Research Application Summary

Organizational security system: A case study of the RUFORUM Secretariat

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Abstract

Security is an important aspect of any business, resident, military, industry and organizations. Most organizations use intrusion detection systems to protect their properties and lives, and most organizations such the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) use the Closed-Circuit Television Surveillance (CCTV) systems. The CCTV cameras record the activities of the intruder and it is displayed on the Liquid Crystal Display (LCD) screen. However, the system cannot alert the neighbours of the fire outbreak or an intrusion in an organization. Therefore, this paper presents an embedded system which combines the use of CCTV cameras, smoke detectors, motion sensors and GSM modems and a buzzer. Once the system detects an intrusion or fire outbreak through the motion sensor and smoke detector, respectively, GSM modem automatically sends a message alerting the responsible person of the fire outbreak or the intrusion and the buzzer is turned on to alert the people around and to scare the intruder.

Key words: Buzzer, GSM modem, motion sensor, Smoke detector, Uganda

Résumé

La sécurité est un aspect important de toute entreprise, résidence, secteur militaire, industrie et organisation. La plupart des organisations utilisent des systèmes de détection d'intrusion pour protéger les personnes et leurs biens, et la plupart des organisations, telles que le Forum régional des universités pour le renforcement des capacités en agriculture (RUFORUM), utilisent des systèmes de surveillance en circuit fermé (CCTV). Les caméras CCTV enregistrent les activités de l'intrus et les affichent sur l'écran à cristaux liquides (LCD). Cependant, le système ne peut pas alerter les voisins en cas d'incendie ou d'intrusion dans une organisation. Par conséquent, cet article présente le système intégré qui combine l'utilisation de caméras CCTV, de détecteurs de fumée, de capteurs de mouvement, de modems GSM et d'un avertissement sonore. Une fois que le système détecte une intrusion ou un déclenchement d'incendie grâce au capteur de mouvement et au détecteur de fumée, respectivement, le modem GSM envoie automatiquement un message alertant la personne responsable de l'incendie ou de l'intrusion et l' avertissement sonore (buzzer) est activé pour alerter les personnes autour et effrayer l'intrus.

Mots-clés : Avertissement sonore, modem GSM, capteur de mouvement, détecteur de fumée, Ouganda

Introduction

Security systems are designed to detect intrusion or unauthorized entry into a building or a given area. Security alarms can be used in residential, commercial, industrial, and military properties for protection against theft, property damage and intruders. Alarm security systems range from small, self-contained noisemakers, to complicated systems with computer monitoring and control properties (Bangali and Shaligram, 2013). It might even include a two-way voice which allows communication between the panel and Monitoring station.

The earliest security systems date back to the early 1900's. These systems were generally expensive, very hard to monitor and surprisingly ineffective according to Alkar and Buhur (2005). In the past 100 years, technology has changed and this has led to a change in security systems which will continue to change as long as technology continues to progress (Ciubotaru-Petrescu *et al,*. 2006).

Currently, organizations like RUFORUM use Closed-Circuit Television Surveillance (CCTV) camera to help protect its properties and to control illegal activities by the unauthorized persons. The CCTV camera records and stores the activities of the employees and the intruder and therefore all the activities within the organization most especially in areas where the cameras have been installed can be monitored through Liquid Crystal Display (LCD) screen. However, CCTV cameras do not alert responsible persons about an intruder or a fire outbreak at the time of the incidence and therefore, an intruder can go unnoticed if the responsible persons were not on the screen at the time of the incidence. Thus, the damages caused would only be noticed after the attack.

Due to the breeches in the use of CCTV cameras, this paper proposed a security system for RUFORUM that combines the use of the CCTV cameras with smoke detectors, motion sensors and GSM modems (a special type of modem which accepts sim cards and it operates like a phone) and a buzzer. The System detects intrusion through the motion sensor and fire outbreak is detected using the smoke detector. The GSM modem then automatically sends a message alerting the responsible person of the fire outbreak or the intrusion and the buzzer is turned on to alert the people around and to scare the intruder. The major components of this system are;

Temperature Sensor. This reads the temperature and when the temperature goes beyond the normal room temperature, the buzzer turns on thus indicating that there is fire.

Smoke detector. In this system, the alarm turns on when the smoke is detected thus the people around can be informed that there is fire outbreak.

Motion Detector. This is used at the doors or windows for safety when the lab attendant is not in the lab. It works on the principle of amount of waves falling on the photodiode. When the waves fall continuously on the photodiode their readings are 255 in decimals. But when it is interrupted by an obstacle / burglar the voltage falls less than 50 in decimals which turns on the buzzer/alarm and notifies the people.

Microcontroller. This is the board on which other devices were connected and it has both input and output pins that are programmed to ensure that the sensors connected to it are functioning as required.

GSM modem. This is used to send a message to alert the responsible person of the either fire outbreak, or an unauthorized entry into the building.

