

## 7 Degree of Freedom Robotic Arm

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**Abstract**— This paper demonstrates our project of 7 degree of freedom robotic arm. In this we try to imitate motion of human hand. A robotic arm is prepared with help of servo motors and the angle is controlled using pulse width modulation. Pulse width modulation is generated using a microcontroller. A robotic arm will move in same ways as that of the operator arm. An exoskeleton will be worn by the operator which will contain the necessary sensors to record the movement of the user and will transfer the different angles through a zee bee module to the receiver of the robotic arm which will interprets the signals and move accordingly. Having used a microcontroller which is easy to program and simple to use results in very low maintenance robotic arm.

**Key words:** At mega 16, zee bee, potentiometer, flex sensor, servo motor. Pwm. end effector

### I. INTRODUCTION

Robotic arm is used in manufacturing sector such as a car manufacturing company in initial years of development of robotic arm it was very costly to implement it. Nowadays the cost has decreased significantly, due to result of lot of researches in this field. New ways to build and to program are being developed and implemented due to advances in technology, design and implementation of robotic arm are used in two main field service robotics and industrial robotics today they have found their use in many fields such as in military to defuse a bomb in hospitals to perform operations in education sector to interest students in learning in hazardous environments such as a nuclear plant chemical plant to handle dangerous chemicals and many more fields A robotic arm is a mechanical arrangement of components, which can be programmed, to produce motion like a human hand. It can be a standard robotic arm or may be part of a more complex robot. The links of such a manipulator are connected by joints which will allow rotational motion (articulated robot) or translational (linear) motions. Kinematic chain is being formed with the help of joints. The finishing point of the kinematic chain of the manipulator is called the end effectors and it is very similar to the human hand. In mechanics, the degree of freedom (DOF) of a mechanical system, is the number of independent parameters that define its design. It is the number of parameters that determines the state of a physical system which is important to the analysis of systems of bodies in mechanical engineering, aeronautical engineering, robotics, and structural engineering. The position and orientation of a rigid body in space is defined by the three components of translation and rotation, which means that it has six degrees of freedom.

There are different types of sensor available, mainly they are of the type electric or electronic. A sensor is a type of transducer. Sensors could be direct indicating - a mercury thermometer or electrical meter or are paired with an indicator (perhaps indirectly through an A to D converter,

a computer and a display) so that the value sensed becomes human readable. Mostly, sensors are heavily used in automation and robotics. We have searched for the availability of the sensors in the market. The sensors used in our project are flex sensors, potentiometer and servo motors. We have searched for the specifications of components which are compatible with our project requirements. The component availability in the market is the primary stage in literature survey. The datasheets of the components are also referred for the specifications of components.

In this project, we are using four variable pots and one flex sensor which controls the seven degrees of parameters of our hand which will act or perform same actions which will be imitated by the mechanical arm. One of the applications of this project is the room having temperature not suitable for human body where human will not be able to enter that room, in such circumstances this mechanical arm can be used.

### II. BLOCK DIAGRAM

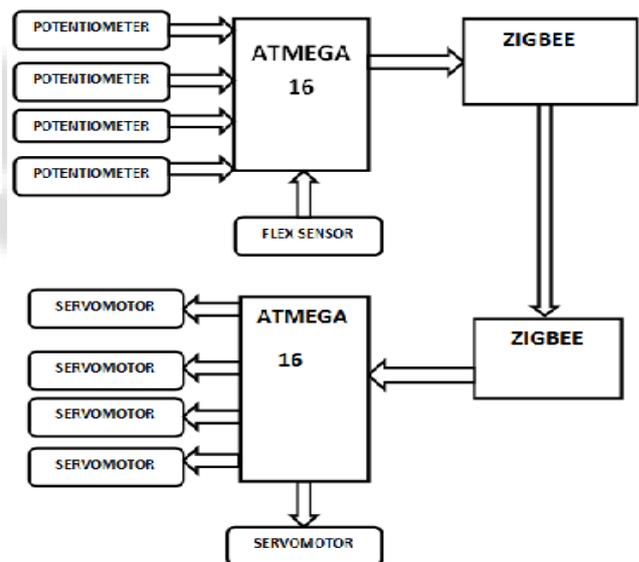


Fig. 1: Block Diagram

This is the block diagram of proposed system it consist of two atmega16 microcontrollers one is used at transmitter side which is the exoskeleton placed on users arm and another one is used at the receiver end which is connected to robotic arm the microcontroller placed on the user hand will read the value from the potentiometer and transmitted it through zee bee model connected to it this value is received at the receiver and accordingly provide the control signal to the servomotors and the arm will move according to the motion of users hand.

