OFFICE- AUTOMATED INTRUSION DETECTION SYSTEM (O-AIDS)

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ABSTRACT

Offices hold very sensitive information, as the information it holds pertains to both documents and equipment, hence the security of the documents and equipment kept within an office is of great importance. This is what led to the development of the Office - Automated Intrusion Security System (O-AIDS). The O-AIDS is a device that is designed to operate as an in-house smart surveillance security system; it is designed using technologies such as microcontrollers, Internet Protocol camera, SMS notification, PIR, Alarm, and smart display. The system works with individual units handling specific purposes and giving readings to the central command unit. Its operation is specifically to detect intrusion, send out a message and turn on an alarm. It is designed to be easily interfaced and connected with power outlets to enhance ease of access and it's cameras has wide viewing angles. It requires low maintenance and can be easily be integrated into existing systems.

Keyword: Office, Automated, Intrusion, Surveillance, Security

1.Introduction

The aftermath of the World War 1, ushered in an increase in crime rate. This occurrence gave rise to the emergence of safety organizations, among which there was a system of monitoring, then called “door shakers”, their service was as straight forward as their name, and they would shake the doors of the subscribers at night. The idea of subscription to safety organizations was encouraged by insurance companies as they gave discounts to owners with existing security subscription plans (alarm.org,2018).

In today’s world, the service of home security has greatly advanced owing to the ever increasing application of technological solutions to the daily need of people. We now have sophisticated gadgets designed for monitoring various events, such as temperature change, break-ins, light intensity, water temperature, water level, metal detector etc. All this has led to a current change in the design of home security now addressed as home automation (alarm.org,2018).

Video surveillance is a technology that has been integrated into our everyday routine, since 1970s, video surveillance with cassette tape, was an innovation to the concept of video surveillance (Bob- Mesnik, 2006), fast forwarded to today where we have sophisticated camera recorders, and storage drivers ranging from 100 of megabytes to Terabytes.. The concept of IP camera, has taken video surveillance to a whole new level, giving users the ability to see things through the camera lens, irrespective of the users location, the IP camera are now designed with an inbuilt motion sensor, which automatically uploads video (live stream) of the environment.The level of development in this field of technology has been exponential (alarm.org,2018).

Automated video surveillance system is a technology that stores video of events which can later be reviewed for investigative or other purposes. This technology coupled with an automated alarm system, designed to work upon the system detecting an intrusion in a given space, gives birth to a holistic automated smart security system**.**

Office Automated Intrusion Detection System (O-AIDS) is an office visitor database and an intrusion detection system, geared at reducing if not entirely eliminating and proffering solutions to break in and theft, by the application of an automated system, capable of detecting an intrusion, sending an automated message with a link to a live feed of the incident to a predefined set of numbers, takes a picture of the intruder, and sounds an alarm to ward of the intruder.

After close consideration of the already existing methods of automated video security, their effectiveness and lapses, we came up with the design of the Office Automated Intrusion Detection System (O-AIDS), that will be able to detect intrusion, take a picture of the intruder, establish a live streaming of the break-in, alert the pre-configured numbers and sound an alarm to create awareness in the case of a break-in. The Office Automated Intrusion Detection System (O-AIDS) is capable of covering lapses in the previous edition or design of home security systems, to lay more emphasis; Edwin Holmes – burglar alarm system, could only sound an alarm, when an intruder was detected. The CCTV only records the events without any method of notification. IP camera gives live streaming of events but cannot draw the attention of the subscriber if he/she is not online.

Presently in the some of the campuses in Nigeria there have been cases of property vandalism and break-ins and forceful entry into Offices. In some cases also , theft and burgled offices are recorded.In a bid to tackle these cases,there is a little impact of security forces in times of need due to little or no information i.e intelligence, some of the security men in the campuses either do not have technical know-how of some sophisticated security technologies or lack appropriate methods to use them, also there is little or no automation in essential daily routines to secure the Offices.This paper therefore present an Office-Automated Intrusion Security System (O-AIDS).The O-AIDS is a device that is designed to operate as an in-house smart surveillance security system.

