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Image Processing Based Robotic Arm with Accelerometer

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Abstract: **A robotic arm is a robotic manipulator, usually programmable, with similar functions to a human arm. Humans pick things up without thinking about the steps involved. In order for a robot or a robotic arm to pick up or move something, someone has to tell it to perform several actions in a particular order from moving the arm, to rotating the "wrist" to opening and closing the "hand" or "fingers". So, we can control each joint. This paper presents a three joint automatic robotic arm which can be used in industries to do repetitive task such as moving the things from conveyor to another place, a sensor will be used to detect the obstacles if present while carrying out the task. If there is any obstacle while moving the object, the arm will wait for a predefined time for the clearance of the object. If the obstacle is cleared, the arm will continue its work. If the obstacle is still present, a buzzer will be turned on so that personnel from the industry can attend the problem and clear the obstacle.**

Here when the wrist will be moved in upward direction then the robot will make progress in forward direction and if the human arm is moved in the downward direction then the robot will take action in backward direction. This wrist moment will be sensed by the accelerometer and the respective movements will be implemented.

Keywords: **image processing, wireless, robotic arm, accelerometer.**

1. INTRODUCTION

Interpretation of human gestures by a computer is used for human-machine interaction in the area of computer vision. The main purpose of gesture recognition research is to identify a particular human gesture and convey information to the user pertaining to individual gesture. From the corpus of gestures, specific gesture of interest can be identified, and on the basis of that, specific command for execution of action can be given to robotic system. Overall aim is to make the computer understand human body language, thereby bridging the gap between machine and human. Hand gesture recognition can be used to enhance human–computer interaction without depending on traditional input devices such as keyboard and mouse.

Hand gestures are extensively used for telerobotic control applications. Robotic systems can be controlled naturally and intuitively with such telerobotic communication. A prominent benefit of such a system is that it presents a natural way to send geometrical information to the robot such as: left, right, etc. Robotic hand can be controlled remotely by hand gestures. Research is being carried out in this area for a long time. Several approaches have been developed for sensing hand movements and controlling robotic hand. Glove based technique is a well-known means of recognizing hand gestures. It utilizes sensor attached mechanical glove devices that directly measure hand and/or arm joint angles and spatial position.

Although glove-based gestural interfaces give more precision, it limits freedom as it requires users to wear cumbersome patch of devices. Jae-Ho Shin et al used entropy analysis to extract hand region in complex background for hand gesture recognition system. Robot controlling is done by fusion of hand positioning and arm gestures using data gloves. Although it gives more precision, it limits freedom due to necessity of wearing gloves. For capturing hand gestures correctly, proper light and camera angles are required. The problem of visual hand recognition and tracking is quite challenging.

Many early approaches used position markers or coloured bands to make the problem of hand recognition easier, but due to their inconvenience, they cannot be considered as a natural interface for the robot control. A 3D MATLAB Kinematic model of a PUMA robot is used for executing actions by hand gesture. It can be extended to any robotic system with a number of specific commands suitable to that system.

In this paper, we have proposed a fast as well as automatic hand gesture detection and recognition system. Once a hand gesture is recognised, an appropriate command is sent to a robot. Once robot receives a command, it does a pre-defined work and keeps doing until a new command arrives.

2. PROCESS

1. TRANSMITTER SIDE:

- Here we have used two cameras.
- One camera is placed on the laptop which will sense the hand moment.
- Another camera will be on the ROBO ARM which will sense the path.
- Accelerometer will sense the wrist moment which will give moment to the ROBO ARM.
- From the first camera the image will be compared in the MATLAB which will be already predefined in the software and accordingly it send the command to the microcontroller.

2. RECEIVER SIDE:

- The command which will be send by MATLAB will be received with the help of wireless modem.
- Accordingly to the command fetched by the controller the motor driver will run the motor.
- As the moment is controlled by the accelerometer the receiver side will accept the command and there will be moment in the ROBO ARM.

