Asian Journal of Applied Science and Technology (AJAST)
(Open Access Quarterly International Journal) Volume 2, Issue 2, Pages 488-494, April-June 2018

Hand Gesture Controlled Surveillance Robot using IOT

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Article Received: 29 January 2018 *Article Accepted: 26 February 2018* *Article Published: 18 April 2018*

ABSTRACT

In this work, a hardware and software based integrated system is developed for hand gesture based surveillance robot. The proposed system is a non-invasive technique and software part of the system uses gesture based image processing technique. The hardware part is developed based on AVR microcontroller platform. The captured image of hand is segmented and its contour is determined. The convexity defects are computed to detect the number of fingers used by the subject. The number of fingers directs the path to robot that is to be followed. The camera placed on the robot capture the images of its surrounding, wherever it travels and send it back to the PC for monitoring. In this way, it can be used as a surveillance system. Experimental results show that the overall accuracy obtained above 90% for gesture recognition by which robot will be directed to follow the path. The system can be directly applied to defence grounds for detection of enemy, for spying purpose where the human reach is avoided or not recommended. This unit can be used for overcoming physical handicaps by helping in development of gesture-based wheel chairs, for control of home devices and appliances for persons with physical handicaps and or elderly users with impaired mobility.

Keywords: Convexity, Surveillance, real time, computing, gesture, IOT Communications.

1. INTRODUCTION

An embedded system is a computer system designed for specific control functions within a larger system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer, is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today. A processor is an important unit in the embedded system hardware. It is the heart of the embedded system. Real time Image/Video processing becomes a challenging task because it is highly environment dependent. The illumination of light highly affects the processing. Lack of proper lighting condition, focusing on mobile subjects, interferences in signals causes presence of various type of noise in the image which makes processing not only difficult but also slower. Presence of complex background makes segmentation, a tiresome task for computation. A Computer having high processing speed is preferable for this purpose. However, now-a- days many stand-alone development boards like Beagle Board,ARM9, ARM11 are available which is compatible for porting Image processing projects on it and make portable Image Processing projects. These boards are much cheaper than our personal computer but a lot of hands-on exercises are need to be performed to have a deep knowledge about its architecture and functioning before switching to build Image Processing applications on it. In our project, we have considered our Personal Computer as our processing device and we have developed all our applications which are compatible to Intel Core2duo processor.

2. LITERATURE SURVEY

There has been many research works a pattern recognizing algorithm has been used to study the features of hand[5]. There are many papers where training of hands using a large database of near about 5000-10000 positive and negative images are considered [4].But this procedure is very tiring and time taking. But the proposed algorithm of our project is a fast method of gesture recognition which neither needs neither any extra circuitry nor it

requires any color gloves in the field of Hand Gesture based Human Computer Interaction following different algorithms to develop a fast and reliable procedure for gesture recognition. A three axis accelerometer has been used to read different types of hand gestures [7]. But carrying extra circuitry on the hand involves attaching a number of accelerometers with the hand, this causes irritation to the user, there may be loose connection in the system which may result in abnormal outcomes. [8] A combination of accelerometer and gyroscope and the readings are taken into for analyzing the gesture. Here accelerometer is dedicated for collecting translational dynamic and static change in positional vector of hand and infer it to the movement of mouse whereas gyroscope has been used for rotation of virtual object. There are many papers where gestures are being analyzed using color gloves. A data glove is a type of glove that contains fiber optics sensor embedded in it to recognize the fingers movement. Hand gesture recognition using image processing algorithms many time involve use of color gloves . By tracking this color glove different hand gestures can be interpreted as described by Luigi Lamberti1 and Francesco Camastra in their paper. Here they have modeled a color classifier performed by Learning Vector Quantization.

3. EXISTING SYSTEM

Existing system, human hand movements are sensed by the robot through sensors and it follow the same. As the person moves their hand, the accelerometer also moves accordingly sensor displaces and this sensor senses the parameter according to the position of hand. Previous system, a gesture driven robotic vehicle is developed, by using RF technology. In recent years of research, efforts are being done seeking to provide more natural and human-centered means of interaction with computers. A particular direction of importance is that of a perceptive user interface, where the computer is endowed with cognitive capabilities that allow it to acquire information about the user as well as the environment. Vision has got the ability to carry a vast amount of information in a non-invasive method and at a lower price; therefore it constitutes a very interesting sensing model for developing perceptive user-interfaces. There are proposed approaches for vision-driven interactive user-interfaces referring to technologies such as head tracking, face expression recognition, eye and iris tracking and gesture recognition.

