RESEARCHERID
THOMSON REUTERS

[Nalini* *et al.*, 6(5): May, 2017]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

AUTOMATIC SURVEILLANCE SYSTEM USING RASPBERRY PI AND ARDUINO

Myrala Nalini*, G.Vijaya Kiran
*M.Tech Student, Dept of ECE, SSN Engineering college, Ongole,Ap.
Associate professor, Dept of ECE, SSN Engineering college, Ongole,Ap.

DOI: 10.5281/zenodo.800624

ABSTRACT

In this current situation, the degree of security is feeble. So there is a lot of robbery, theft going on in and around the world. So, people fear to keep any of their valuables in their homes. A common man feels his valuables are secured if there is efficiency in security. This paper deals with the design and implementation of Smart surveillance monitoring system using Raspberry pi and arduino. It increases the usage of technology to provide essential security to our homes and for other control applications. The proposed home security system captures information and transmits it via email. Hence this project can give effective security in minimal cost.

KEYWORDS Arduino, 4x4 Membrane Keypad, Buzzer, raspberry pi, usb camera.

INTRODUCTION

New innovative technology revolves around how much a product is capable of implementing along with its price. The Raspberry Pi crosses off both criteria because it is a cheap effective computer which is capable of much more. What makes it so convenient is that so much can be done with it from a security system to a VPN server. The possibilities are endless! Like any other computer it can accept several programming languages including Python. Most importantly, security can be a necessity today and the Pi has the ability to become a camera security system with a cost under 80dollars. Regular security systems lead up to prices within the range of thousands.

Video surveillance systems traditionally consist of cameras attached to monitor screens. These systems are installed to give an overview of a large area to a limited number of operators. The goal is to detect abnormal situations. Depending on the seriousness of the situation, action can be taken. Operators often work in a room with lots of monitors like illustrated in figure 1. Their task is to watch constantly the monitors. If incidents happen, they warn the security or police. Some monitors show the video stream of a single camera and some show multiple streams on a single monitor simultaneously or sequentially. However, in some areas the monitors are not watched constantly. Video recorders record the output of each camera. After an incident, the video footage can be used as evidence. One obvious disadvantage of this approach is that operators are not able to prevent incidents or limit their damage, since the videos are only watched afterwards. Another disadvantage is that it takes a significant amount of time to search for the right video images, especially when the suspect arrives at the scene hours before the incident and a large amount of cameras are involved.

The task of the human operator is not limited to watch the videos and react to abnormal situations. After training and acquiring experience, a human operator is able to incorporate the area context in order to judge the events on the monitor. Take for example a car that stops near a weapon depot. The event of a car stopping might not be abnormal, but the fact that it happens neara weapon depot might trigger the operator to give it some more attention. Building upon this example, an operator has a set of Regions of Interest (RIOs), that we define as: certain regions in the surveillance area that are potential targets of incidents. Examples of ROIs are parking lots, ATMs, the road to a nuclear reactor, and so on. For each of such ROIs, the operator has a list of what is normal and suspicious behavior. For example, it is normal if a car stops near an ATM and someone steps out. However, if a truck hits the ATM with a high speed, a robbery might be going on action should be taken. Besides incorporating context, human beings are very good at recognizing moving objects . Even small motions on a large screen are not a problem for humans. However, humans do make mistakes. Even more, it appears that they

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

make a significant amount of mistakes when they are watching to surveillance monitors . The main reason is the nature of the task: passively watching multiple monitor screens where nothing special happens for a long period of time. Research has been done to help the operators with the task to keep an overview. However, if we could ease the task of the human operator by watching the monitor screens for him, the chance of preventing incidents is expected to increase significantly. Another problem is that hiring people is expensive, so the monitors are watched only when necessary. In contrast, computers can work for 24 hours a day and 7 days a week without large expenses.

Figure 1: Control room.

LITERATURE SURVEY

The field of video surveillance is very broad. Active research is going on in subjects like face recognition, 3D object modeling, multi-camera camera setups and human behavior analysis. This chapter contains summaries of several papers that describe fields which are close to the subject of this thesis. The set of papers include survey papers and papers that describe a particular system. For every paper it is also mentioned why the paper is chosen and our personal opinion is given.