2. Review of Related Works

2.1 Video Surveillance

The concept of video surveillance is not alien to us, as it has been in existence since the 1980s, a detailed look into this method of security would show its strength and its weakness. A common and prevalent case of video surveillance in our community is the use of Closed Circuit Television (CCTV), this is one of the most applied technological security measures, as it has proven to be effective in deterring criminal events. Below is a critical review on video surveillance system. Surveillance has been embedded into our routine security measures, owing to the function it plays in quality security measures, it has been operational from the time of the Athenian Agora

and the Roman forum (Sennett, 1990). In current times surveillance has come to be a central forum (Sennett, 1990), and a feature of contemporary society (Lyon, 2001).The additional features offered by modern day surveillance system, capable of saving and retrieving data of real time happenings. This has led to speedy investigation of break-ins and criminal incidents, and has actively led to the conviction of many criminals.(Norris and Armstrong, 1997). The evolution in technology has not left security systems behind, with the advent of the accident detection, indoor and outdoor monitoring, traffic monitoring, elder care, traffic and controlling analysis, airborne traffic management, traffic monitoring , maritime traffic control, counting moving object (pedestrians, vehicles), understanding of human behavior, activity analysis identification, motion detection , tracking and classification (Fereshteh Falah Chamasemani and Lilly Suriani Affendey l, 2013).

Due to the availability , development and low price of sensors and processors, the demand for the applications for the support indoor and outdoor environments(such as train station, parking lots, shopping mall etc).There is multidisciplinary nature of the research in video surveillance systems, it involves embedded computing,pattern recognition, image analyzing and processing, signal processing and communication.(Fereshteh Falah Chamasemani an Lilly Suriani Affendey l, 2013).

The underlining factor between the first and second generation of surveillance is the drastic reduction in the need for man power (human eye) to review the recorded video. While in the second generation systems the surveillance system is capable of identifying possible threats and events that can be potentially harmful. (Ray Surette, 2005).

2.2 IP Camera Surveillance

IP camera are an offshoot from the earlier video technology, the very first form of video camera was an analog operated technology, it was used to record real life happenings and the recordings was saved on tapes. It was applied in the early stage of video surveillance, where the recordings would be replayed to properly discern what happened in an event, by watching the whole video. This early video had a lot of drawbacks, it required a person to constantly change the tapes, when it got full, the quality of the video was poor, it did not

support the remote feature which is now used in the security industry, and lastly it did not have the ability to inform the owners when an event was ongoing. (Essays, Uk, 2018)

The internet opened up new ways to effectively utilize technology for better security systems, the local area network revolutionized the field of the video surveillance (Essays, Uk,2018), thanks to the internet the traditional Closed Circuit Television(CCTV) can now be replaced by IP cameras, which have the additional digital features of zooming, higher picture quality, get particular scenes of events, and has a lot of add on feature that can be used to get the best of video surveillance security, and with the advent of machine learning, and artificial intelligence, IP cameras can now be armed with facial recognition, and event detection, hence the level of human interference is greatly reduced. (Essays, Uk, 2018). The IP camera surveillance systems has it's pros and cons, below are a few of its features outlined to buttress their strengths and weakness.

2.3 SMS System of Home Automation

Alheraish A. proposes a work on home automation system using Short Message Service (SMS). The system allows legitimate users to change passkey for control and door lights in the home ,and detects illegal intrusions at home and. Illegal intrusion in home can be identified through proper monitoring of state of home door, which is done using infrared sensor and Light Emitting Diode The passkey can be any 4 digits which can be set using SMS from mobile number of registered user. or using keypad. A user can handle control of lights in their home using SMS remotely ,lights in different rooms can be turned on randomly at time intervals, impression that home is occupied can be given, which might not be true.(Arun Jose, Reza Malekian, 2015).

The work of M.S.H Khiyal et al. proposes an SMS-based home security system called SMS-based wireless Home Appliance Control System (HACS). In their work, a homeowner can control their home using SMS messages from a preset registered mobile number. If the SMS is not from a legitimate mobile number, the system ignores the message. In the case of an intrusion, the appliance control subsystem and security subsystem in the proposed system informs the owner through SMS. (Arun Jose , Reza

Malekian, 2015).

