Design and Evolution of a Mobile Phone Detector

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ABSTRACT

Here, the work focuses on the evolution and design of a mobile phone detector, which is capable of detecting incoming and outgoing signals from mobile phones. This handy, pocket-size mobile transmission detector can sense the presence of an activated mobile phone from a distance of one-and-a-half meters. Due to this, it can be useful for preventing the use of mobile phones in examination halls, confidential rooms, petrol pumps, etc. Moreover, some illegal practises like spying, unauthorized video transmission can also be easily detected by this. The circuit can detect the incoming and outgoing calls, SMS and WhatsApp messages even if the mobile phone iskept in the do not disturb or silent mode. The instant the Bug detects Radio Frequency (RF) transmission from an operated mobile phone, it starts producing a beep sound like alarm with Light Emitting Diode (LED) also blinking. The alarm is continued until the signal transmission is halted.

Keywords: Light Emitting Diode, Radio Frequency, LC Circuit

INTRODUCTION

Mobile phones are used in good way and also in a bad way. When the class is going on, students intend to use their cell phones and not listening to what is being taught. These days, students are also carrying their cellphones to the examination halls to copy which would help them to get good marks. In the contemporary years, there has been a significant rise in the issues related to using mobile phones in restricted, limited or prohibited places. This is obviously because individuals nowadays rely too much on mobile phones. From Religion buildings like Gurudwara's, Temple's, Churches to petrol pumps, no one overlooks. Therefore, it is necessary to somehow detect these mobile phone signals and thus help in preventing their usage in such areas.

Some efforts were also made initially to address this matter but they all have their imperfections.

One such was the mobile phone jammer. A mobile phone jammer or blocker is a device which deliberately transmits signals on the same radio frequencies as mobile phones, disrupting the communication between the phone and the cell-phone base station, effectively disabling mobile phones within the range of the jammer, preventing them from receivingsignals and from transmitting them. Jammers can be used in practically any location, but are found primarily in places where a phone call would be particularly disruptive because silence is expected, such as entertainment venues. Because they disrupt the operations of legitimate mobile phone services, the use of such blocking devices is illegal in many jurisdictions, especially without a licence. When operational, such devices also block access to emergency services. Thus, they can't be used in case of any emergency.

To avoid such problems, a mobile phone detector would be an ideal choice.

LITERATURE SURVEY

The surviving technology currently available in the open merchandise makes use of discontinuous components, and an old design method using a down converter in accordance with a band pass filter. Additionally, these technologies are neither accurate nor affordable.

A RF detector using tuned Inductor-Capacitor (LC), which also makes use of discontinuous components was the first signal detection technique.

They were a bit cheap but requires a lot of precision tuning. Moreover, this design when examined was found to be inaccurate. The design incorporated tuned LC circuit which is used to detect low frequency radiation in the Amplitude Modulation (AM) and Frequency Modulation (FM) bands. Since the transmission frequency of mobile phones ranges from 0.9 to 3 GHz, it detects the signals in the GHz frequency band. A part of the LC circuit is formed is formed by capacitor C and the coiled wire forms the L to receive RF signals from the mobile phone. The RF transmission signal is detected when mobile phone is operated and it starts producing a beep alarm along with blinking of LED as soon as the signal is detected.

The other technique appears to be more accurate but again, it has its own limitations and is also very much unaffordable. The two most admired mobile phone detectors obtainable under this technology were manufactured by Berkeley Varitronics Systems and mobile Security products.

The Wolfhound cell phone detector and Cell Buster were manufactured by these companies. The Berkeley Varitronics systems Wolfhound cell phone detects Personal Computers (PCs), Code Division Multiple Access (CDMA), Global System for Mobiles (GSM) and cellular bands using the RF signals.