4. PROPOSED SYSTEM

To proposed a fast and simple algorithm for hand gesture recognition for controlling robot using IOT. It provides four different gestures for controlling the robots, i.e., forward, backward, left, right. These movements are given by the user using Flex Sensor. In this, we start with a multiple applications robot which includes human detection. The system will be sealed at some useful place, from which entire and clear view of the area under surveillance can be seized with camera. It helps us to provide a safety and it avoid humans from any dangers to their life. The surroundings with sharp camera-eye. Send video and data captured to the server wirelessly. Easy control by a remote through wireless network. Mobile in all directions with miniature size. Power supply is used to convert AC to DC supply. It is given to all components. Hand gesture is used to give the direction by using flex sensor. A flex sensor or bend sensor, that measures the amount of deflection or bending. In this project we used Atmega 328

controller. Nearly it consists of 28 pins. The inputs can be controlled by transmitting and receiving the inputs to the external device. It also consists of pulse width modulation (PWM).

The sensor signal is given to controller. Controller control the robot using IOT. Receiving side the controller send the signal to driver. Driver we use ULN2003. It is used to drive the motor with the help of relay. Relays are switching devices. It is used to drive the left motor and right motor which depends on the driver signal. LCD is used to display the short messages in our project.

The project is designed to develop android application based a robotic vehicle for remote operation. This is a kind of robot can be helpful for mobility aid for elderly and disabled people. And images transmission and reception. Advantages of Bluetooth has low costs and low power and nature can be pointed to parts of Bluetooth has been added into various types of mobile devices such as mobile phones, PDAs and other wireless set.

5. BLOCK DIAGRAM

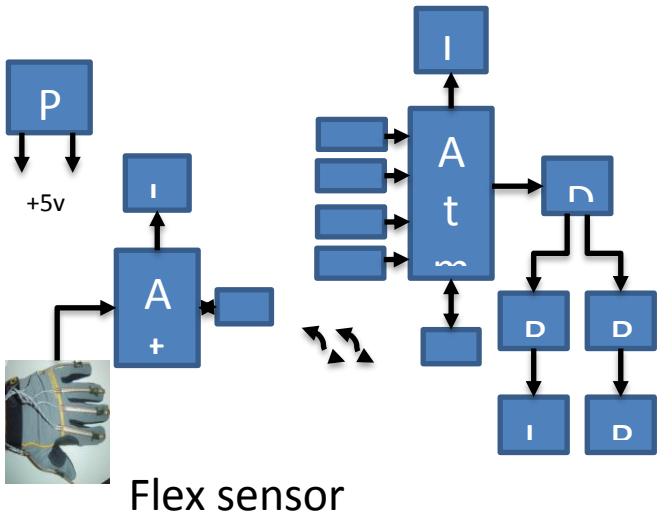

Fig 1. Block Diagram

Power supply is used to convert AC to DC supply. It is given to all components. Hand gesture is used to give the direction by using flex sensor. A flex sensor or bend sensor, that measures the amount of deflection or bending. In this project we used Atmega 328 controller. Nearly it consists of 28 pins. The inputs can be controlled by transmitting and receiving the inputs to the external device. It also consists of pulse width modulation (PWM).

The sensor signal is given to controller. Controller control the robot using IOT. In robot unit IR sensor used. It is used to detect any obstacle in front of the robot. Receiving side the controller send the signal to driver. Driver we use ULN2003. It is used to drive the motor with the help of relay. Relays are switching devices. It is used to drive the left motor and right motor which depends on the driver signal. LCD is used to display the short messages in our project.

6. CIRCUIT DIAGRAM

It consists of two sections, control unit and robot. In control unit consists of power supply, controller, flex sensor, LCD and IOT. Power supply gives supply to all components. It is used to convert AC voltage into DC voltage. Transformer used to convert 230V into 12V AC.12V AC is given to diode. Diode range is 1N4007, which is used to convert AC voltage into DC voltage. AC capacitor used to charge AC components and discharge on ground. LM 7805 regulator is used to maintain voltage as constant. Then signal will be given to next capacitor, which is used to filter unwanted AC component. Load will be LED and resister. LED voltage is 1.75V.if voltage is above level beyond the limit, and then it will be dropped on resister. Flex sensor is connected to controller port A0 & A1. Controller we use Atmega 328. It has 28 ports.

