VIDEO CAMERA BASED GESTURE PROCESSING FOR A SPYBOT COMMANDED ROBOTS

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ABSTRACT

In the modern days, robots have become an integral part of human life. Now a days humans and robots need to coincide, it is important to evolve more natural and easy communication mechanisms for human-machine interaction. The communication mechanism needs to be easier for humans than machines. Hence a mechanism has been developed by using natural gestures of the humans. In this paper, a archetype silent spybot is developed that operates by processing the gesture commands signal. This prototype uses video processing with object tracking algorithm to understand the gesture commands. The spybot is programmed to understand the gesture command signal and make route according to hand gestures, sensed by a video camera operating within a short range. The gesture commands can be used for controlling the spybot functions such as movement of the robot or other operations of the robot silently that can be implemented by ArduinoUno microcontroller board. Performance calculation is carried out through various locations with positive results. By means of application, a spy robot that captures images from target places silently and sends the captured data to a host computer.

Key words: *Arduino Uno microcontroller board,Gesture controlled robot, Gesture signal processing, Radio Frequency.*

I INTRODUCTION

In today's world communication is the essence of human life. Communication is the process of transferring data from one thing to another. More than a decade, research efforts are made to extend the role of communication over human-machine interaction. The steps involved in this is generating a message signal, encoding it, transmitting the encoded signal receiving the, processing it and then recreating the original information. To attain this, human message signals that could be voice or gestures are employed. This method needs to be common, easy to learn and easy to analyse for humans. For that one method has been developed by using natural human signs.

More than a year, humans have been using gestures to communicate. Gestures are used by persons to show their thoughts like emotions, needs and so on. Gesture is mostly used in communication mode. Interaction of human machine can be achieved by converting the gesture command into a signal. Even though signal is in formal representation, the human gestures are transformed into gesture signals. In order to pull out the useful information embedded in the signal, it needs to be analysed.This is the technique that the gesture signals are communicated among humans and machines.

In order to capture the gesture signals video camera is used. This idea is served by using sensors and also it helps to capture the gestures. The robots can be controlled by hand gestures. Human gesture signal processing contains wide applications. These applications includes controlling the electronic devices and controlling the robots prototype is developed in which the gestures were captured using the accelerometer sensor in the user's mobile. The sensed gesture controls the prototype which was developed.

II FLOW CHART

In this paper, a prototype silent spy robot is developed, whose operation is controlled with the help of gesture command signals and it is received by an onboard RF module. This robot also has an extra feature because of the video-camera usage.

Moreover it has a password protection feature to ensure the security and safety of operation of the robot, and obstacle avoidance feature. The performance evaluation of the robot is carried out via different experiments. In this paper the skin detection algorithm is used to identify the hand gesture and counting algorithm is used in gesture recognition process. In order to communicate information to a digital machine, human gestures need to be converted into a signal representation. The process includes capturing the analog data through sensors and sending the data captured to the actuators. The analog gesture signal needs to be converted further into a digital signal.

III GESTURE SIGNALS

In order to make communication to a digital machine, human gestures need to be converted into a signal representation. This process involves in capturing the analog data via sensors and then sending the data captured to the actuators. Again, the analog gesture signal needs to be converted into a digital signal.

These gesture signals are in digital form. These signals are then used for control appliances such as automated homes or replace the interfaces like keyboards for interacting with computers etc.
A gesture is an analog action that can also be perceived by vision or physical observation.

The sensors that can be used for perceiving these signals are accelerometer, thegyroscope, cameras, and infrared or ultrasonic proximity sensors etc. In this paper, camera sensor is used to capture the gesture signals.

In this spy robot, hand gestures are used for control signals .The spybot operations are performed by variety of gesture commands. In this paper five different commands were used such as moving the spybot forward, backward, left, right and stop.

IV METHODOLOGY

Normally, the gestures are captured by camera. The input video, is a sequence of frames, that has been divided into data block and the frames are analysed to understand the meaningful information conveyed by each gesture. If the hand moves from the center to the top of the screen, then the signal is considered as a forward command signal.