### III. CIRCUIT DIAGRAM

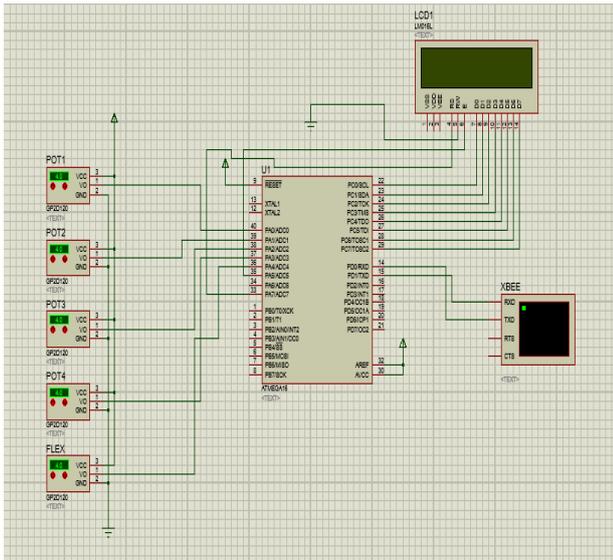


Fig. 2: Circuit Diagram

The atmega 16 microcontroller consist of a 8 channel 10 bit analog to digital converter which convert analog values recived at the adc pin of the microcontroller into a digital value between 0 to 1023. This adc value is then mapped to give a angle to rotate the servo motor the mapping take place such that at digital value value of 0 it gives 0 degree angle and at 1023 it gives an 180 degree angle this angle value is then converted into packets of data and transmit it to the USATR (universal synchronious asynchronous transmitter and reciver ) which is connected to the zeeb bee transmitter which is used for wireless communication.

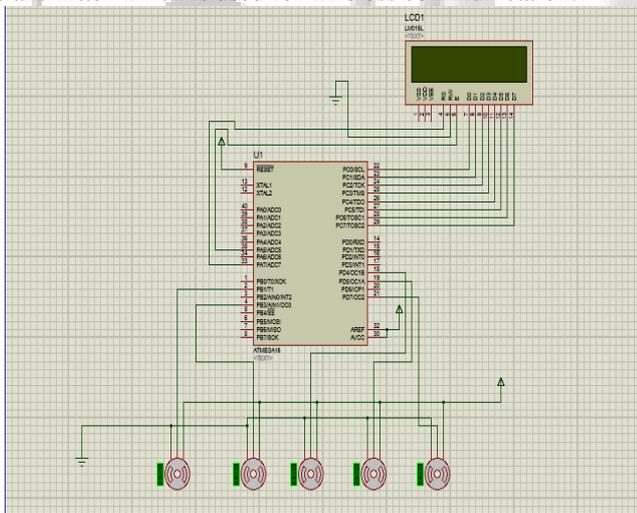


Fig. 3:

The above circuit diagram consists of zigbee reciver section and the robotic arm. This circuit consist of five servo motors are used to control the motion of the robotic arm this servo motors work on PWM(pulse width modulation) signal.The packets recived by the zeebee reciver connected to the microcontroller which contains the angle of motion of the servo motion, this angle produces the duty cycle for perticular servo motor used to relicate the joint on human arm the mapping od duty cycle take place such that for 0 degree angle it produces dutycycle of 10% for 90 degree angle it produces dutyclel of 50% and for 180 degree the deautycycle produced is of 90%

### IV. FLOW CHART

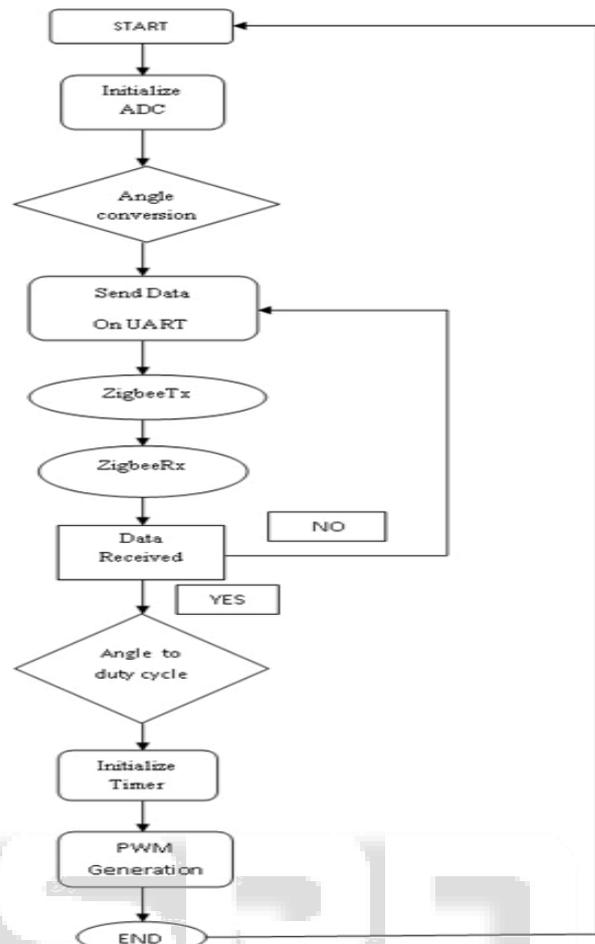


Fig. 4: Flow Chart

### V. CONCLUSION

The above mentioned project demonstrates the 7 DOF robotic arm using POTENTIOMETER AND FLEX SENSORS which is very helpful in automation industries in research and many other fields. Using in built function of atmega16 microcontroller such as ADC , PWM and serial communication programming is very simple. modification or improvement is very easy due use programmable microcontroller This type of arm can be also used in hazards environment such as in space hazards chemical factory also in environment which are not favorable for humans this paper shows how to built an affordable and precision robotic arm for use in military an medical application. Due to use of low cost components and material the manufacturing cost can kept low.

### REFERENCE

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