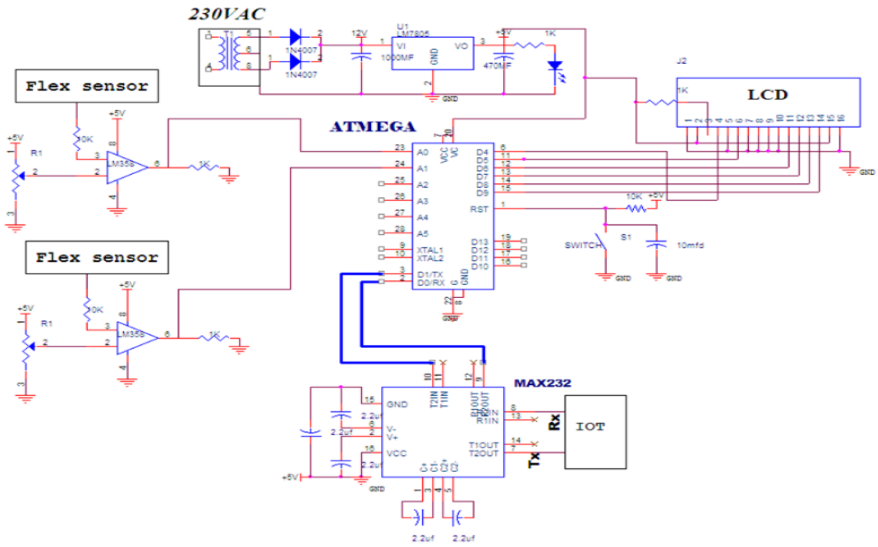

Fig 2.Transmitter Circuit

Controller receive the sensor signal and to control robot via IOT. IOT modem is connected to controller port 2 & 3 through the MAX232. It is used for serial communication between controller and modem. In another section is robot. In this unit consists of IR sensor, controller, communication device, driver unit, motor and LCD. Controller receive the information via IOT .In this section we used IR sensors. It is used to detect any obstacle in front of the robot. It is connected to controller port A0, A1, A2 & A3. Controller receive the signal and to control robot by using driver unit. Driver we used ULN2003. It is used to drive the motor with the help of relay. It is connected to controller port 16, 17, 18 & 19. Relay is act as a switch. It is connected to driver output ports 14, 15 & 16. Motor is connected to relay. LCD is also interfaced to controller. It is used to display the short messages.

7. RESULTS AND DISCUSSIONS

The ROBO moves in all four directions: Right, Left, Front, Back .Real image path monitoring through 4G network. We control robot by using hand gesture in any places. Also the movement of the robot is manually controlled through PC.

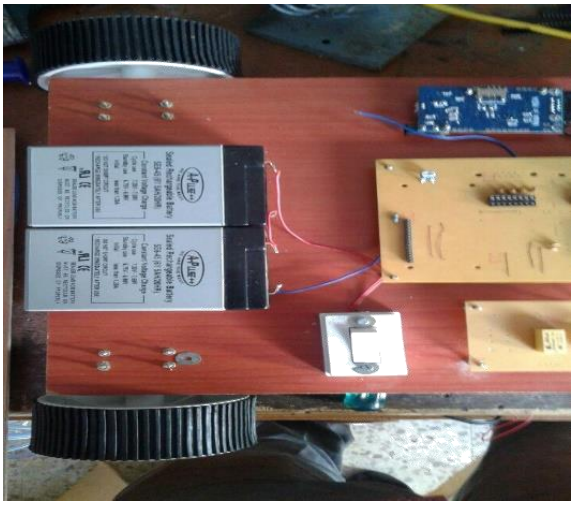

Fig.4. Design of Robot

8. CONCLUSION

This project proposed work here is an authoring method capable of creating and operation controlling motions of surveillance and industrial robots based on hand-robot interaction. The proposed methodology adopted is user-friendly and eliminates intrusion and facilitates motion control of robots using finger signals, which is supplement only to language in the sense of means of communication. The proposed robot motion controlling method is expected to provide effective and implementable solutions for not only just industrial robots, but also for higher intelligence embedding robots like humanoids.

In this research work, we have presented a real-time algorithm to track and recognize hand gestures for human-computer interaction with the surveillance robot in context. It has been proposed an algorithm based on hand segmentation, then its tracking and posture recognition from extracted features of hand by making use of the concept of convexity hull. The system's performance evaluation results have concluded that this low-cost interface can be used by the researchers or industrial workers to substitute traditional machinery. The experiments have confirmed that with environmental factors in control it results in higher efficiency and, thus, better product development and application oriented concept.

ACKNOWLEDGEMENT

This work was supported in part by Department of Science & Technology (DST), FIST Program at Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India.

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