Hampapur et al [10] gives an overview of what aspects are important for large-scale video surveillance systems. The challenges that are pointed out are: combining multiple sources of information, automatic event detection and deploying systems with a large number of cameras (cost-wise). The article also shows some basic techniques like object detection, 2-D and 3-D object tracking, object classification and object structure analysis (specifically: head detection). Moreover, the structure of two designed systems are presented: Face cataloger, which aims at doing high-resolution face detection using 3-D head detection and a pan tilt zoom (PTZ) camera at the entrance of a restricted room. A system for long-term monitoring, which saves the surveillance video fragments in a database in such a way that it can be queried later on. During this saving process, the video fragments are analyzed by the Smart Surveillance Engine which detects, tracks and classifies the objects. Examples of queries: “give all vehicles that drove through this particular part of the camera sight“ and ”show all vehicles that drove to the east“.

Lefter et al [17] describes the surveillance system that the authors envision for the NLDA area in Den Helder, The Netherlands. The system uses both video and audio signals to secure the area. It consists of two subsystems: a car-driver identity recognition system at the entrance of the restricted area and a car-driving behavior recognition system along the roads in the area. The paper describes how they analyze the behavior of the drivers, fuse the video and audio data and use an expert system to solve conflicts between audio and video. At the end they describe several scenarios that help them developing this expert system.
Over et al[19] gives an overview of the TREC Video Retrieval Evaluation (TRECVID) 2009. The goal of this evaluation was “to promote progress in content-based exploitation of digital video via open, metrics-based evaluation”. In 2009, sixty three research teams submitted a video recognition system. There were four tasks: high-level feature extraction, search (fully automatic, manually assisted, or interactive), copy detection and surveillance event detection. Each system had to be able to do at least one of these tasks. During the evaluation, the submitted systems are tested and the results are presented in this paper. For our graduation project, the last task is interesting: surveillance event detection. The goal of this task is to recognize particular visual events of people. Ten types of events were specified. The data that is used consists of multiple synchronized camera views.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

2.1 Surveillance System

Surveillance is the monitoring of the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting. The word surveillance is the French word for "watching over".The word surveillance may be applied to observation from a distance by means of electronic equipment (such as CCTV cameras). Surveillance is very useful to governments and law enforcement to maintain social control, recognize and monitor threats, and prevent/investigate criminal activity . A home security and surveillance system is an essential part of any modern automated home. The basic design of a security system begins with analyzing the needs of the inhabitants, surveying existing technology and hardware, reviewing system costs, considering monitoring choices, and finally planning the installation. In addition to perimeter and interior protection offered by a security system, surveillance monitoring includes features that enable the inhabitants to observe environmental conditions inside and outside the home when at home or away from home. The design of a security and surveillance system should provide for the protection of the entire perimeter of a home as well as visual- and audio-based surveillance monitoring. Security system sensors are available that are designed to detect sound, window and door intrusion, air movement, body heat, motion, and other conditions that indicate an intruder is present. A good security system design should consider the best plan for existing homes as well as new construction. It should also consider the lifestyle of all the inhabitants, the location of valuables or any items to be protected, how the system is to be controlled, adequate smoke and fire alerting sensors, and the type of emergency response required. The design choices are numerous and varied due to advances in home security technology and the wide availability of compact, low-cost video surveillance systems .

2.2. Types of surveillance system

There are various types of home surveillance system that can be very useful in security system. Some of such systems are given below.

2.2.1. Wireless Security Systems: Wireless home security systems use battery-powered radio transmitters and receivers to connect the various components such as cameras, sensors, area motion detectors, sirens, central controllers, smoke/fire detectors, keypads, and video displays. These types of security systems are usually available at a local hardware store or on the Internet and are often designed for do-ityourself installation. Wireless home security systems has some advantages like they are easy to install, they avoid the expensive and time consuming task of installing new wires in the walls of existing homes, Wireless sensors are designed to transmit a unique identification code to a controller, it enable you to take the components with you when moving to a new location, Wireless sensors, motion detectors, and video cameras can often be installed in locations that are not accessible for wired equipment. But it has some disadvantages also such as Wireless system design specifications can limit the distance between sensors, cameras, and the central controller, they require periodic replacement of batteries. Most professional builders recommend wireless systems as a last choice.

2.2.2. Hard-wired Security and Surveillance Systems: Hard-wired security and surveillance systems use wires installed inside the walls, attics, crawl spaces, and underground to connect the sensors to a central controller. Surveillance cameras or microphones are also wired to speakers, video switchers, and video display monitors. A hard-wired system design normally uses power from the home AC power wiring as the primary source. The main components of a hard-wired system are include a central control panel, sensors, one or more keypads, motion detectors, smoke and fire sensors, cameras, camera switchers, video displays, and sirens. This System has some advantages such as hard-wired security systems are considered by most contractors to be more reliable than wireless systems, the hard-wired components are usually less visible and more aesthetically pleasing than wireless components, Hard-wired systems do not depend on batteries except for power failure backup protection and disadvantages such as Hard-wired systems are more expensive than wireless systems, problems can arise in the installation of sensors in existing homes where some areas are not accessible for pulling wires inside the walls.

