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# A Robotic Arm Controlled By Gesture

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**ABSTRACT:**In today's age, in nearly all fields, the bulk of the research is performed by robots or robotic arm with various degrees of freedom according to the necessity. Gesture implies human expression and hand movement. The principal goal of this project is to use human movements to guide the robotic arm. Through the assistance of an accelerometer, also known as inertial tracker, the human movements are detected. The segment transmitter uses a microcontroller. This is written in such a way as to do the behavior needed by the human expression. Theses sensed signals are interpreted and then transmitted through the RF transceiver module to the robotic arm at the recipient portion. Thus the robotic arm performs the movement necessary. They often use a remote control device to monitor the robot's speed. For wireless contact this device often requires an RF transceiver package. You will create the plan, and you can do the necessary research. This new model would also be beneficial and would reduce risk to citizens employed in unsafe places.

**KEYWORDS*:***Human Gesture, Robotic Arm, Microcontroller, Arduino, Encoder/Decoder, I/O Pins, Sensor

## I. INTRODUCTION

Increasingly, robots are being introduced into industries to replace people particularly to conduct the dangerous tasks. A robot is an electro-mechanical system [1], capable of automatically or under human control executing a complicated sequence of acts. They are used in diverse fields such as manufacturing, military, education, and science. Human doing such unique activities, such as dealing with toxic materials, defusing explosives and certain risky jobs, may be harmful. Hence, to conduct the procedures, humans may be substituted with robotic arm. A robotic arm [2] is a typically programmable robot manipulator that has close roles to a human arm.The robot arms can be automatic or manually operated, and can be used with considerable precision to execute a range of tasks.
The robotic arm is operated by management recognition technologies. Gesture understanding helps people to connect with the computer without any electronic tools and to engage naturally. Recognition of gestures [3] is a subject of computer science and language technology with the goal of decoding human gestures by mathematical algorithms. Gestures may arise from anybody gesture or condition, but usually come from the face or hand. Gesture detection helps people to speak and engage with the computer without any electronic tools.Hand movements are used widely in robotic control applications, and with these robotic contact robotic systems can be operated instinctively and intuitively.There are several versions of these robots possible or built according to requirement. Few variants are Managed Keypad, Voice Power, and Power Management etc. Most industrial robots, though, are still designed utilizing the traditional teaching method that is still a repetitive and time-consuming activity that needs experience. Therefore new and simpler ways to program the robots are required.The design's prime purpose is for the device and framework to continue movement as soon as the user makes a motion or pose or action. The Robotic arm is coordinated with the operator's gestures [4] (hand postures), and the frame portion is coordinated with the operator's gestures (leg postures).
The objective of this article is to establish techniques that enable users monitor and configure a machine, with a high degree of abstraction from the basic language of the robot, i.e. to simplify the programming of robots.

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## II. LITERUTRE REVIEW

There are various forms a robotic arm can be operated in. Throughout the past, other engineers have been focusing on manipulating the robotic arm by computer screens, joysticks, and also interfacing them with the internet so they can be controlled from anywhere in the world.

Pedro Neto et al. have suggested accelerometer-based monitoring of an advanced robotic arm [5] technique. This is controlled by digital accelerometers with 3 axes, connected to the human body, recording its actions (gestures and postures). Compared with other popular input tools, notably the teach pendant, this method is more intuitive and simpler to deal with using accelerometers.It is more efficient, too. It will have a reaction time of 170 msec. Future goal is to integrate a gyroscope into the device.

Bonny Varghese et al. developed the anthropomorphic robotic arm [6] wireless function. This has four shifting digits, each with three links, an opposite thumb with a revolving wrist and a forearm. The hand glove includes five linear slide potentiometers for monitoring the finger motions, and the wrist and elbow motions each have an accelerometer given. A dexterous anthropomorphic robotic arm has been built, with seven degrees of freedom. Using this package restricts the robotic arm's remote control to a few meters.

K. Brahmani used MEMS technologies to power a robotic arm. It consisted of controlling robotic arm controlled with LMC1668 [7] core centered on ARM8. To power their motions the LMC1668 core was used and interfaced with robotic arm DC motors. MEMS, a module of three dimensional accelerometers, records the human-arm movements and generates three analog feedback voltages in three dimensional axes. The 2.5 GHz RF Module also uses two flex sensors to monitor the gripper movement.

MalavAtulDoshi et al. proposed and used flex sensors to evaluate the efficiency of a wireless robotic hand. A robotic hand with real time power is built and produced reliably and cost-effectively. This five fingered robotic arm mimics a limited degree of flexibility and is seen in many devices for leprosy patients, such as prosthesis. Recently introduced was the robotic hand for tele-surgery using haptic technology. But the main restricting factor was the difference in time between the orders.

