

# Gesture Based Object Handling with Arm Motion Control

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**Abstract-** The rapid growth in Gesture recognition techniques for friendly hardware designing, introduced an integrated approach to real time detection, tracking and direction recognition of hands, which is intended to be used as a human-robot interaction interface for the intelligent handling of robotic arms for pick and place objects. Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from face and hand gesture recognition. In today's world, in almost all sectors, most of the work is done by robots or robotic arm having different number of degree of freedoms (DOF's) as per the requirement. A robotic arm is a robot manipulator, which can perform similar functions to a human arm. In industries, a robotic arm perform various different tasks such as welding, trimming, picking and placing etc. Moreover the biggest advantage of these arms is that it can work in hazardous areas and also in the areas which cannot be accessed by human. The proposed idea is the design of a robotic arm which is able to pick and place the objects, raising and lowering the objects. The motions performed by robotic arm are forward, backward, right and left. Accelerometer sensor captures gestures of human-arm and produces three analog output voltages in three dimensional axes.

## I. INTRODUCTION

Robotics is a current emerging technology in the field of science. Robotics is the new emerging booming field, which will be of great use to society in the coming years. These days many types of robots are being developed and are put to varied applications and uses. The development of hand gesture based object handling with arm motion control involves pick and place of objects easily as it arms turns freely in all direction. The arm motion is operated & controlled with the help of hand gestures which transmits signals to the controller through an device fixed on the gloves put on hands rather than controlling it manually through a conventional remote controller. The arm of robot moves in up, down, left or right directions and picks up objects from one place and keeps at another desired place as directed by the movements of

fingers and hand. The prototype is built using a PIC micro-Controller, chosen for its low cost, in addition to its features of easy erasing and programming. Automation is the most often spelled term in the field of electronics. The anxiety for automation brought much advancement in the existing technologies. One among the technologies, which had greater developments, is the accelerometer sensor. These had greater importance than any other technologies due its user-friendly nature. Accelerometer sensor is a Electro Mechanical Sensor can be used to effectively translate hand movement into computer interpreted signals. For motion recognition the accelerometer data is calibrated and filtered. The accelerometers can measure the magnitude and direction of gravity in addition to movement induced acceleration. The DC motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary permanent magnets, and rotating electrical magnets, battery. The Microcontroller is programmed with the help of embedded C instructions. This Microcontroller is capable of communicating with input and output modules. The controller is interfaced with dc motors through relay driver circuit. The dc motors are fixed to control the direction of the arm movement.

## II. METHODOLOGY

### A. BLOCK DIAGRAM

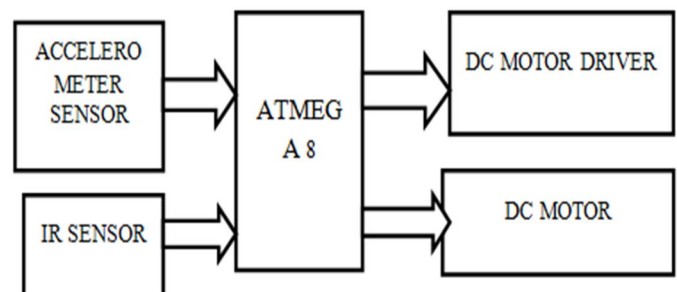


Fig 1 Block diagram

### B. CONSTRUCTION

In this paper, the design of robotic arm motion control according to movement of hand. The movement is sensed by sensor and to sense the presence of object the IR

sensors is used. These output of the sensors is fetched as the input to controller. The block diagram is shown above in fig 1. The microcontroller which acts as the mediator between the input module and output module is programmed using ATMEGA 8 C compiler software using Embedded C language. As per programming the pick and place of the objects will takes place. The objective of project is to move the arm of robot according to the movement of the human hand and the arm of robot moves at free degree of rotation as like hand rotation. By this the arm of robot can pick and place the object from one place to another.

### III. PROJECT DESCRIPTION

#### ROBOTIC ARM

A robotic arm is usually programmable with similar function as those same like the human arm. The robotic arm includes different parameters such as weight of the object to lift, degree of freedom, workspace. The robotic arms are connected to dc motors via dc driver circuit in which it helps to lift the object from one place to another.

#### GESTURE RECOGNITION

Accelerometer sensor is used for the gesture recognition. An accelerometer is device which measures the vibration or acceleration of motion and produces different voltage levels. The force caused by vibration or change in motion causes the mass which produces an electrical charge that is proportional to the force exerted on it. Since the charge is proportional to the force and the mass is constant, then the charge is proportional to the acceleration. The sensor produces the three different voltage levels. The output of the accelerometer sensor is in analog form and it is converted into digital form with the help of inbuilt ADC of the Atmega8 microcontroller. The converted digitized data is compared with the data already taken.

### IV. SOFTWARE USED

#### EMBEDDED C

All the above mentioned modules are controlled by embedded C program. Once started, the modules will continuously run and when the work is completed, whisper-quiet operation will take place. Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Traditionally, embedded C programming requires non standard extensions to the C language in order to support

exotic features such as fixed point Arithmetic and basic I/O operations. Embedded C uses most of the syntax and semantics of standard C. It is small and reasonably simpler to learn, understand, program and debug. In comparison with assembly, C code written is more reliable and easy, more portable between different systems. C compilers are available for almost all embedded devices in use today. C has the advantage of processor-independence i.e. it is independent of the kind of controllers or processors used, and is not specific to any particular microprocessor/microcontroller or any system.

### V. CONCLUSION AND FUTURE

Growing demand for natural Human Machine Interfaces and robot easy programming platforms, a gesture recognition system that allows users to control an industrial robotic arm was proposed and implemented successfully. A 3-axis accelerometer was selected to be the input device of this system, capturing the human arm behavior to control the robotic arm movement. And two flex sensors were used to control gripper movement. When compared with other common input devices like teach pendant, this approach using accelerometers over wireless medium is more easy to work. Using this system, a non-expert robot programmer can control a robot quickly and in a natural way. The low price and short set-up time are other advantages of the system. Future work will build upon increasing the number of accelerometer movement which is possible through the use of highly sensitive accelerometers. One approach might be the implementation of a gyroscope into the system, in order to separate the acceleration due to gravity from the inertial acceleration. The use of more accelerometers attached to the arms is another possibility

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