Wolfhound-PRO Cell Phone Detector is a precision, handheld, wireless sniffer specifically tuned to the RF signature of common cell phones (both U.S. & international bands) including LTE, AWS, PCS, CDMA / WCDMA (UMTS), GSM, EGSM Cellular bands as well as GPS trackers and even U.S. DECT 6.0 cordless phones that cause interference with European cellular carriers.

The Cell buster from mobile security product which provides steady observation for mobile phone and also has voice alert that tells the user to shut their phone off if caught.

A mobile phone booster uses an amplification system made up of three main components: outside antenna, inside antenna & a booster device. Making use of advanced technology, repeated amplification strengthens weakened signals. These components then effectively boost cell phone networks in weak signal areas and establish a mechanism through which the users can enjoy an uninterrupted cellular network.

Author and Year	Description	Methodology	Gap/Limitations
Innovative Systems Design and Engineering www.iiste.org ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online) Vol.7, No.9, 2016	Students utilize mobile phones for storing lecture materials, e-books, tutorials, videos, communication with classmates, and internet browsing for various purposes. While these applications offer significant benefits, there are potential drawbacks when mobile phones are used in restricted environments, such as exam venues. Some students who do not comply with general university exam regulations resort to using mobile phones to cheat during exams. The widespread adoption of cell phones in the early 21st century led to challenges like privacy invasion and increased academic dishonesty.	This paper introduces two independent systems designed to detect mobile phones in exam venues. The first system is a mobile detector with a 1.0m range, employing a resistor-capacitor circuit capable of identifying both incoming and outgoing calls, video transmissions, and text messages, even when the mobile phone is set to silent mode. The second system is a Reed switch circuit scanner that responds to an applied magnetic field, detecting mobile phones that are switched off or in flight mode. This system allows scanning of students without physical inspection upon entering examination rooms.	Despite the positive outcomes of this concise study, there are some limitations that should be acknowledged. Firstly, the proposed mobile detection systems, while promising, might not be foolproof and could potentially result in false positives or negatives. The effectiveness of these systems may be influenced by various factors such as the specific models of mobile phones, signal interferences, or changes in technology.

STUDY OF CELLULAR PHONE DETECTION TECHNIQUES STUDY OF CELLULAR PHONE DETECTION TECHNIQUES Nicholas W. Scott, 2011	This project involves creating a digital signal detector capable of identifying incoming and outgoing signals from mobile phones. The compact and portable mobile signal detector can effectively sense the presence of an active mobile phone from a distance of one and a half meters. Its applications extend to preventing mobile phone usage in settings like examination halls and confidential rooms. Additionally, the device is suitable for detecting unauthorized activities such as spying and illicit video transmissions.	The circuit is designed to identify incoming and outgoing calls, text messages, and video transmissions, even when the mobile phone is in silent mode. Upon detecting Radio Frequency (RF) transmission signals from an activated mobile phone, the device triggers a beep alarm, and an LED indicator blinks. The alarm persists until the signal transmission ceases. The circuit is assembled on a compact general-purpose PCB and enclosed in a small box for practical use.	he detector is designed to identify mobile phone signals, but it may not differentiate between types of devices emitting similar signals. Other devices using similar frequencies could potentially trigger false alarms. The operational range of one and a half meters might be restrictive in certain situations. In larger spaces or crowded environments, the detector's ability to cover the entire area may be limited.
International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 www.ijert.org Vol. 3 Issue 7, July - 2014	The goal is to identify the IoT's ecosystem, architecture, and technicalities—its status, opportunities, and expected future trends—regarding its role in LsM. Among identified IoT roles in LsM, the authors found that data will be its main contributor. The traditional approach of reactive data processing will give way to the proactive approach of augmented analytics to provide insights about animal processes. This will undoubtedly free LsM from the drudgery of repetitive tasks with opportunities for improved productivity.	A PRISMA-based systematic review of IoTT's use in LsM has been presented with LsM highlighted as a methodical process with strict regimentations. This provided the rationale to consider a highly logical and at the same time methodical technology such as IoT for LsM. IoT as highlighted so far will play a key management role in LsM. This will happen by deploying its primary feature of identification by sensing and observation, etc., through monitoring and control to manage the strict regimentations in LsM. The health and well-being of livestock have been highlighted as important factors in determining the quality of animals as products in the market.	A gap analysis is intended to investigate a range of relevant initiatives that includes the adoption of industry 4.0 technologies for extensive livestock farming to find if sustainability can be ensured through big-data-driven systems using IoT sensing networks, DL, and other ML-assisted techniques. Contributions would also be made in respect of the provision of a reference framework that adds additional functionalities to actualise CPS for extensive livestock farming going by the consistency observed in the literature [92,99] regarding the use of digitalization to enforce sustainable productivity.
A study on working and performance of Cell Phone Detector by Thilagavathi S (2022)	Cell phone detector is used to detect the cell phone while in unwanted areas such as school, college or confidential areas like, income tax office and other official places where use of cell phone is banned. There are times when it is difficult to entreat every cell phone user individually from using cell phone for a time period.	The circuit is planned to recognize unapproved utilization of cell phones in examination lobbies, confidential rooms and soon. It additionally identifies unapproved video and sound recordings. It distinguishes the signs from cell phones regardless of the possibility that it kept in the noiseless mode. Created waveform of the PDA is radiofrequency one with a wavelength of 30 cm. Subsequently the circuit is composed in such an approach to detect the radio frequency wave. Turning out from the mobile phone when its being utilized and after that passed on to the output as an alarm or LED signal.	The model adaptation has just constrained scope of 2 meters. Be that as it may, if a preamplifier arrange utilizing JFET or MOSFET transistor is utilized as an interface between the capacitor and IC, range can be expanded.

