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Automatic Gun Control using Motion Detection System

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Abstract - *In these days security is the major issue for all over the world. Security is very important in order to protect vulnerable and valuable assets such as a person, dwelling, community and nation from any harm. International security issues are also very important, especially border and coast security to any country. The basic purpose of this automatic gun targeting system is to secure the border using programmed or computerized and this will reduced the human impacts. The aim of this work is to design the automated security system in order to detect, track and destroy the target for surveillance operations. The system can be operated in two modes, in which the target can be tracked automatically by using microcontroller based system. On other hand, the system can also be controlled manually in which the user has right to select the target and performs shooting if necessary. The image processing algorithms are implemented in Matlab. The process starts by processing the video signal on computer by using the video camera, then the target is selected which can be tracked further by using different image processing techniques. Morphological method is used for processing to remove noise and to maintain the shape of moving object. After the selection of target, the micro-controller unit takes the decision to shoot any unauthorized person or activity within its range. The gun is mounted on a tripod stand and its movement is controlled by using the stepper motor. Once the target is selected it can be tracked by moving the camera and gun.*

Key Words**:** *Border security, Moving object detection, Video surveillance, Image Processing, Matlab.*

1 .INTRODUCTION

In these days security is the major issue for all over the world. Security is very important in order to protect vulnerable and valuable assets such as a person, dwelling, community and nation from any harm. International security issues are also very important, especially border and coast security to any country. The people of national security agencies, maritime security organization, military forces and other forces sacrifice their lives to protect their country people. The lives of forces are also very precious like other lives. So by using advance technologies, the forces can protect their nation superiorly with minimum life losses. In this modern era, computer base security equipment's are very popular among forces because they are more advance and safe for themselves. For example drone technology the "unmanned aerial vehicle" which is controlled automatically by computer is very popular these days. In this technology, the target is selected and hit by using computer based algorithms including image processing techniques. Real time image and video processing for object detection and tracking has many important applications in the field of computer vision(B. Coifmanet al., 1998), such as video surveillance, military purposes etc. The availability of high quality and inexpensive video cameras and the increasing need for automated video analysis has generated a great deal of interest in the areas of motion detection, object tracking and object targeted(A. Yilmazet al., 2006)Thus on a very highs possible to identify three key steps in video analysis: detection of interesting moving objects, tracking of the detected objects from frame to frame, and analysis of the object tracks to recognize their behavior and targeted object accordingly. In the past the border security is totally depending on soldier. In highly secured area the soldier detected the enemy and targets him. But if the soldier was not able to detect the enemy the enemy could easily enter the secure area. So for the increasing the security level automated security system based on motion detection is introduced. The main concept of Automatic Gun control System is to detect and target the living object or any movement in highly secured area such as Border by using automation. In this work, the image processing algorithms are designed and implemented in computer based system. In future the system can further implement with the help of digital signal processors (DSP) in order to make the system working in standalone mode.

2. LITERATURE SURVEY

[2.1] Robotor an autonomous vehicle for target detection and shooting by Vivek Pal.

This paper has presented an autonomous moving robot has been implemented which is capable to detect a certain object, approaches towards its target and shoot it down. The result shows that the accuracy to find the target is 95 %which demonstrate its accuracy and efficiency. The main constraint of this approach is that it can shoot only static object but no one is always static in nature. So our future work is to make an autonomous system which could predict the direction of moving targets using object tracking.

[2.2] Vision-Based Navigation of Mobile Robot with Obstacle Avoidance by Single Camera Vision and Ultrasonic Sensing by Akihisa Ohya.

This paper describes a vision-based navigation method in an indoor environment for an autonomous mobile robot which can avoid obstacles. In this method, the self-localization of

the robot is done with a model-based vision system, and a non-stop navigation is realized by a retroactive position correction system. Stationary obstacles are avoided with single-camera vision and moving obstacles are detected with ultrasonic sensors. We will report on experiments in a hallway using the YAMABICO robot.

[2.3] Smart Border Surveillance System using Wireless Sensor Network and Computer Vision by Neha Bhadwal, Vishu Madaan, Anuj Kakran, Prayag Raj, Awadesh Shukla Lovely Professional University, Phagwara Punjab.