2.2.3. Remote Access Systems: A remote access system provides the capability to monitor and control a home security system from a location away from the home. A telephone call to the home followed by a key number code allows the caller to obtain status information concerning environmental and alarm system condition. Remote systems can also be programmed to call a specific phone number when certain environmental conditions exceed an established threshold. A special synthesized voice response system provides the caller with an audible report. The caller, with proper coded inputs, can also perform all the same control functions from a distant location that are available on the keypad in the home [7]. This type of traditional surveillance systems suffer from an unnecessary waste of power and the shortcomings of memory conditions in the absence of invasion. The traditional surveillance systems take a long time to detect whether there is any intruder. If there is

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

no intruder, the sensing device which continuous to work and consumes much power. To meet the increased requirements of the IEA we have to reduce the standby power of each electrical apparatus to less than 1 Watt.

PROPOSED SYSTEM

From the surveillance systems stated above we realized that these systems are in continuously on position although there is no intruder. So it consumes much power and also use large memory of the system for storing the data or picture captured by web camera attached to the system which also in continuously on position. So to reduce the power consumption of the traditional surveillance system we proposed the embedded surveillance system using raspberry pi and arduino. With low power usage security and safety is one of the most discussed topics in almost every field like surveillance, industrial applications, offices, and in general, in smart environments. Traditional surveillance systems suffer from an unnecessary waste of power and the shortcomings of memory conditions in the absence of invasion. In this project we design a home embedded surveillance system which evaluates the development of a Low-cost security system using small keypad built around a microcontroller arduino with ultralow alert power. The system read the password from the keypad through arduino and arduino send the signal to raspberry . Detecting the presence of any wrong password entry, it triggers the signal wakes up the arduino. The arduino sends the sensor signals to the embedded system, the program starts the Web camera.

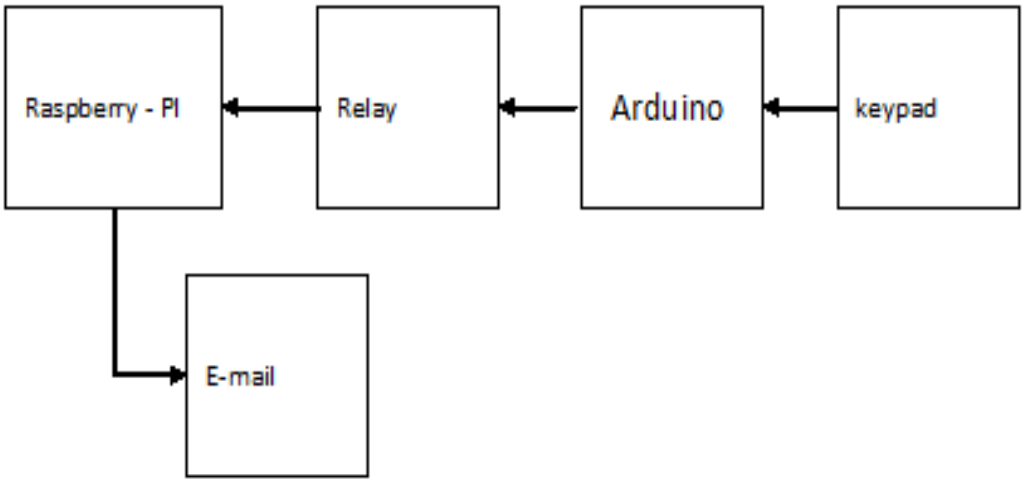

Figure 2. Block diagram of proposed system

The Figure 2 gives a brief idea as to how the project " Automatic surveillance system using raspberry pi and Arduino" works. Initially the password is predefined. When the device is switched on, it resets the system. Now the user is prompted to enter the password. The user enters the password through a keypad which is read by the arduino. Now the entered password is checked with the predefined password. If the password matches, then the servo motor deflects and the door unlocks else it send the command to raspberry pi. The rapberry pi capture the image and send it to email of authorized person.