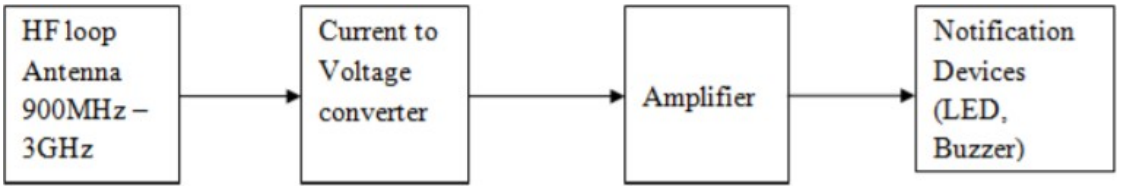
Cellular Device Detection in Restricted Premises October 2019	This document outlines the implementation of a system designed to identify an active mobile phone within restricted access areas. The system is particularly effective in detecting unauthorized transmission of video recordings, thwarting potential spying activities. It operates by detecting signals within the frequency band of 0.9 to 3 GHz, corresponding to a wavelength range of 0.033 to 0.1 meters, thereby preventing the unauthorized use of cellular phones. The system can identify various activities, including incoming and outgoing cellular calls, Short Message Service (SMS) exchanges, mobile data service usage, and video signal transmissions, even when the mobile phone is in silent mode. Additionally, the system features a mobile application that enables real-time analytics of the detected signals, providing valuable insights.	This project specifically employs the RF system of the cell phone as the basis for detection. A circuit capable of detecting signals within the range of 0.9GHz to 3GHz is utilized to identify the presence of an active cell phone. When the signal is successfully detected, an LED indicator flashes, serving as an alert for the use of a cell phone within a 1.5-meter radius	While cell phones are globally prevalent and essential for interpersonal communication, there are instances or locations where their use must be restricted due to security concerns or potential health risks. The field of cell phone detection has been under scrutiny for an extended period, and various techniques have been proposed for identifying their presence.
New Solutions for Cell Phone Detection January 2007	Problem to real time detect existence of cell phones stay in power on state in a given area is a technology challenge because most time cell phones keep radio silence on a standby mode. This paper proposed two solutions, "virtual base station solution" and "ready beacon utilization solution" to solve this problem. Location updating registration of a cell phone entering into a new registration area is made use of to fulfill a lure technology and the problem of cell phones detection is settled perfectly.	Virtual Base Station Solution: Create a virtual base station to simulate a communication environment. Leverage the location updating registration process of cell phones entering new areas. Exploit the lure technology to attract cell phones and establish communication for effective detection. Ready Beacon Utilization Solution: Utilize ready beacons strategically to prompt cell phones to actively participate in communication. Leverage the location updating registration process to ensure active interaction and reliable detection.	Addressing the real-time detection of active cell phones in a powered-on state within a specific area poses a technological challenge due to the prevalent radio silence observed during standby mode. This paper introduces two solutions, the "virtual base station solution" and the "ready beacon utilization solution," to overcome this challenge. The proposed approach involves utilizing the location updating registration of a cell phone entering a new registration area to implement a lure technology, ultimately resolving the problem of cell phone detection effectively.
Smart Mobile Detector for Unapproved Usage of Cell Phones by Naveen Raj, 2019	This useful device is designed to detect the presence of an activated mobile phone within a range of one and a half meters. As a result, it can effectively prevent the use of mobile phones in places like examination halls and confidential rooms, making it particularly beneficial for identifying unauthorized phone use for spying or unauthorized video transmission. The circuit is capable of identifying incoming and outgoing calls, SMS, and video transmissions, even when the mobile phone is in silent mode.	When the device detects the radio frequency (RF) transmission signal from an active mobile phone, it initiates a beeping alarm, and the LED indicator starts flashing. The alarm persists until the signal transmission ceases. The circuit is assembled on a compact general-purpose PCB, designed to be as small as possible, and is enclosed in a small box, similar to discarded mobile phone cases. As mentioned earlier, capacitor C3 should have a lead length of 18mm with lead spacing of 8mm. It is crucial to carefully solder the capacitor in a standing position with equal spacing of the leads.	The cost of assembling the circuit on a general-purpose PCB and enclosing it in a small box may be a limiting factor for widespread adoption. Accessibility of the device could be challenging, especially for smaller institutions or individuals.Rapid advancements in mobile phone technology may outpace the capabilities of the device over time. Regular updates or modifications may be required to keep the device relevant.