Methodology

System planning. This involved determining whether the system was required/needed at RUFORUM to help protect the computers and other peripherals. It also involved carrying out a feasibility study to determine resources needed to improve the organization's security and also making sure that the plan meets the needs of the users.

System development and design. This stage required finding all the resources needed in the development of the system as specified by the users and also designing the system architecture. This is where the actual development was done including writing and testing the codes to ensure that they are functioning and free from errors. The system was developed using a prototyping system development model. In this model, the system is constructed, tested and then reworked. This process is repeated until the approximate paradigm is obtained and this helped in the development of the entire system.
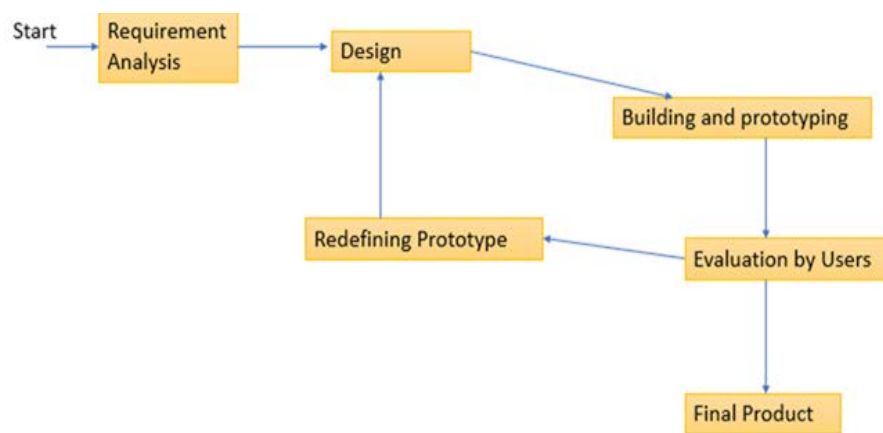

Figure 1. Prototyping system development model

System integration and testing. System integration involved bringing together all the components of the system to ensure that they worked as a single unit. This stage involved validation and evaluation of the system to ensure that it is free from errors and that it meets the specified requirements and needs of the users.

Data collection methods.
Observations. This involved the use of eyes to observe the visible aspects by the observation checklist which was compared with the data collected. The data collection methods yielded qualitative results since it is part and parcel of any meaningful research. The merit of observation is that, it provided information that could be compared and contrasted with the information collected by other means.

Interview. This involved face to face interaction with the respondents. The people interviewed were the security personals at the RUFORUM Secretariat.

Results and discussion

The designed system embedded CCTV camera, motion sensor, smoke detector and a buzzer. The system was able to detect intrusions and smoke and it was able to send a message to the security personal through the GSM modern alerting him of the intrusion and fire outbreak and the buzzer was automatically turned on to alert the people around.
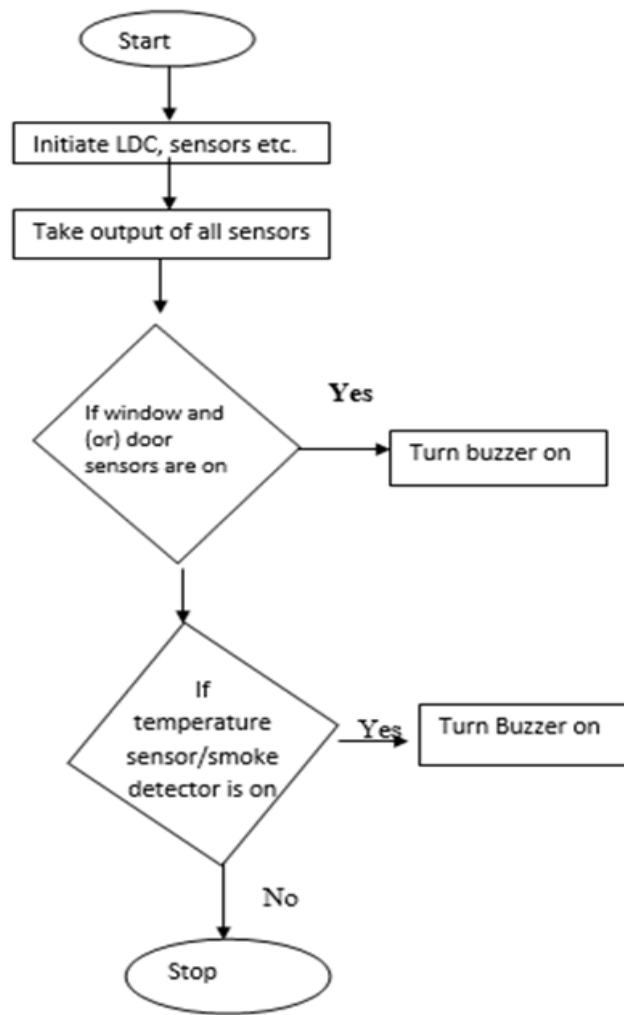
Figure 2. Data flow diagram

Conclusion

The complexity of the algorithm of this system can be increased by introducing a number of sensors to improve the security of the organization.

Acknowledgement

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