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Smart Reconnaissance and Apprise System Enhanced with IoT

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Abstract: ***Nowadays mobile devices are integrated with our everyday life. The security and remote surveillance system is an increasingly prominent feature on the mobile phone. The modern surveillance is integrated with so many automation technologies. In this modern world, crime has become an ultra modern tool. A lot of incidents occur like robbery, unwanted forced entry , threatening abruptly. So the security does matter in our daily life. People always remain busy in their day to day work, so they absolutely want to ensure utmost safety of their beloved things. To prevent such incidents, we are proposing a smart surveillance system enhanced with WI-FI(IEEE-802.11)technology. This paper presents the monitoring and controlling of surveillance system enhanced with WI-FI (IEEE 802.11) technology. This system consists of webcam and Raspberry PI(BCM2837). In this system, webcam is used to detect the motions or to trace out the intruders and also to detect fire. In case of any human movement or fire accident occurs, the webcam will capture live data in the surroundings and transmits the live video to the social network through WI-FI (IEEE802.11). Simultaneously, the buzzer alerts the nearby neighbours. The system also consists of sprayer, which sprays the chloroform liquid on the intruders and sprinkler discharges water when the effect of the fire has been detected.***

Keywords: Internet Of Things, WI-Fi, Surveillance, Webcam, Smart Home.

I. INTRODUCTION

In this age of internet, a huge number of devices are interconnected and are communicating with each other. IoT devices enable machine to machine communication over the internet. Home Automation and Home Surveillance is the part of the larger Internet of Things (IoT) community. It enables various devices and appliances to be monitored and controlled over the internet. In Internet of Things (IoT), Surveillance includes proper monitoring of behaviour, activities, or information for the purpose of influencing, managing or directing. This can include observation from a distance by means of electronic equipment such as closed circuit television (CCTV),or interception of electronically transmitted information, such as Internet traffic. IoT plays a major role in technology industry and most of the social, economical engineered products are incorporated with this technology. The internet is about 20 years old and more than 2 billion people are interconnected with it using computers, smartphones and tablets. IoT integrated with Raspberry Pi plays a major role in developing useful products which are used in various applications such as power optimization, home automation and home surveillance. The main purpose of the product is to provide a remote surveillance system, especially for the people who are working for most of the time, indirectly it provides them a way to have an eye on the security of their homes even though being away from it for most of the time.

II. LITERATURE SURVEY

The contribution of various scholars are studied for the survey and analyzing merits and demerits in order to enhance the consequences for making the system work better.

Jian Li, et al [1] discuss a possible solution for the early detection and prevention of fire. This is experimentally demonstrated using a long-range Raman Distributed Fiber Temperature Sensor (RDFTS) and a Temperature Early Warning Model (TEWM). The sensors for the temperature detection are mainly classified into electrical sensors and fiber-optics sensors. The Raman Distributed Fiber Temperature Sensor (RDFTS) can detect the environmental temperature by using the spontaneous Raman scattering in optical fiber combined with optical time domain reflection technique. The RDFTS mainly focuses on real time monitoring rather than a prediction warning system which is a significant change which needs to be implemeted at the earliest, this is one of the major challenge that the system faces. Therefore the Temperature Early Warning Model (TEWM) based historical time- series for fire detection is used, Compared with the conventional alarm systems, the TEWM can accurately predict the trend of temperature and short the early warning response time. This system has its application in forest, urban underground pipe gallery and smart grid.

Patrick Jason Y. Piera et al [2] discuss a possible solution for the fire detection and alarm system using the wireless sensor networks as the core technology.The overall system of the fire alarm system consists of a LabView-operated fire alarm conrol panel managing

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various nodes split into zones.The nodes include Wireless Fire Detection node, Wireless Fire Alarm node and the Fire Alarm control panel. The entire system primarily consists of XBee modules. These modules answer the problems of the traditional FDAS such as hardwiring, and inflexibility of nodes during construction and expansion. However after the device was implemented there were some parameters which affected the overall performance of the system ,those parameters are network stabilization, distance of nodes, obstructions in the communication path, the electronics circuit, and the LabVIEW architecture. In conclusion, the average response time of each detection was according to the standard.

Adri Priadana, et al [3] discuss a possible solution for the filtration of selfie face images on search results based on hashtags on Instagram by combining web data extraction technique and human face detection technique using the Haar Cascade method. This system follows a series of steps: initially web data extraction is done along with the data collection of various topics associated with hashtags after which the face detection is performed. Finally the image is filtered into two categories: image with selfie and image without selfie. The main operation here is the human face detection which is done using the Haar classifier which uses the Open Source Computer Vision Library(Open CV). Haar-like features scanning is done on the image to detect human faces, starting from the upper left corner and ending in the lower right corner of the image. The programming is done using Python. The applied method had produced an accuracy of 71.48%. The authors plan to expand their work by incorporating other features on Instagram such as user's comments, and social network relevance.