Examination hall centralized mobile detection using arduino duemilanove 2021	This paper introduces a technology designed to identify and locate a restricted user who is using a cellphone in an unauthorized area, aiming to prevent continued cellphone use. While manually checking each cellphone is time-consuming, especially in large groups such as classrooms, this paper proposes an automated system for detection and identification. Unlike existing mobile jammers that disrupt the entire network, this system specifically targets cellphones of students present in the exam hall.	The system automatically detects active cellphones in the examination hall and relays this information to a remote computer (administrator) through a graphical user interface (GUI). It continuously monitors cellphone activity, displaying details such as the user's message, room number, and location. This automated process helps determine the precise location of the cellphone user. The system calculates the distance between the detected position and the detector, establishes increasing boundaries, and updates room dimensions. This allows seamless tracking of cellphone activity, even when users switch from one room to another.	Calculating accurate distances between the detected position and the detector, as well as identifying increasing boundaries, may present technical challenges. Environmental factors and the need for precise measurements could impact the reliability of the system.While the system aims to track users switching between rooms, challenges may arise in accurately capturing and updating this information, particularly in real-time scenarios.

Implementation Design

Among the detection techniques described earlier, the RF spectrum approach was selected for implementation. The choice of this selection was based on the ease of implementation due to readily availability of the discrete components required in the local market. The most effective method is the implementation using voltage-controlled oscillator (VCO), frequency down-converter and a band pass filter. However, due to the unavailability of the components required in the local market, the method could not be implemented within the timeline of this project.

