MATLAB based Gesture Controlled Robot

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Abstract—*A robot is an artificial intelligent agent that performs various tasks based upon the guidance provided to it in practice, robot is usually an electromechanical machine which is guided by computer and programming. Today human-machine interaction has taken a step ahead from not only small interfaces like mouse, joystick but also with the gigantic machines. Hand gesture controlled robot has received great attention in the recent years because of its exploitable applications. This technical review paper deals with the controlling of a robot/machine not with the old fashioned keys but with the natural interaction. The review paper utilises "Sixth-Sense" technology or the 6G technology i.e. using expression to convey the message. This technique involves controlling of robot using MATLAB programming.*

Keywords*: Gesture, MATLAB, Bluetooth, ATMEGA16 and L293D, six sense technology, robots, artificial intelligent.*

1. INTRODUCTION

The primary aim of building hand gesture recognition system is to create a natural interaction between human and PC, where the recognized gesture can be used to control the robot through MATLAB and Embedded programming.

The project consists of two types of interfaces:

- Human-PC interface
- PC-Robot interface

1.1) Human-PC interface

It is also referred as man-machine interaction, is a non-invasive technique for controlling the advancement of technology. In this a webcam of the PC collect the data in the form of images and compute that data to get information. A person makes different gestures using his hand which is captured by the webcam and PC processes these images using MATLAB. The processed images provide us the information about what the person wants to command through his gestures.

1.2) PC-Robot interface

PC is connected wirelessly to the robot, the output generated by the PC is transmitted wirelessly through Bluetooth module. Every hand gesture signifies a predefined command and the gesture received by the PC are analysed through the software and the command corresponding to it is generated. In this case computer provides different directions to the robot for its traversal. These commands are transferred firstly to the micro-controller through serial communication. Then further the command is transferred to the robot wirelessly, the Bluetooth module helps in wireless transmission which is connected on both sides; PC as well as Micro-controller side.
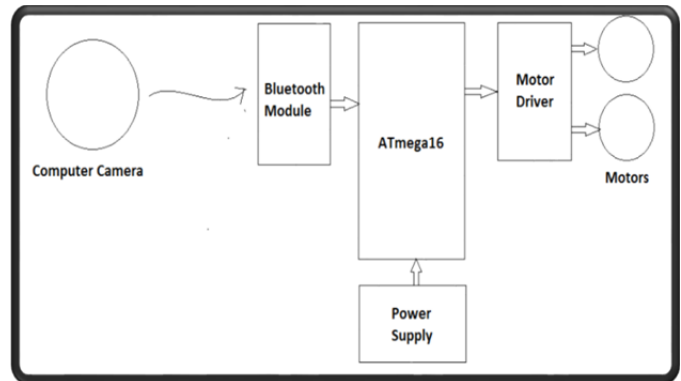
Block diagram of the system: (Fig 1)

2. PROPOSED WORK

In this technical review paper we have proposed automatic gesture control using MATLAB (Image processing). Once a gesture is recognised by the PC command signals is generated and send to the micro-controller. Already a programme for signal detection is burned on the micro-controller. Once that command signal is recognised by Robot it works accordingly to the predefined function unless a new signal is received again.

3. METHODOLOGY

The system involves acquisition of live streaming from the web cam for gesture recognition. The frames are taken at regular time interval. Here frame capturing rate for gesture is 2 frames per second.

The proposed method is further divided into following sub-parts:

3.1)Capturing movement from live stream.

3.2)Conversion of captured image into suitable format (through MATLAB)

3.3)Comparison of captured image with the live streaming.
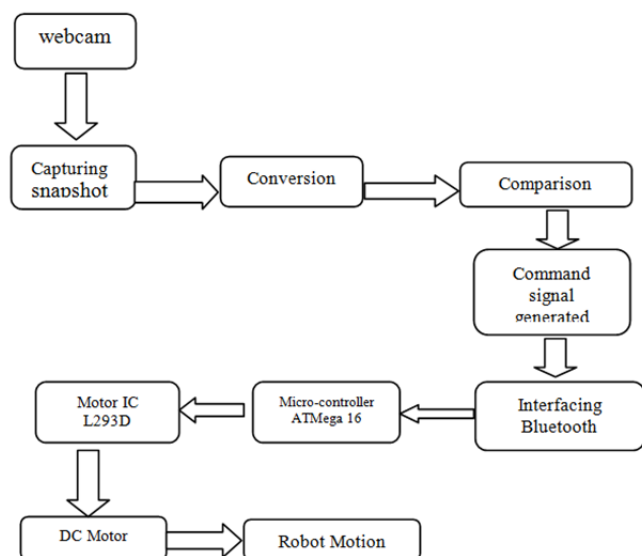
3.4)Generation of command signal through Robot.

