Home Security Robot Capable of Moving through Any Shaped Path

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Abstract: Now-a-days the technology is developing with lightning speed in each second. The growth of technology is having impact on almost every phase of life. The technological advancement had made our life more comfortable and simpler. In parallel, the technological advancement is also used by the wrong people for thefts and other anti-social activities. There comes the importance of applying more secure modern technologies for making our life safe and comfortable. The development in technology had now reached on automation of each and everything and the automation techniques are also being developed further. Most of the stuffs that are used in the daily life are automated like the air conditioners, washing machines and many more things. Application of automation had changed the way of life around the globe; it is now applied in agricultural sector, industries, space research, defence, home security and even in medical sector. The possibilities for a system to be applied on medical field are its accuracy, precision and compact size and now the robotics have reached the precision, accuracy and compactness and started using them for surgeries. The usage of automation has many advantages than that of other conventional methods. It can decrease the human effort and number of workers or human resource required for the specific task. It is more reliable than that of the manual operated systems and can performance will be constant in all circumstances other than when it is intended to. Application of automated system in defense can bring down the loss of valuable lives in combats. As the technology developed the importance and the reliability of CCTV has faced a drastic fall back. The main problems with CCTV are it is needed to be monitored continuously to prevent crimes; otherwise it will just be a record of the scene. It is in this scenario the importance of automated security systems came to action. The important plus points of automated systems are they can take decisions by their own, in accordance with the conditions and does not need human interpretations in every stage.

Keywords: CCTV, home security, Arduino, automation.

1. Introduction

Topic of the system is 'Home security system capable of moving through any shaped path' which can identify the residents of the house as well as can distinguish outsiders from residents. Security of houses and properties is one of the main concerns that we face while leaving for a pleasure trip or somewhere away from the home and we can't enjoy the trip to its full extent because of the thoughts of valuables at home. It is common now-a-days that the news of burglaries and attacks towards home alone elderly people. It is in this context the importance of an efficient home security system. In a study conducted by Helen Paxton and Dr. Lee for Rutgers University School of Criminal Justice found that residential security systems decrease crime rates and most burglars avoid houses with modern security systems. Some of the ways that the home security systems could benefit us and our families are,

- *Protects valuables:* This is the main benefit of a smart home security system and the first thing most people immediately think of. There could be many valuable things in every house including jeweleries, electronics money or any other high value things. The usage of an automated home security system can prevent all of these either by preventing the invader or by notifying any local authorities who are meant to prevent the break-in.
- *Deters crime:* In the study conducted by Rutgers University School of Criminal Justice says that with the number of home security system installed houses in an area increased, the number of crime recorded decreased. The installation of home security system not only protects the installed house but also the neighbouring houses.
- *Notifies the owner about suspicious activities:* The owner of the house will get notified through SMS when someone tries to break in to the house without permission.
- Will help the user to be relaxed even when you are away from house.
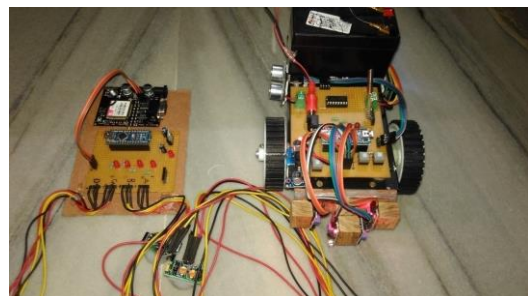- No work fatigue.

Fig. 1. Home security robot

An automated system can be defined as a system which can operate itself or a system which can take decisions its own according to the conditions or requirements. An automated home security system is a system which is intended to secure

the house without human assistance. It has to select decisions by the system itself. In the project the developer has developed an automated security system which is suitable for securing house and properties. It aims to increases the security of houses with automated robotic systems which can bring down the cost for providing tight security, high efficiency and low energy consumption and can work independent of the climate and other conditions etc.

In this modern era most of the operations are completely handled by robots in industrial sectors. Manufacturing, assembling, testing is being done by using automated robotic systems. Even in home security sector also automation is getting rapid and strong development.