Block Diagram



Based on the block diagram, the circuit design of each block was designed and the final circuit integrated together. The subsequent sections explain the detail and design of each block diagram.

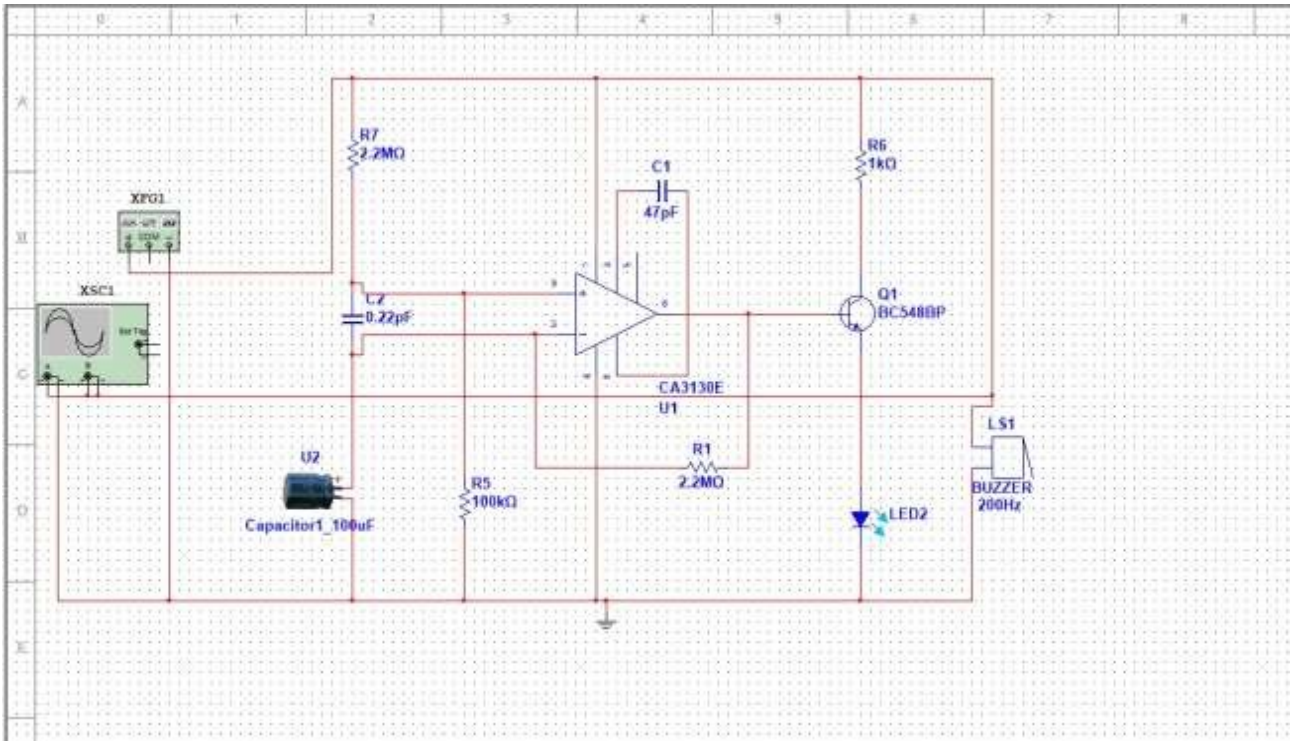
Circuit and its working

Circuit diagram of the mobile phone detector is shown in figure below.

In this circuit, there are two ICs, the IC1 is functioning as a signal amplifier and IC2 is working as a time delay. At the point when any mobile phone signal receives, the 555 timer IC will become activated and actuate a LED and a piezo buzzer for a few seconds.