This paper describes a survey of wireless sensor networks for Border Surveillance and Intruder Detection. The aim is to devise a multi-sensing system which is developed by combining different techniques of surveillance and intruder detection, for varying border scenarios such as, flat surface movement or water-body movement. Different sensors for human intruder detection such as, geophone, hydrophone, infrared and surveillance cameras are discussed. Propose a model to study videos captured by surveillance cameras and extract features from it after converting video to shots. Basic features are extracted by employing an object tracking method based on ROI. At last, semantic content extraction results in recognizing the intruder without any false matching. Presents a framework which combines the human target detection, tracking and face-recognition based human identification for surveillance purposes. Background subtraction is employed for the detection of moving targets. Face recognition involves detecting the face of the target. If face detection fails, then target tracking continues without augmenting targets identity. Propose a system for intruder detection which employs an object detection technique using Wireless sensor networks. PIR (Passive infrared) sensors are used which are further connected to MICAz sensor node. The proposed system is expected to detect and track the intruder and report its speed and direction of movement to a central base station for further processing. Apply image processing techniques to implement a robotic smart home security system. The system is able to detect faces, signboards and provide notifications to the user if an intruder is detected. Raspberry pi is used to control the motion of the robot via Arduino and all the sensors are connected to it wirelessly. Propose a mechanism for smart border surveillance and automatic combat. It makes use of features extracted from optical flow information of the scene. Once the automatic detection of intruder takes place, suitable action is taken depending upon the relative position of the intruder with respect to the border fence. If the intruder happens to be behind the fence, mere tracking is followed. If the intruder is above the fence and trying to cross it, an alarm is raised. Auto-firing can be activated when the intruder has actually crossed the fence. Introduce hybrid wireless sensor network architecture for border patrol system, called Border Sense. It constitutes of three layers. The first layer consists of underground and ground sensors. The second layer has multimedia sensors which carry the visual information. The third layer consists of unmanned aerial vehicle which enhances the coverage and flexibility. Furthermore, deployment of the system components is discussed. Present a method for detecting and classifying a target by using seismic and PIR sensors. The target can be classified into one of the three classes of vehicle, animal or human. A wavelet method called symbolic dynamic filtering (SDF) is used for feature extraction from the sensor signals. Propose a new method to detect moving human body based on the technique of background subtraction. Initially, a background image is obtained. To extract the moving regions from the current frame, difference between the current frame and the background image is obtained. At last, the shape features of the extracted regions are used to determine if the moving region is a human or not. Present a method to detect moving target via using the technique of background subtraction and shadow removal. The method is applied for RGB color space. Metrically trimmed mean and mean absolute deviation are the estimators used for background subtraction.

3. SYSTEM DEVELOPMENT

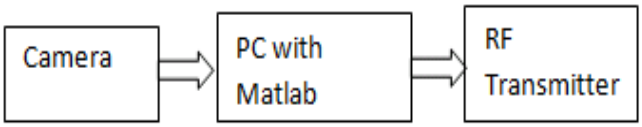
A Hardware Components

- ATMEGA16 Microcontroller
- RF Receiver
- RF Transmitter
- IP Webcam
- Black Actuator
- Power supply
- Relay
- PL2303

B Software Used

- MATLAB
- Dip-trace
- AVR Studio
- progISP

Transmitter Section



Receiver Section

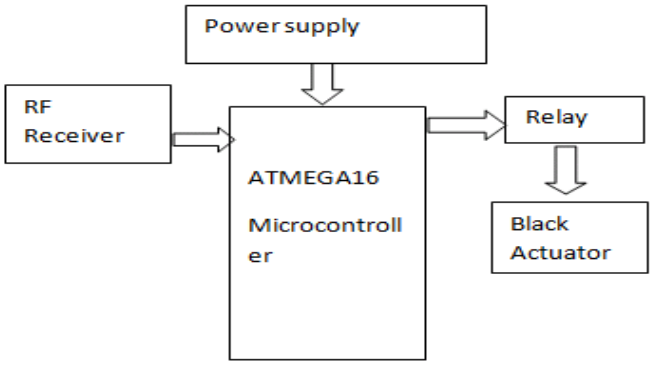


Fig 3.1 Block Diagram

ATMEGA16 Controller

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals.