GourabSen Gupta suggested a robotic arm with remote vision control dependent on Wi-Fi. A device built for tele-operation is capable of controlling an anthropomorphic robotic arm through a LAN or the internet [8]. The customer will remotely monitor the robotic arm and even trigger his sensory input signals. Mounted on the robot head, the device collects pictures and transmits them to the control panel. The robot arm had been operated utilizing a system of master-slave power. The machine was run with PC-based equipment and a combination of old and modern master setups.The acceleration of the robotic arm is basically immediate and simultaneous, and the initial rotating encoding process was implemented using potentiometers.

## III. OVERVIEW OF SYSTEM

This part will disclose about the technical apparatus and method which will needed for making the robotic arm which will controlled by human gesture.

*3.1 A System for Capturing the Gesture:*

Gesture Detection Device guides the robotic arm [9]. The object tracking are used to identify human movements, and the robotic arm replicates certain behavior. The Robotic Arm block diagram is seen in Figure 1. Using RF module, this arm can be controlled from a long distance. The segment on the transmitter consists of inertial sensors for detecting the human movements, Arduino Uno and RF transmitter board. The portion of the receiver is composed of RF receiver assembly, motor guide, relays and DC motors. Around twelve volts Power supply is connected to both parts. The Arduino Uno reads from the accelerometer the analog output values, and transforms the analog value to the corresponding digital value.The Arduino Uno processes the electronic data and sends them to the RF transmitter obtained by the receiver and is processed at the receiver end which drives the motor in a specific direction. Fig. 1 is show how robotic machine recognize the gesture of human.

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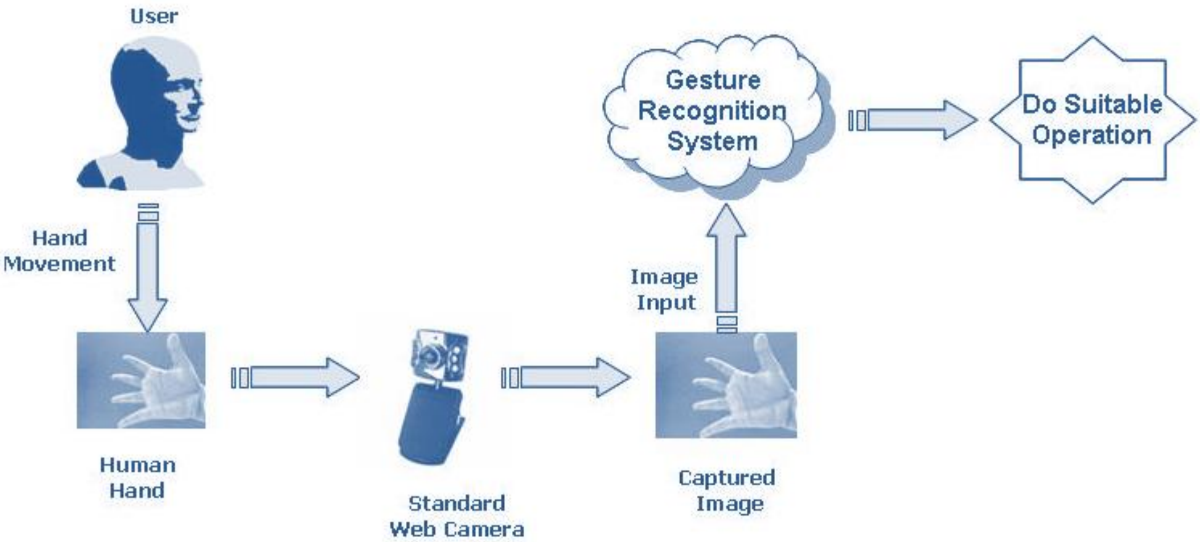


**Fig. 1: Gesture recognition system**

*3.2 Remote Controlling Technology:*

Universal remote controller technology is used to track device versatility. Using RF Module, the switches are used for wireless monitoring of movements. This RF package contains an RF Transmitter and an RF Receiver. The transmitter and receiver pair runs at the 430 MHz range. Serial data is obtained by an RF transmitter and distributed wirelessly by RF with its antenna. The transfer happens at a limit around 1 Kbps to 10 Kbps. An RF receiver which operates at the same frequency as that of the transmitter receives the transmitted data. The RF module and a set of encoders and decoders are used. RF module is used with a decoder and encoder assembly.

*3.3 Sensors:*

To provide the device with the additional functionality, the camera and temperature sensor are interfaced with the Arduino Uno board. Cameras are used for constant video sharing in order to track the robot's external climate. This is often used to display the field of research and is not apparent from a distance as worked. This content is accessed via successful internet link in a PC or mobile computer. The temperature sensor is used for detecting the ambient temperature and preventing harm to the device.