3. Methodology

This involves modeling , simulation and construction. The components used in the construction of the Office Automated Intrusion Detection System (O-AIDS) include Arduino Mega microcontroller,Arduino Uno microcontroller ,Passive Infrared sensor ,Alarm buzzer , Keypad module , Liquid Crystal Display (LCD) , Camera module Push button , Resistor ,Toggle switch, Jumper wire , Light Emitting Diode (LED) , IP camera Relay module, GSM module , Cat5 cable and SD card module.After the construction, the system was simulated using Proteus Simulator.The model of the system is presented using block diagram in Figure 1.The brief illustration and description of the components is presented in Figure 2. The schematic diagram of the system is also presented in figure 3. The Simulation set up of O-AIDS is in presented in figure 4 using Proteus Simulator.

3.1 Block Diagram

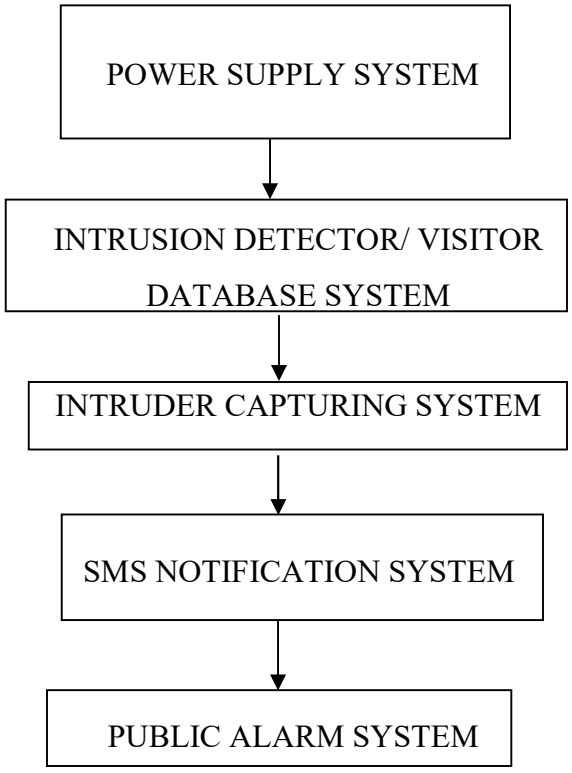

Figure 1: Block Diagram of the Model

The breakdown of the model is as shown in Figure 1 above. The model comprises of sub-components as follows; Power Supply System, Intrusion Detector/Visitor Database System, Intruder Capturing System, SMS Notification System and Public Alarm System.