PL2303

The PL-2303 operates as a bridge between one USB port and one standard RS232 Serial port. The two large on-chip buffers accommodate data flow from two different buses. The USB bulk-type data is adopted for maximum data transfer. Automatic handshake is supported at the Serial port. With these, a much higher baud rate can be achieved compared to the legacy UART controller. This device is also compliant with USB power management and remote wakeup scheme. Only minimum power is consumed from the host during Suspend. By integrating all the function in a SSOP-28 package, this chip is suitable for cable embedding. Users just simply hook the cable into PC or hub's USB port, and then they can connect to any RS-232 devices.

RF Tran receiver

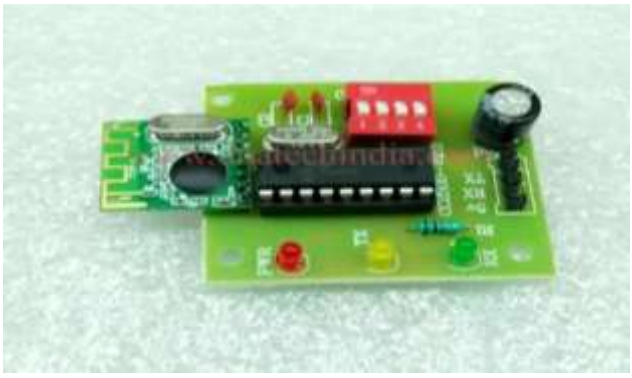
An RF module (radio frequency module) is a (usually) small electronic device used to transmit and receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver. They are of various types and ranges. Some can transmit up to 500 feet. RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry.

Transmitter modules

An RF transmitter module is a small PCB sub-assembly capable of transmitting a radio wave and modulating that wave to carry data. Transmitter modules are usually implemented alongside a microcontroller which will provide data to the module which can be transmitted. RF transmitters are usually subject to regulatory requirements which dictate the maximum allowable transmitter power output, harmonics, and band edge requirements.

Receiver Module

An RF receiver module receives the modulated RF signal, and demodulates it. There are two types of RF receiver modules i.e. super heterodyne receivers and super-regenerative receivers. Super regenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Super-regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage. Super heterodyne receivers have a performance advantage over super-regenerative; they offer increased accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in the past tended to mean a comparatively more expensive product.



4. PROPOSED METHODOLOGY

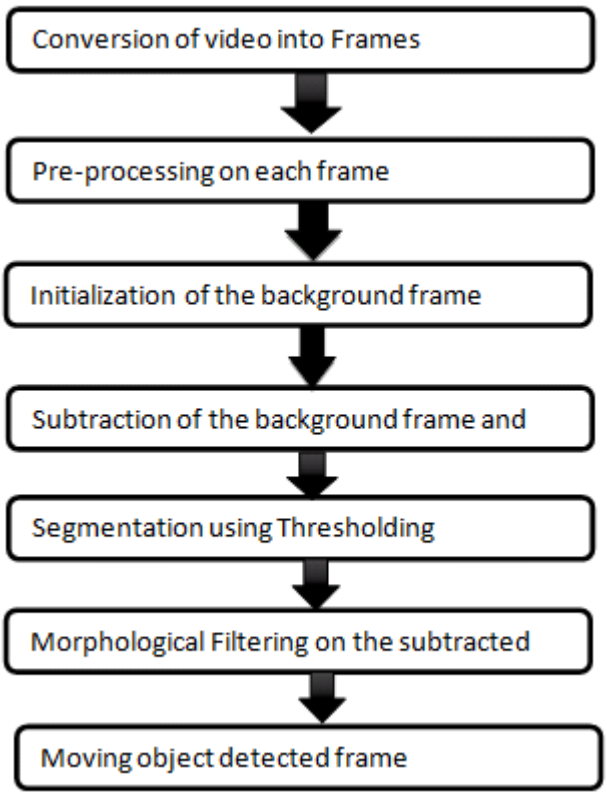


Fig4.1 System Flowchart

CONCLUSIONS

The theme of the work is to design the automated security system for surveillance operations. The system is designed by using image processing algorithms in order to select, track and hit the target. In this work, the image processing algorithms are designed and implemented in computer based system whereas for future development, we can use digital signal processors (DSP) in order to make the system working in standalone mode. Another advantage of using DSP processors is to reduce the processing time as DSP processors are efficient and faster in performance. The performance of the system can also be improved by using high resolution cameras with night vision provision. The work can also be expanded for traffic control or military purposes.

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