Chentao Li et al [4] address the problem of complicated wiring, high price and single service for smart homes. The standard design is based on bus-like layout and has limitations like high cost, can't modify according to user needs, not as smart. The authors abandon the traditional bus connection method, uses ZigBee to construct wireless sensors and transmit data wireless. ZigBee technology is an emerging two-way wireless communication technology. ZigBee technology is used for environmental monitoring. It sends the input to the server through wireless transmission, and sends instructions to the server to control the device. The STM32 is used as the main controller. Star connection structure is used to ensure stability of the system. Since, ZigBee is lower cost and wireless is reduces the problems. Tests that were proved that the stability is relatively high.

Akram Khan et al [5] have presented an IoT Smart Home System(IoTSHS). They have proposed a system which is designed to provide the remote control to smart home through mobile, infrared(IR) as well as with PC/Laptop. The controller used to design the IoTSHS is WiFi based microcontroller. They have provided a Temperature sensor to indicate the room temperature and tell the user if it's needed to turn the AC ON or OFF. The designed IoTSHS is to be interfaced through relays with the items under control through the power distribution box. The authors have designed this system to provide remote controlling for the people who cannot use smart phone to control their appliances mainly the elderly people, special needs people and also normal people. Thus, the designed IoTSHS can benefit the whole part of the society by providing advanced remote controlling for the smart home. The only possible drawback of this system is the user interface is slightly complex for the elderly people to comprehend, so making it a bit simpler will make this an absolute success.

Trio Adiono et al [6] proposed a mobile application which is able to be run on Android based smartphone. It uses both RSA and AES algorithm, to encrypt data. the app can also intelligently control the appliances automatically using the scenario and scheduling feature. Smart home system basically consists of two subsystems/environment, which are the indoor environment and outdoor environment. The indoor subsystem consists of nodes, host, and access point. The outdoor subsystem consists of user and cloud server. Inputs are modified to JSON data type when application response to the user's input. The JSON data is sent by using AMQP communication protocol and RabbitMQ message broker. Communication between appliances themselves uses ZigBee, instead of internet. By using the internet connection to do the communication, user can access the smart home system at anytime and anywhere in real-time. By using a smart home application, user can monitor and control all appliances in the home remotely yet in real-time. The smart home system can be used as a solution for security, ease, and energy saving in the home.

Sourabh Jamadagni, et al [7] present the growth in the industrial monitoring system's design using Internet of Things (IoT). The previous methodologies may cause severe consequences . The authors proposed to extend the number of sensors used in previous designs. The sensor used for the development of this system is MQ-2 which detects the leak age of gas at any atmospheric condition and fire sensor as a simple and compact device for protection against fire. Python is used for coding in this system. SMS is sent by the GSM when Gas and Fire is detected. This system is more accurate and cost effective in a secured approach. It has more scope to employ it in different applications such that it will give more effective outcome.

Khaoula Karimi et al [8] present and discuss threats of smart home attacks. Also, ways to secure communication between smart home and smartphones. Smart Home is the most popular Internet of Things (IoT) parts; it can be defined as a home with technology features that provide the safety and well-being of its residents. The two types of threats are Internal system threats and External system threats. The author proposes the use of encrypted data. Since the communication is based on the internet. Network

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monitoring is a necessary step to ensure the security of the system too. Protocols such as ZigBee Wi-Fi etc. is used. User Authentication is based on hash function, this hashed data is then compared to the extract data from trained neural networks. Physical protection is a vital security requirement because home devices are left unprotected. Smart home insurance is a benefit for the homeowner that ensure his safe and wellbeing.

Vishakha D. Vaidya et al [9] have reported a a comparative study and analysis of a Smart Home System based on various technologies such as GSM, Bluetooth, IoT and PIC Microcontroller with ZigBee modulation. The main purpose of this study is to provide a system with flexibility, portability and low cost installation charges which helps in reducing human efforts, reducing the electricity charges and to help old age people and children. In GSM based home automation, system allows to send commands to control home appliances and get alert in form SMS. Likewise, Bluetooth has a frequency of 2400 HZ and range of 100 meter for connectivity. As compared to other technologies , Bluetooth has a distance limitation. Inspite of that it works efficiently within it's given range. To take this up a notch, the authors have proposed an IoT based smart home system to connect and monitor things remotely using Internet. Since the system is low cost with minimum set of equipment used, IoT is best suited technology for home automation. After comparing various technologies we can come to a conclusion that each system has it's own advantages and disadvantages and the best way to use a particular technology is using it for the required situation where all the constraints are satisfied.