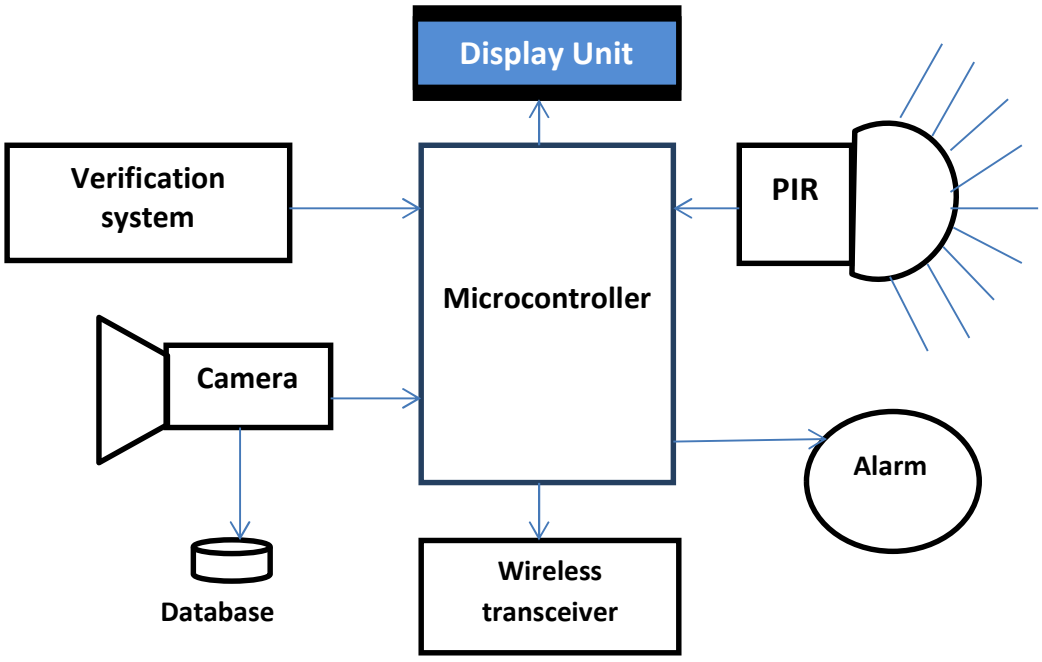

Figure 2: Components of O-AIDS System

The power system is a dc supply unit which provides power to all the modules, the intrusion detection system/visitor database system, keeps track of anyone who comes to visit, and if there is a break in, it kick starts the intruder capturing protocol. This is done by the camera to take a photo- shoot of the intruder, the system sends an SMS to the pre-configured numbers and turns on an alarm to ward of the intruder.