2. Benefits

The benefits of Home Security System Capable of Moving through Any Shaped Path can be categorized under tangible and intangible benefits and they are,

Tangible benefits
- Reduce the cost for security.
- Less expenditure more return service.
- Need no supervision.
- One-time investment.
- Intangible benefits
- Better security than other conventional ways.
- Low power consumption.
- No work fatigue.
- No environmental harms.

3. Feasibility

Feasibility of system describes whether the system is possible to complete practically. The feasibility of the system is analyzed in many ways including technical feasibility; which check whether the system is technically possible or not, economic feasibility; which check whether the budget of the system is affordable or not, operational feasibility and social feasibility check about the acceptance of the project by the society.

- *Technical feasibility:* The hardware components of the system are easily available. The designing of the circuit and the hardware components are also feasible. All the functionalities of the system can be executed with a little hard work.
- *Economic feasibility:* The system is designed in a way that the components used are readily available and with comparatively economical components. So the production of the project is expected to be economical.
- *Operational feasibility:* The operation of the system is fully automated. The image processing in MAT-LAB was done in the PC attached to the system.
- *Social feasibility:* The system is using electric power from a battery or a power adapter for avoiding pollution. It is estimated to minimize the human effort in home security and satisfies the security needs of the residents.

From the above points it is clear that the system is technically, economically, operationally and socially feasible. So the system is feasible in many ways.

4. Technical Functionalities

Sensing movement: The human body movement is detected with the use of four PIR sensors placed in each corner of the courtyard of the house. PIR sensor is having two slots in it which are sensitive to IR. When the sensor is not triggered, both the slots will be experiencing the same IR from the surroundings. But when a warm body like human or animal passes by, first it will intercept with one slot of the PIR sensor and this cause a positive differential change between the two slots. The reverse will happen when the body leaves the sensing region, and a negative differential change is produced and the changes in pulses are the sensor output.
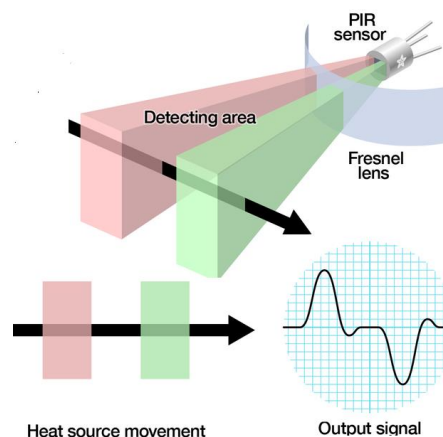

Fig. 2.　Human body movement detection using PIR sensor
(learn.adafruit.com)

Triggering the robotic vehicle: When a sensor detects human movement it triggers the robotic vehicle and the vehicle will move towards the movement detected sensor. After reaching the triggered point the robotic vehicle initiates the image processing part in the MATLAB software.

Image recognition in MATLAB: The system distinguishes between the residents of the house and outsiders by face recognition using image processing in MATLAB. When the robotic vehicle reaches the sensor which sensed the human movement, it triggers the MATLAB program. The MATLAB program will open the camera and capture an image. The captured image then processed using image processing in MATLAB. If the captured image matches with the images of the residents of the house the system will do nothing and wait for next trigger from the sensor. If it doesn't match with the resident's image the system will send a SMS to the owner's number.

5. Conclusion

The planning, designing and implementation of Home security robot capable of moving through any shaped path is done through various procedures. Secondary research was conducted following various techniques that help for the understanding of system working and selecting components.

The importance of providing security systems to houses and the interests of people towards automated security systems and the technological advancements were identified using primary research methods. Discussions and interviews with different house owners of two different states was giving different needs for the system as the structural, geographical and the regional change cause the difference in the security needs and the functionalities of the robot. The project planning was done with the help of Gantt chart and PERT Chart. The developer was able to study more about every component in the circuit. The logic block diagram of the working of the system was included in the document. The estimated cost analysis of the system was also done. The module helped the researcher to identify the benefits and importance of applying automated home security systems in every house for making them more secure. The research methods followed in the project helped the developer to gather more knowledge about the controllers and other components used in the system. Home security robot capable of moving through any shaped path is very helpful to houses for making them more secure.

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