Here keypad were used to enter the password which is predefined. The arduino takes the password and chek it then takes the decision. The voltage converter converts 5v to 3.3v why means the arduino output is 5v but the raspberry takes 3.3v only. The raspberry capture the picture by using web cam and send it to authorized person through email based on arduino signal.

RESULTS

Fig . working model of proposed system

The fig shows the working model of proposed system. Here the keypad is connect to the arduino and arduino is connect to raspberry pi through voltage converter.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

In arduino pins 2, 3,4,5,6,7,8,9 are connected to keypad and pin11 is connected to voltage converter and the voltage converter is connected to GPIO7 in raspberry pi. The usb camera is connected to raspberry pi through usb port.The Fig shows the email output which send through the python code

Figure 3. working model of proposed system

Figure 4. Image send to email

CONCLUSION

This project is effective in providing enough security as long as the password is not shared. In future this project can be provided maximum security by the enhancements in order to completely satisfy user's needs. Hence, a common man can afford to purchase such locking system in minimal cost to keep his valuables safely without any worries. Raspberry Pi opens up a whole new chapter when it comes to technology today. Not simply because of its size but because of its capabilities. The fact that it is so portable allows it to be used for anything. A cost effective system which is user friendly and convenient.

REFERENCES

[1]. Raspberry Pi. Raspberry Pi, n.d. Web. Oct. 2013. http ://www.raspberrypi.org
[2]. Gantt, Charles. "Raspberry Pi Camera Module Review and Tutorial Guide. "TweakTown News. Tweak Town, 22, July 2013. Web. Oct. 2013. http://www.tweaktown.com/guides/5617/ raspberrypicameramodulereviewandtutorialguide/index4.html.
[3]. "Python Sending Email Using SMTP." Tutorials Point Simply Easy Learning. N.p., n.d. Web. Oct . 2013.
[4]. http://www.tutorialspoint.com/python/python_send ing_email.htm.
[5]. Buenger, Christoph. "Raspberry Pi as Low Cost HD Surveillance Camera." CodeProject N.p., n.d. Web. Oct. 2013. http://www.codeproject.com/Articles/6655 18/RaspberryPiaslowcostHDsurveillancecamera.

[6]. "Motion Guide for Motion Version 3.2.12." Motion Guide. N.p., n.d. Web. Oct. 2013. http://www.lavrsen.dk/foswiki/bin/view/M otion/MotionGuide.
[7]. Cheng-Hung Tsai, Ying-Wen Bai, Wang Hao-Yuan and Ming-Bo Lin, "Design and Implementation of a Socket with Low Standby Power", IEEE Transactions on Consumer Electronics, Vol. 55, No. 3, pp. 1558- 1565, August 2009.
[8]. International Energy Agency, Things That Go Blip in the Night: Standby Power and How to Limit It, Paris, France, International Energy Agency, 2001.
[9]. International Energy Agency, Standby Power Use and the IEA "1-watt Plan", International Energy Agency, April 2007.
[10]. Hampapur, A.; Brown, L.; Connell, J.; Ekin, A.; Haas, N.; Lu, M.; Merkl, H.; Pankanti.
[11]. Smart Video Surveillance: Exploring the Concept of Multiscale Spatiotemporal Tracking.
[12]. IEEE Signal Processing Magazine, 22(2):38–51, 2005. 15, 23
[13]. [10] S. Sivagamasundari, S. Janani, "Home surveillance system based on MCU and GSM", International journal of communications and engineering, 2012, volume 06– no.6,
[14]. http://en.wikipedia.org/wiki/Surveillance
[15]. https://www.adafruit.com/products/1914
[16]. Ying-Wen Bai, Zi-LI Xie and Zong-Han Li, "Design and Implementation of an Embedded Home Surveillance System with Ultra-Low Alert Power", International conference on consumer electronics,2011, pp 299-300
[17]. I. Lefter, L. Rothkrantz, P. Bouchner, G. Burghouts, and P. Wiggers. A Multimodal Car
[18]. Driver Surveillance System in a Military Area. 2010. 16, 32
[19]. P. Over, G. Awad, and J. Fiscus. TRECVID 2009 – Goals , Tasks , Data , Evaluation
[20]. Mechanisms and Metrics. In Proceedings of TRECVID 2009. NIST, USA, 2010. 16

CITE AN ARTICLE

Nalini, M., & Kiran, G. V. (2017). AUTOMATIC SURVEILLANCE SYSTEM USING RASPBERRY PI AND ARDUINO. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY, 6*(5), 635-640. doi:10.5281/zenodo.800624