3.3 SCHEMATIC DIAGRAM OF THE O-AIDS

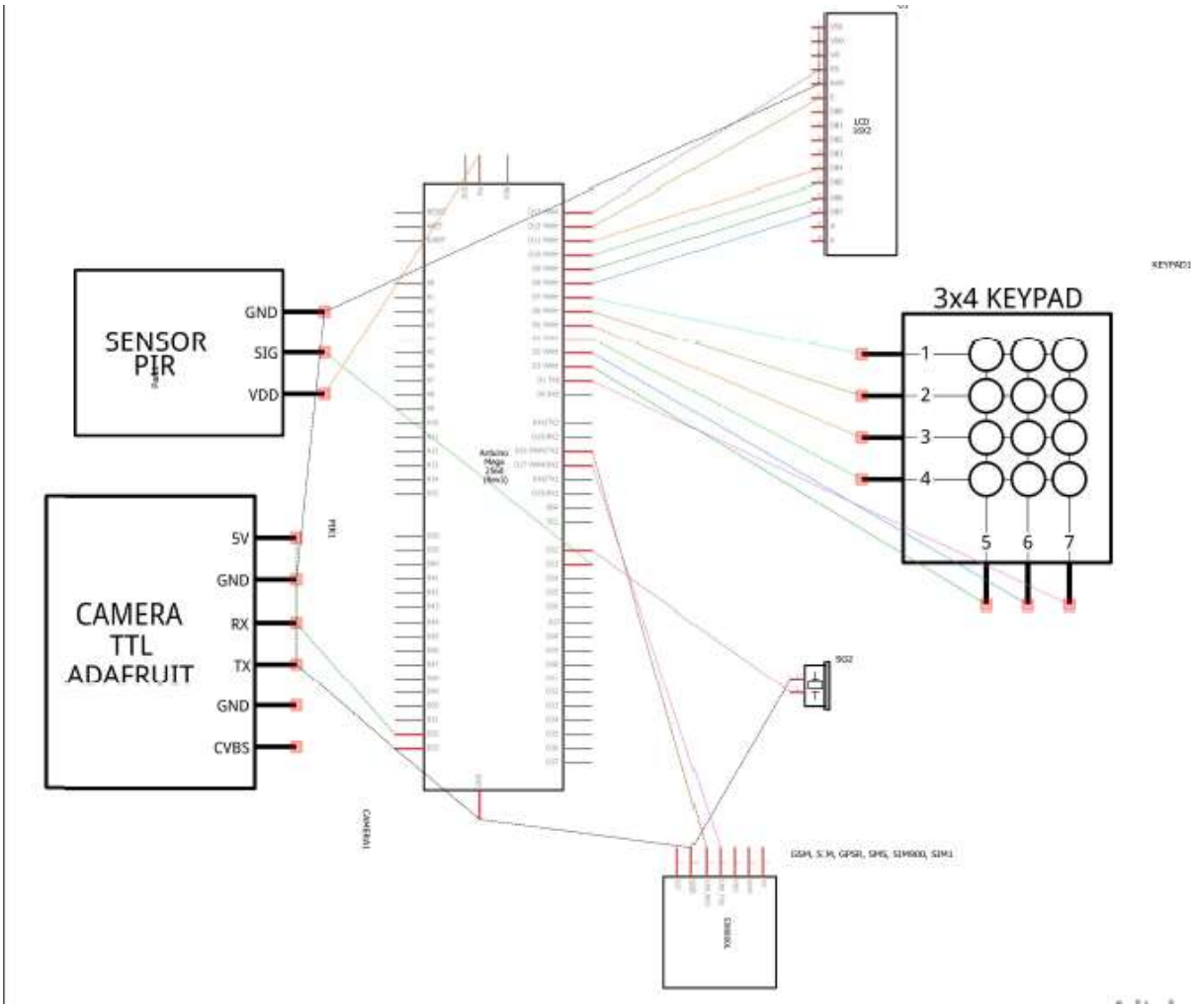

Figure 3: Schematic Diagram of O-AIDS

3.4 SIMULATION OF THE CIRCUIT USING PROTEUS

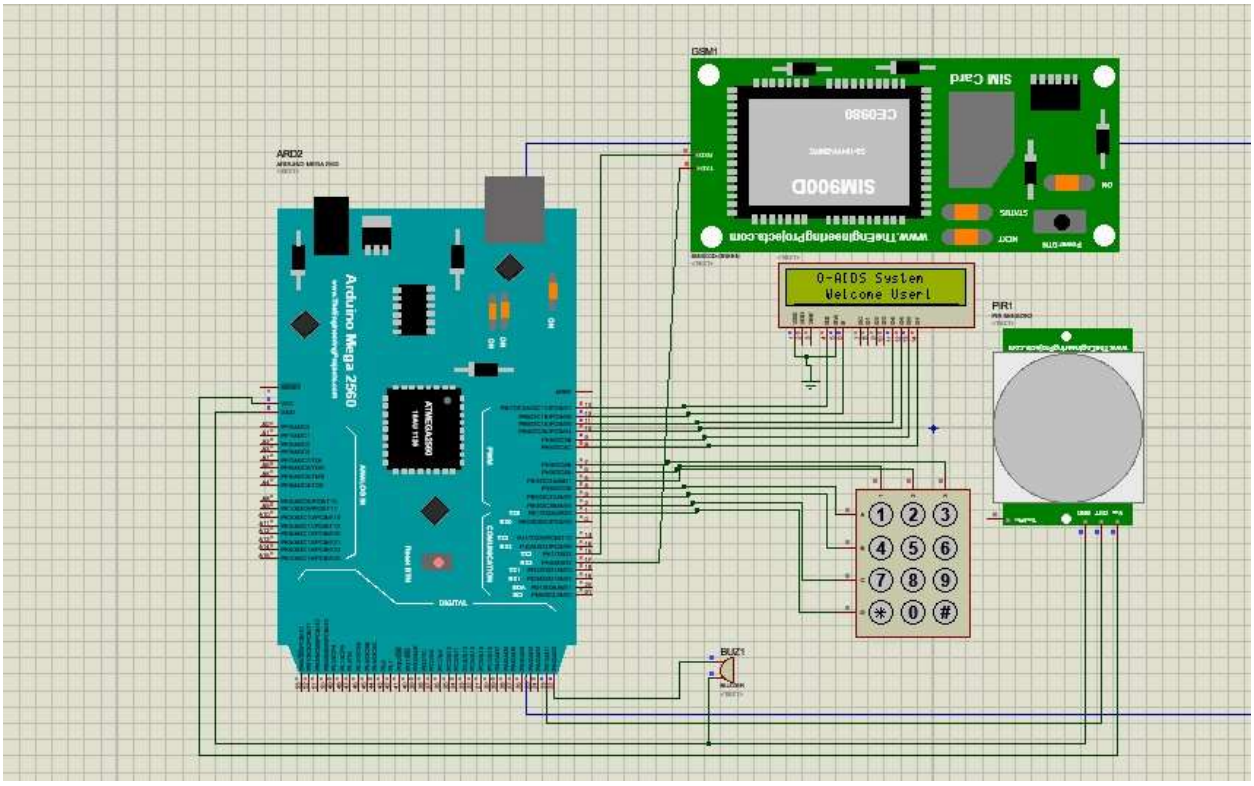

Figure 4: Simulation of O-AIDS Using Proteus Simulator

4.1 System Testing and Capability

The design of O-AIDS exhibits some of the following capabilities; validation of passkey, detection of a human presence in a room, successfully transmit GSM messages to the pre-configured numbers, online video transmission upon human detection, taking a picture of the intruder and saving it on a detachable SD-card, activation of alarm when an intruder is detected and transmission of live coverage of the intruder.