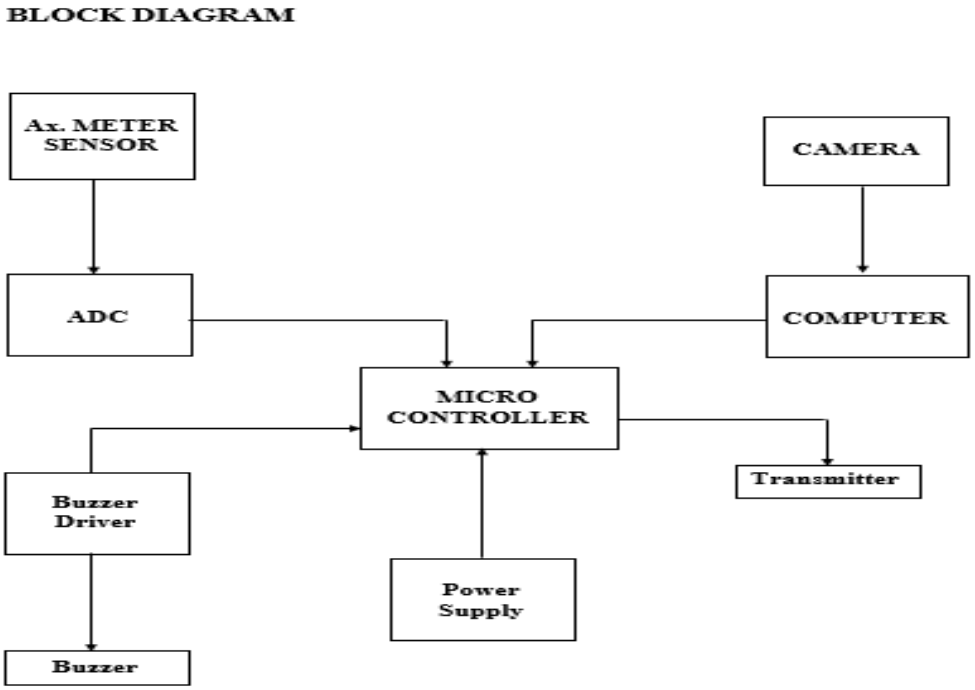

Fig. Block Diagram For Transmitter Side

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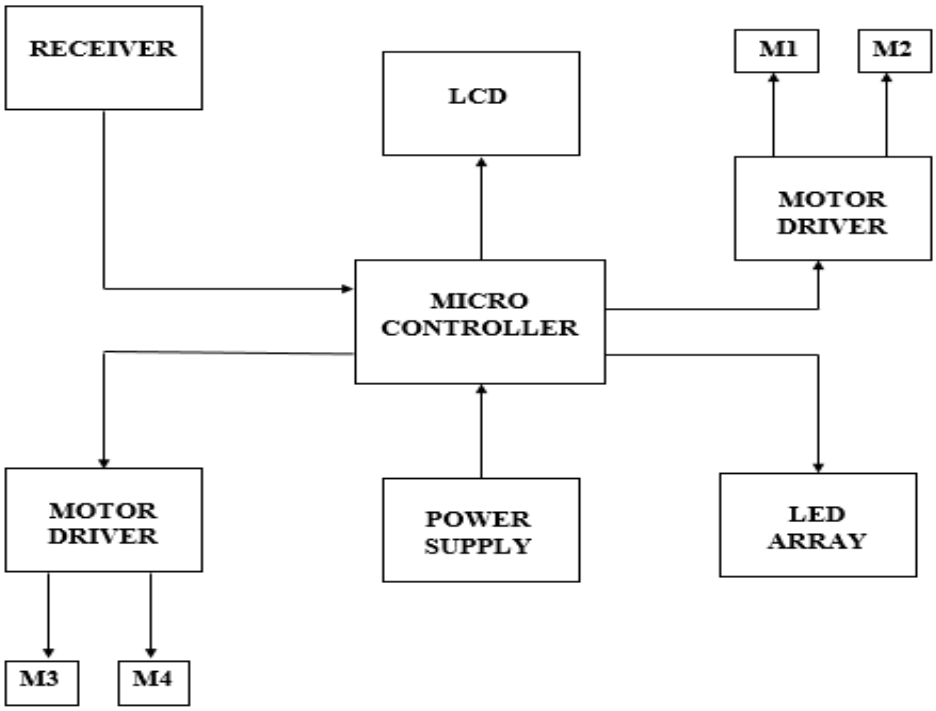

Fig. Block Diagram For Reciever Side

3. CONCLUSION

From the project of wireless ROBO ARM we can conclude that ROBO ARM can do same work as the human arm with the help of image processing technology. From the help of wireless modem the portability of the project will be increased easily & can be moved from one place to other.

With the help of accelerometer ROBO ARM moves in forward and backward directions. All basic and main programing is done in MATLAB and BASCOM software.

In a future our project can be useful in medical surgery purpose by adding and improving programming of it.

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