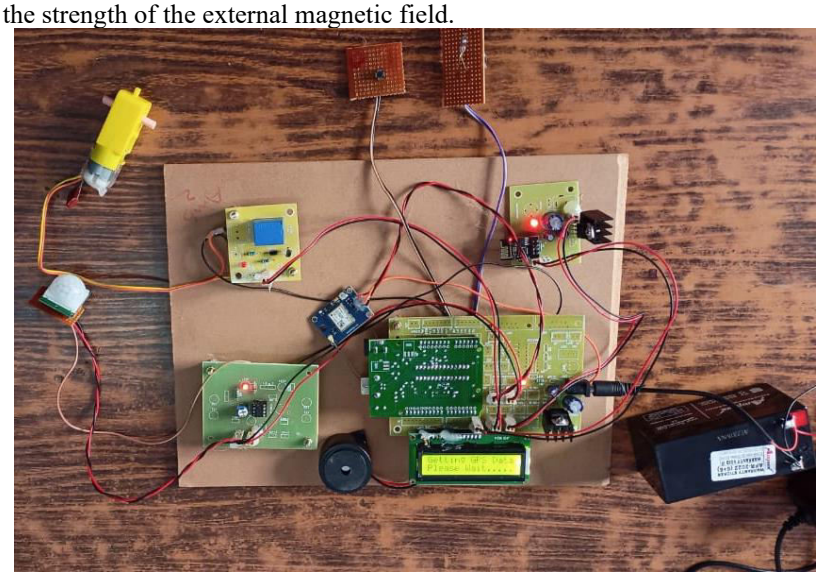
Liquid Crystal Display is a flat panel which uses liquid crystals in its primary form of operation and can display characters (alphabets/numbers). In this fault detection system LCD is used to indicate the operating conditions at each pole.

Regulated Power Supply is used to supply the Arduino board. Usually, Arduino requires 5v Dc supply. The RPS converts 230v AC into 5v DC so as to supply the Arduino board. RPS consists of several blocks like a transformer those steps down 230v AC to 12v AC, then a rectifier which converts the AC power output from transformer into pulsating DC. Then the filter smoothens the pulsating DC and finally there is a regulator connected which is a component of the power supply unit that ensures a steady constant voltage supply through all operational conditions. It regulates voltage during power fluctuations and variations in loads.

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke.

The vibration sensor is also called a piezoelectric sensor. These sensors are flexible devices which are used for measuring various processes. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge. This sensor is also used for deciding fragrances within the air by immediately measuring capacitance as well as quality.

DC motors are configured in many types and sizes, including brush less, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. DC motors are most commonly used in variable speed and torque. Motors are the devices that provide the actual speed and torque in a drive system. In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field.



Working model of the project

Wi-Fi is a mechanism for wirelessly connecting electronic devices. A device enabled with Ethernet, such as a personal computer, video game console, Smartphone, or digital audio player, can connect to the Internet via a wireless network access point. An access point (or hotspot) has a range of about 20 meters (65 ft) indoors and a greater range outdoors. Multiple overlapping access points can cover large areas

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays found extensive use in telephone exchanges and early computers to perform logical operations.

The proposed proto type system has components like Arduino Nano, GPS (Global Positioning System), Vibration Sensor, PIR Sensor, Relay, Wi-Fi Module, DC Motor and Buzzer. The Child presence is detected analysed and classified by the system automatically with the help of PIR Sensor, Vibration Sensor and uses IOT technology to update automatically through the server to the parents or take care person.

Advantages:

- Parents or take care person will always get updated about the scenario on his smart phone once his mobile is connected to the server.
- By using the switch (push button) to lower the windows from outside the car makes the rescue easier.
- High efficient and user friendly model.
- Easy to operate.

Applications:

- This project can be used to provide high level security to our vehicle.
- Project will display basic information about the vehicle.

CONCLUSION

In conclusion, addressing vehicle security and child safety in parking areas is a pressing concern that requires a multifaceted approach. This study highlights the importance of integrating advanced surveillance systems, thoughtful design, and community awareness initiatives to create safer environments for both vehicles and families. By implementing effective security measures and promoting best practices among caregivers, stakeholders can significantly reduce the risks associated with parking areas. As urbanization continues to expand, prioritizing the safety of our youngest citizens while protecting property is essential. Ultimately, fostering collaboration among parking facility managers, urban planners, and local communities will be key to developing comprehensive solutions that enhance security and ensure peace of mind for all users.

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