Likewise if any movement is occur in any of the four directions, suddenly the signals. They are used to control the prototype spybot. Thus, the gesture module extracts information from the input given by the user. This information gives the signals to the robot has to move forward, or left, and also to find the angle.

The input signal is taken from the webcam. This video input is divided into a mass of frames. After that it is analysed to obtain information about the gestures. For the purpose of increasing the accuracy of recognition, and focusing on a color component of image.

In this paper, Red color is used to increase the focus of gesture command. The next thing is to highlight this Red component of the image. Normally images hold the noise that can be filtered by using a median filter.

The Spatial Filters are considered as an optical device .it is based on the principles of Fourier optics .It alters the structure of a coherent light. Once the image is filtered, it is then converted into a binary image.

Usually Red color is used for tracking the gesture .Next; the highlighted areas are located by computing the centroids. Based on these centroids position, the gesture information is analysed. Therefore this process conveyed the information by the gesture.

V COMMAND PROCESSING UNIT

In command processing unit the movement level is controlled by a different set of gesture commands that is in the form of a degree. This unit operates on an Arduino UNO controller based Platform. The Mat lab code the command signals has been sent and it is received by the onboard RF module, which is connected to the Arduino board.

The Arduino microcontroller is preprogrammed to respond to these gestures command signals, as well as to activate the respective servo motor actuators.

Also, the safety of the robot operation can be ensured by adding features like Obstacle Avoidance. It is programmed that RF send signals to the Arduino microcontroller board to activate the buzzer whenever the robot senses an obstacle.

VI THE SILENT SPY ROBOT

In this paper, prototype silent operated spy robots refer is design. It will fulfill the needs of military, police or personal security. It may use in different environments .For instance, it can be used as an intruder alarm, and also it can be used for handling mines. The spy robot needs to operate in a stealth mode then only it operates in enemy's environment also. By using any silent signals the gesture signals are controlled remotely and must be able to send back the captured information immediately to the host computer. This prototype spy robot is developed using the gesture commands signal processing.

A mobile phone's camera facility is used along with a servo motor, once the robot is controllable by the gesture command signals by placing the mobile camera at the front side of the robot. Whereas the servo motor gives a periodic signals with the microcontroller and the data is accessed from the camera by connecting to a host computer within the same network. Thus, the spy robot can give real-time data about the places to which, it can travel RF signals makes the operation of robot more secure and compatible as compared to DTMF signals. Also, use of gesture controls to even illiterate people, and also to the physically challenged ones.
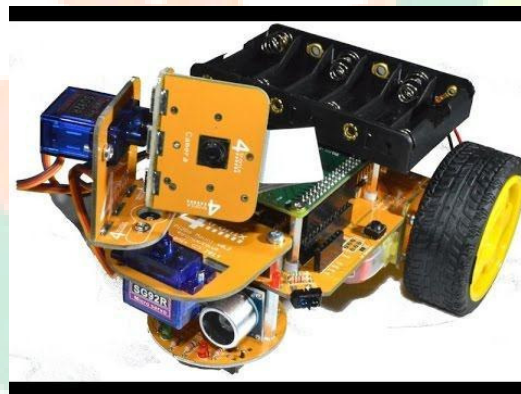
VII RESULTS

Fig 4. Output of spybot commanded robots

Fig 5. Simulation of Real Time Hand Gesture recognition for Physically Impaired

VIII CONCLUSION

A spybot is constructed through image processing using human gestures command signal processing . The gesture commands are processed by two sets of controls; they are the direction of the movement and the

degree or quantum of the movement. An Arduino microcontroller is used as a platform and that is used with RF for the communication of gesture commands signal. This robot can have numerous potential applications. The prototype robot developed is unique in sense. Because it can be generally controlled, by running the MATLAB code and connecting a robot's into RF module. Thus, these robots used in different purposes.

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