The O-AIDS operation is according to its specifications, the system is capable of identifying its operator, through successful validation of the passkey, the device can successfully detect an intruder which is done only when the system has been set to lock mode, its capable of informing preset numbers of the break-in while, taking pictures of the intruder and transmitting live video of the incident, and finally turning on an alarm to deter the intruder. With this functionalities of the O-AIDS, it can be applied as an efficient and quality Office security device.

This device is an improvement to the already existing technology 'Closed Circuit Television (CCTV)' as it does not just record happenings, but it is capable of intelligently coordinating hardware to act as a self-aware system.

4.2 Advantages of Office Automated Intrusion Detection System (O -AIDS)

i. The following are some of the advantages of O-AIDS;

ii. **An Efficient Intrusion Detection System:** The application of PIR sensor, detecting the

   a. intruder is not a thing of worry, since the PIR sensor is used to detect heat frequency disposed by the intruder to sense the person's presence and convey the message to the Arduino board which in turn triggers the security system.

iii. **Adds Safety Through the Use of Efficient Electronic Component:** Advantage is added safety for the subscriber and their valuables. The use of electronic components, leaves out most human errors, this also helps increase the safety and security of your premises.

iv. **Brings Criminals to Book Through Culprit Identification:** With the use of the surveillance camera, the intruder's image would be caught thereby leading to a faster

apprehension of the culprit and rules out the chance of accusing the wrong person for an incident.

v. **Contributes to Economy:** Simply put, you are contributing to the economy when you purchase and utilize an Office Automated Intrusion Detection System (O-AIDS). It encourages local invention and innovation.

vi. **Sense of Security:** Perhaps this benefit will not apply to everyone, but for those who live in troubled neighborhood, the use of the Automated Intrusion Detection System (AIDS) would give them ease of mind, knowing that they would be alerted if there was an intrusion and the security agencies, neighbors would also be alerted about the intrusion.

vii. **Enhanced Secured:** The Office Automated Intrusion Detection System (O-AIDS) is less prone to hacks and exploitation, the system is designed to be a one sided communication hence there is no room for external manipulation.

viii. **Easy Installation:**The Office Automated Intrusion Detection System (O-AIDS) standalone setup makes it easy for installation both by professionals and non-professionals. Since the bulk of the project is made up of electronic components and not constructions, that means that it leaves room for great expansion.

ix. **Flexibility and Mobility:**Due to the design of the (O-AIDS) , it can be easily moved even after installation, to get better view of various angles, and to accommodate changes to the environment.

x. **Easier Expansion:** As the home structure change, the needs of the security structure changes as well. The home automated security system is very flexible therefore it gives room to accommodate enhancement, restructuring, add-ons etc.

xi. **Reduces Excess Bandwidth Usage:** This is achieved by the automated activation of the IP camera, only when an intrusion is detected, hence data usage is highly optimized.

5. Conclusion and Recommendation

It is evident from this design that offices can truly be secured with the application of the right technology, and that microcontrollers can be successfully implemented to handle complex works, with the purpose of actualizing a given purpose or goal.It is therefore recommended that the device is installed indoors, since its current design does not support harsh weather; for outdoor installation the device should be enclosed in an outdoor housing. In order to enable optimum

performance, the device must be installed with a backup power supply, which would keep it running even when there is no power from the mains. The system being originally designed to operate in an office, have a provision for expansion. However, if the system is to be installed in a hall or large space, the number of PIR sensors and camera modules must be increased to adequately cover the new space.The system can be enhanced to record video of the intrusion, although to achieve that there would be additional hardware required.

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