Kartika Candra Kirana et al [10] proposed an ant system which can choose routes based on heuristic information to optimize the sliding window technique in face detection. It is based on shortest face search route using heuristic information. propose an ant system to optimize the sliding window technique in the small sizes face detection. The limitation of this research is detect the single face in the entire image. Based on experimental, the Ant colony algorithm and the Viola & Jones algorithm achieve an iteration average of up to 14150 and 19200. In addition, they both reach computational time up to 50.699 FPS and 50.358 FPS.

S.NO	Paper	Technique	Result	Issues
1	A Wireless Sensor Network for Fire Detection and Alarm System.	Wireless Sensor Networks based fire detection system using XBee modules .	An efficient fire detection and alarm system to eliminate the difficulties of a traditional fire detection and alarm system when it comes to installation and maintenance.	The parameters which effect the performance of the system are network stabilization, distance of nodes, obstructions in the communication path, the electronics circuit, and the LabVIEW architecture.
2	Long-range Raman Distributed Fiber Temperature Sensor with Early Warning Model for Fire Detection and Prevention.	Raman Distributed Fiber Temperature Sensor (RDFTS) and a Temperature Early Warning Model (TEWM) for fire detection and prevention.	An optimal fire detection and prevention model , which can effectively provide a temperature early warning mechanism and prevent fires from spreading.	Though, this system has a long range and can provide early detection of fires, it needs to be converted from real-time warning system to a prediction warning system and also the sensing fiber needs to be coated with a protective structure to improve the safety of the fiber.
3	Face Detection using Haar Cascades to Filter Selfie Face Image on Instagram.	Web Data Extraction and Human Face detection using Haar Cascade Classifier.	A reliable analysis of human face selfie images on Instagram by determining several hashtags as the basis.	It lacks an efficient face detection system in Haar classifier and can certainly improve its accuracy by atleast 25%.
4	Design of Smart Home Monitoring and Control System Based on Zigbee and WIFI.	Uses ZigBee to construct the wireless sensor network.	The ZigBee module is relatively stable in short distance, and the WIFI can ensure that the user operates through the LAN or Ethernet.	Due to high cost, many families can't afford it. Users can't modify according to their needs.
5	Design of an IoT Smart Home System	IoT using WiFi based Microcontroller.	A realistic, durable, cost-efficient, and simple smart home system which benefits the whole part of the society by providing advanced remote controlling for the smart home.	Since the user interface of the system is a bit complex for the elderly, it requires a more simpler version.

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6	Design of Smart Home Mobile Application with High Security and Automatic Features	A mobile application which is able to be run on Android based smartphone. It uses RSA and AES algorithm. Communication between appliances themselves uses ZigBee.	Using a smart home application, user can monitor and control all appliances in the home remotely yet in real-time. User can also send various input commands, use every smart home system feature, and monitor the appliance through the application. It can be used for security reasons too.	There occurs a 4 second delay when user try to change the status of multiple applicances. It occurs due to hardware limitations.
7	Gas Leakage and Fire Detection using Raspberry Pi	It is based on Internet of Things(IoT) using MQ-2 sensors which detect gas and raspberry pi.	Method will detect the leakage of gas and fire and it will be informed to the user through SMS. This system is more accurate and cost effective in a secured approach. It also solves the transparency problem in an effective way.	Detection of gas becomes hard over long length of the pipeline.
8	Smart home- Smartphone Systems: Threats, Security Requirements and Open Research Challenges	based on wireless communication between smart home and smart phone.	have provided some security requirements to address these challenges and help the product manufacturers to offer value-added on the one hand, and the consumers to choose the product that meets their needs on the other hand.	Due to the hardware limitations, security issues still exist in a smart home. Implementation of a secure smart home-smartphone system increases the price. The lack of communication between all home devices may be a weak point for the security.
9	A Comparative Analysis on Smart Home System to Control, Monitor and Secure Home, based on technologies like GSM, IOT, Bluetooth and PIC Microcontroller with ZigBee Modulation	GSM, Bluetooth, IoT and PIC Microcontroller with ZigBee modulation.	Provides a comparative study on various technologies used in a smart home system to give us a clear idea on which system to choose based on our requirement.	In case of Bluetooth technology, it works only within a given range of distance. This anomaly is modified by using the IoT technology.
10	Ant System for Face Detection	ant system which can choose routes based on heuristic information to optimize the sliding window technique in face detection. Viola & Jones Algorithm is used.	Ant colony algorithm and the Viola & Jones algorithm achieve an iteration average of up to 14150 and 19200. In addition, they both reach computational time up to 50.699 FPS and 50.358 FPS.	limitation of this research is detect the single face in the entire image.