However, the circuit likewise utilizes for some other reasons as well, it tends to utilize at the places where the mobile phone doesn't allow. For example, at examination halls. It can likewise be utilized to locate a lost mobile phone regardless of whether the mobile phone is set to vibration alert or on low volume ringtone. The working voltage of the circuit is 6V to 12V DC. You can likewise utilize any small size batteries with the circuit

MOBILE PHONE DETECTOR: CIRCUIT DIAGRAM



Hardware Components

S.no	Components	Value	Qty
1	IC	CA3130	1
2	IC	NE555	1
3	Transistor	BC548	1
4	Diode	1N34	2
5	Antenna	3.5-inch	1
6	Piezo Buzzer	–	1
7	LED	–	1
8	Resistor	1M,10K, 1K, 470R	2, 1, 1, 1
9	Battery	6 – 12V DC	1

Results

This design was successfully tested and proven by taking readings of each component before the signaldetector detects an active phone and when it does not. The finalized project was also tested using a mobile phone.

A Jio mobile phone was used for performing the mobile tests. First of all, it was turned on and a phone call was made with the detector nearby. It was observed that, once the call was made, the detector detect edits signal and the LED glows up along with the sound but later stops even when the call was not halted, the circuit was working effectively andsystematically.

Innovative Systems Design and Engineering www.iiste.org ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online) Vol.7, No.9, 2016:

[redacted]

and the nature of RF signal on circuits.

STUDY OF CELLULAR PHONE DETECTION TECHNIQUES STUDY OF CELLULAR PHONE DETECTION TECHNIQUES Nicholas W. Scott, 2011

The first test with this cellular phone detector was to just have an active cellular phone in the room. So the LG cellular phone was turned on and a phone call was placed with the detector nearby. Absolutely nothing came out of the connected headphones. To troubleshoot this problem, the circuit was tested with a spectrum analyzer and signal generator. The antenna was connected to the signal generator at 900 MHz with 10dB of amplitude and the spectrum analyzer was connected to the headphone jack using the available probes (only 500 MHz was available). Injecting the 900 MHz signal into the antennas resulted in a lower amplitude signal on the output.

International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 www.ijert.org Vol. 3 Issue 7, July – 2014:

Upon making a call, the LED of the mobile-phone-detector circuit starts blinking. This continues until the transmission ceases. The detector is in a position to detect the presence of an active-phone within a distance of about 4meters, giving

the warning-indication if someone uses mobile-phone within the radius. The simulated circuit of mobile-phone-detector is as shown in Figure2. while Figure 3 shows breadboard-assembly of the same. It was observed during the experiments, that the utilization of purely-analog-circuits made troubleshooting and debugging harder as compared to software- related-circuits. Also, the presence of RF-signals from the various colleagues' phones all around made the detector circuit over-responsive.

A study on working and performance of Cell Phone Detector by Thilagavathi S (2022):

- It can be utilized to forestall utilization of cell phones in examination lobbies, confidential rooms, and so on.
- It is likewise helpful for recognizing the utilization of cell phone for spying and unapproved video transmission.
- It is valuable where the utilization of cell phone is denied like oil pumps and service stations, historical places, religious places and court of laws.

Cellular Device Detection in Restricted Premises October 2019:

This pocket-estimate versatile transmission indicator or sniffer can detect the nearness of an initiated portable cell phone from a separation of one and-a-half meters. So it can be utilized to anticipate utilization of cell phones in examination lobbies, classified rooms, and so forth. It is likewise helpful for identifying the utilization of cell phone for spying and unapproved video transmission. The present work entitled "CELL phone DETECTOR" is one such gadget which is utilized to distinguish the radio recurrence created by PDA set up where its use is denied. Trying to increase the detecting range of mobile bug to few more meters for observing wide range of area.

New Solutions for Cell Phone Detection January 2007:

The Mobile Detector with Frequency Jammer successfully detected and jammed all the four operators. Results obtained when the Mobile Detector with Frequency Jammer was ON and OFF for the four operators are shown in Figures 9 to 12. When the detector is ON it will detect the mobile phones in the range within 2G and GSM networks and once the jammer is switch on, it jams all networks in same range. The results show that this work functioned as intended.