Fig. 2: Proposed Model : (Fig 2)

4. SYSTEMS COMPONENTS

The components used in the project are as follows:

4.1- ATMEGA 16- The AT refers to ATMEL which is the manufacturer company while MEGA represents micro-controller category which is Mega AVR, 16 signifies the memory of the controller. ATMEGA 16 is calibrated with an internal oscillator whose frequency ranges from 1 MHz to 8 MHz On the other hand ATMEGA 16 can be operated using an external crystal oscillator whose maximum frequency is of 16 MHz It has advanced RISC architecture. It is 40 pin IC with 4 ports A, B, C, D respectively. It has 8 channels ADC (Analog to Digital Converter). Basically there are 32 programmable input/output pins.

4.2- L293D IC- It is a motor driver IC which is connected to the microcontroller and the two DC motors in order to make the robot locomotive. Basically, motor driver is nothing but a current amplifier which receives low current (of 5mA) from the microcontroller and generates high current output (of 250mA) which in return can control and drive the motor. To turn ON and OFF a motor and to run it in the particular direction one switch is sufficient, but if we want to change the direction of the robot then we need to change the polarity and this can be done by using H-bridge circuit, since this motor driver is Dual H-Bridge. L293D is a 16 pin DIP with total 4 input/output programmable. This driver IC can run two small PMDC simultaneously in either direction, forward and reverse with the pins connected to the microcontroller.

4.3- Bluetooth Module: it is a wireless medium through which pc and robot are connected. A Bluetooth module is a small IC with 4 pins.

4.4- Motors: We have used two PMDC motors for the motion of robot.

5. SOFTWARE USED:

5.1 AVR studio- we have used studio5 which is an Integrated Development Environment (IDE) for developing and debugging embedded Atmel applications. It provides a seamless and user friendly environment to write, build, burn and debug the code. This supports all AVR micro-controllers.

5.2 AVR Dude-This is burner which is specially designed for Atmega family of controllers.

5.3 MATLAB- it refers to the matrix laboratory it is also a user friendly platform for writing a code. It contains various tools for different applications like image processing, image compression etc. we have used matlab2013.a

6. APPLICATIONS AND FUTURE WORK

There has been rapid development in the field of robotics, robots are used in variety of sectors:

6.1 Defence- used as surveillance robots so that they can help the force with the location or to spy on their enemies. Since they are small, easy to carry and can reach inconvenient places.

6.2 Wheel chairs- gesture based wheel chairs can be used for the differently- abled persons so that they do not require dependency of others.

6.3 Domestic- various home appliances can be controlled through gestures without needing any switch socket for the operation. Also the gestures controlled systems are used for the entertaining purposes like play stations, 3D games.

6.4 Medical environment- touchless interfaces are of great necessity in various medical fields, patient monitoring and also for surveillance.

6.5 Industries- various heavy machines like trollies, arms etc. can be controlled with the help of gestures. Basically, automated devices which can be controlled through gestures using programming can be installed. The approach has huge potential to carry out work in various other fields. With the help of better specifications of the microcontroller the work can be updated and also the performance of the system can be improved. Use of better wireless communication technique can improve the system work.

7. CONCLUSION

Various works has been done for controlling the robot.in this paper the controlling of robot through gestures has been done using MATLAB programming, which provides efficient methods for feature extraction and friendly user interface. This paper deals with the cost effective technology to control the robot (mere a PC and software). Gestures made in this process utilize only one hand and thus not require the need of both the hands which can be helpful for physically abled persons. It also eliminates the need of a person standing beside the robot and controlling it.

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