Table 1: Comparison On Various Methods Used in Smart Home Surveillance using IoT.

III. CONCLUSION AND FUTURE WORK

As we can see, many systems have been developed for controlling, monitoring and surveillance of various appliances using IoT but most of them lack in the department of the actual range that they provide in detecting potential threats such as fires, theft, gas leakage and so on. The main reason for this shortcoming is that most systems use sensors which have a narrow range of detecting various threats . To overcome this we propose a product which uses Webcam to expand and enhance the range of detecting those threats. In Table 1, the focus is on controlling, monitoring and surveillance of appliances using the Internet along with other alternatives such as Bluetooth, ZigBee, Wireless Sensors, etc. Therefore the main potential of IoT is not explored to it's fullest. In the future, the surveillance system where the IoT devices are voice automated remotely would be an enhancement to the existing system as it would provide easy control and efficient monitoring.

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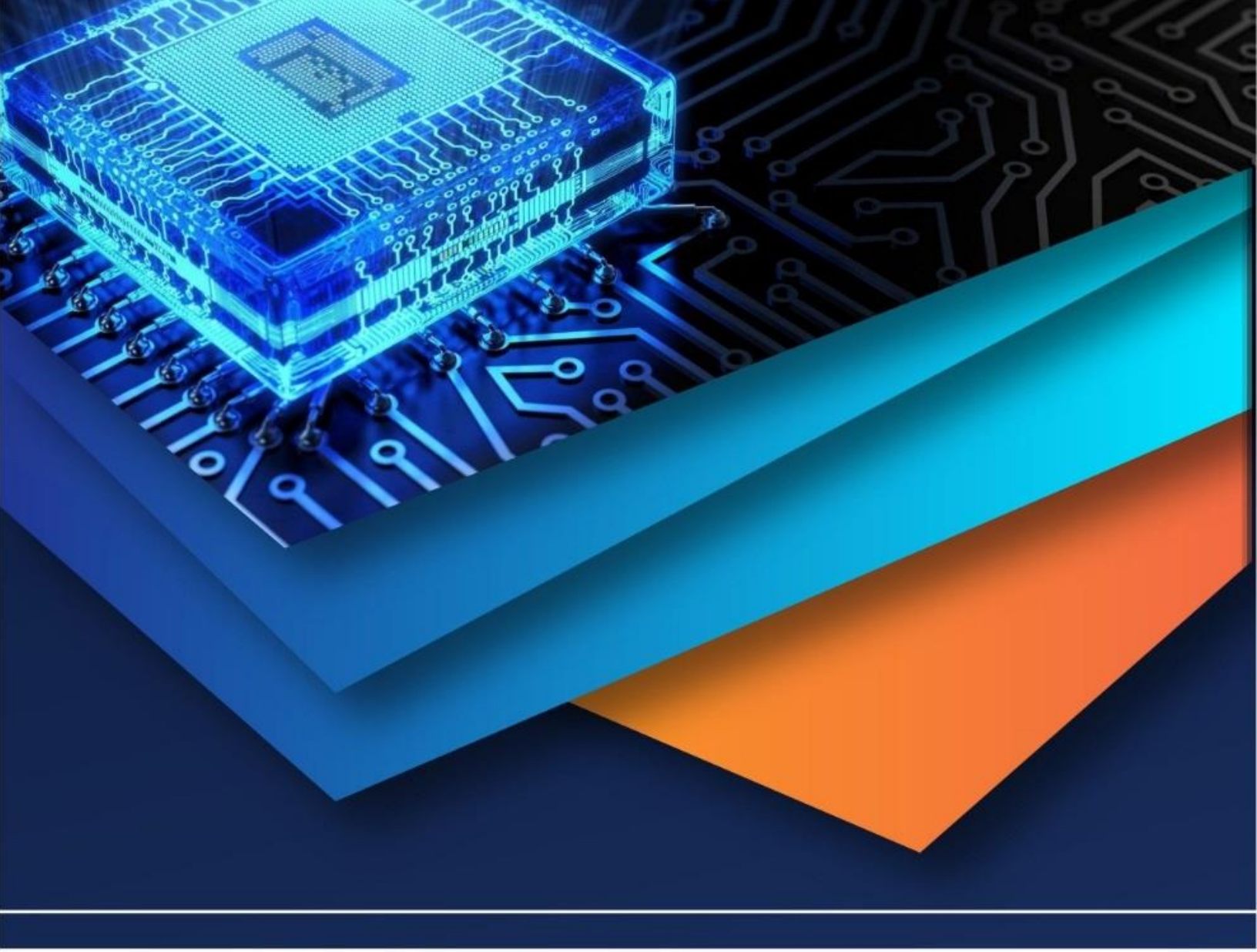
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