Smart Mobile Detector for Unapproved Usage of Cell Phones by Naveen Raj, 2019:

The proposed framework defeats the disadvantages of the past actualized frameworks. In this paper we examine about shrewd home and ecological screen framework from a few viewpoints, for example, IoT. A few analysts have proposed distinctive strategies for home computerization. In keen natural screen framework, IOTs perform superior to Bluetooth, ZigBee, GSM and SMS. In future proposed framework will be useful to spare vitality in keen way and furthermore it will be helpful for impaired people groups to control home cleverly utilizing any savvy gadget. This proposed framework will perform essential job in making India advanced. It will likewise contribute up to some degree in government based "Digital India" venture. This undertaking can be additionally reached out to voice controlled component.

Examination hall centralized mobile detection using arduino duemilanove 2021:

When the cell phone is activated the detector sense the presence of Radio Frequency signal then the LED will glow and buzzer will start alarm.

CONCLUSION

This pocket-size mobile transmission detector or sniffer can sense the presence of an activated mobile cell phone from a distance of one and-a-half meters. The detector could detect the signal in the frequency range of 0.9GHz to 3.0 GHz thus a cell phone that is in use. This phone usage was indicated by the blinking of the LED. Therefore, it can be used to prevent use of mobile phones in examination halls, confidential rooms, etc. It is also useful for detecting the use of mobile phone for spying and unauthorized video transmission.
A mobile detection system using IoT (Internet of Things) has proven to be a valuable technological solution with numerous applications and benefits. The system, designed to detect and monitor mobile devices within a specified area, has implications across various industries and scenarios. Here is a conclusion highlighting key aspects and outcomes of such a system:

1. **Enhanced Security:**
    - The mobile detection system significantly improves security measures by providing real-time tracking and monitoring of mobile devices. This is particularly crucial in sensitive areas such as airports, corporate offices, and government facilities.
2. **Efficient Resource Management:**
    - The system aids in efficient resource management by analyzing the movement and density of mobile devices. This information can be utilized to optimize facility layouts, manage crowd flow, and enhance overall operational efficiency.
3. **IoT Integration:**
    - Leveraging IoT, the mobile detection system seamlessly integrates with various sensors, cameras, and other devices. This interconnectedness allows for a comprehensive and holistic approach to data collection and analysis.
4. **Data Analytics and Insights:**
    - The system generates a wealth of data that can be analyzed to extract valuable insights. Patterns of movement, peak usage times, and user behavior can be studied to make informed decisions for improving services, security protocols, and infrastructure.
5. **Customization and Adaptability:**
    - One of the strengths of the system lies in its adaptability to diverse environments and requirements. The solution can be customized to meet the specific needs of different industries, making it a versatile and scalable technology.
6. **Privacy Considerations:**
    - While reaping the benefits of enhanced security and operational efficiency, it's crucial to address privacy concerns. Implementing robust privacy measures, such as anonymizing data and complying with relevant regulations, ensures responsible and ethical use of the technology.
7. **Real-time Alerts and Notifications:**
    - The system's ability to provide real-time alerts and notifications in response to predefined events enhances its utility. Security personnel can be promptly alerted to potential threats or abnormal activities, enabling swift and effective responses.
8. **Cost-effectiveness:**
    - In the long run, the mobile detection system can contribute to cost savings through optimized resource allocation, reduced security incidents, and improved overall efficiency. This cost-effectiveness adds to the system's attractiveness for widespread adoption.

In conclusion, a mobile detection system utilizing IoT technologies represents a cutting-edge solution with the potential to revolutionize security, resource management, and data-driven decision-making. As the technology continues to evolve, addressing privacy concerns and ensuring ethical use will be paramount for its successful integration into various industries and public spaces. The ongoing refinement and adaptation of these systems will likely lead to even more sophisticated and effective implementations in the future.

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