*3.4 Movement Measuring Device (Accelerometer):*

Sensors for the accelerometer are used to measure the swing [10] in planes x and y and transform this into analog signals. These sensor Accelerometers are small surface mount modules available today, so it can conveniently connect to a controller. This is a lightweight, thin, low-power, three axis accelerometer complete with voltage outputs controlled by signal. It contains total of six pins.

First pin is power supply pin, second pin is ground pin and last pin is self-testing pin. The existing three pins are for axis X, Y and Z. The X and Y axis pins are attached with the Arduino Uno board pins. The Arduino Uno board runs on 3 volt power supply. The X and Y axis pins are attached to the Arduino Uno board pins. It can measure the static gravity acceleration from tilt-sensing applications as well as the dynamic acceleration resulting from motion, shock or vibration and gives corresponding analog values via X, Y, Z axis pins. The accelerometer is available in a chip size kit with thin, low profile, 4 mm x 4 mm x 1.45 mm, 16-pin, plastic pin frame. The low cost and small size of a 3-axis accelerometer are the two factors that make the hand gesture detect efficient.

*3.5 Arduino:*

The Uno is focused on the ATmega microcontroller board. It has fourteen I / O connectors, six of which can be used as outputs pins, six analog inputs, a quartz crystal of 17 MHz, a USB interface, a power port, an ICSP header and a reset key. Uno consists of both a programmable digital circuit board and a part of software application, or IDE running on your device, used to write and transfer machine code to the digital board. Its modular, the hardware and software

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simple to use. By receiving input from a variety of sensors, Arduino Uno can sense the environment and can influence its surroundings by controlling lights, motors and other actuators.

*3.6 Radio Frequency Module:*

This module is composed of two more parts one is Transmitter (represented by Tx) and Receiver (represented by Rx). It is usable with increasing operating range in various operating frequencies. To send and receive the message or signal, an Encoder Circuit and a Decoder Circuit are used between the Transmitter and Receiver respectively. This module performs the native communication function between the Robotic Arm, Screen, and the user's different hand and leg movements through RF signals. This project needs one such RF Element. The RF Adapter used in this project operates on 310 MHz frequency of 399-499 meter operating range.

*3.7 Robotic Arm:*

This is the critical component of the program because this element does the project's Select and Drop job. The robotic arm is fitted with a Gripper [11] (for taking and positioning the objects) and an Arm (for lifting and lowering the objects). Both the Arm and the Gripper are fitted with a Servo Motor for mobility control. Such motions are coordinated with the user's hand movements, which control the Robotic Arm. The accelerometer was placed at the side, recording the eye movements.

## IV. WORKING AND IMPLEMENTATION

The design process integrates a single device of robotic arm, remote control machine, camera and sensors. The machine includes two controls. Accelerometer sensor is used for arm monitoring and Remote Controller is used for system functionality. A 3-axis hand mounted accelerometer is used to measure human hand actions, and a microcontroller acquires the values in analog form. This analog data is translated to digital data and transmitted via RF Board. The section of the receiver is the arm composed of three DC motors which give the arm three degrees of freedom. The motors are mounted on the arm body made of hollow metal, and the control circuitry is installed on a traditional frame. For horizontal motion with angles from 0 to 180 degrees one high torque DC is used, and another is set in the base for arm rotation. Gripper mouth movement is achieved by DC motor with angles of 0 to 180 degree.

The remote control device consists of two motors each operated by wireless switches, respectively. The switches are linked to the encoder address connectors. The encoder consists of a Transit Permit pin allowing for transmission. So when the switch connected to pin thirteen is pressed, the six address bits together with the three data bits are encoded and sent to the output pin in serial form.The data is obtained from the RF receiver circuit at the input pin, and then this data is tested four times, then decoded and IC tests if the encoder's address pin relation is the same as the decoder's. If the decoder's address configuration fits the data is decoded and latched on to the device pins in the obtained device (from encoder). The decoded data is then sent to the motor driver as control signals. Designed to drive the engine in forward direction.

## V. RESULT

This has built a handheld robotic device that operates according to the hand movement. It offers a simpler alternative to use an accelerometer to monitor a robotic arm and is more straightforward and easier to deal with. The RF module runs at 430 MHz frequency and has a length of 40-70 meters. This device can be used to conduct dangerous tasks inside industries. It can also be modified to bomb robot detection, as it has a robotic arm that can also raise the device. With the aid of which its position can be monitored GPS device can be applied to the robot. Fig.2 is showing the part of robotic arm controlled via human gesture.

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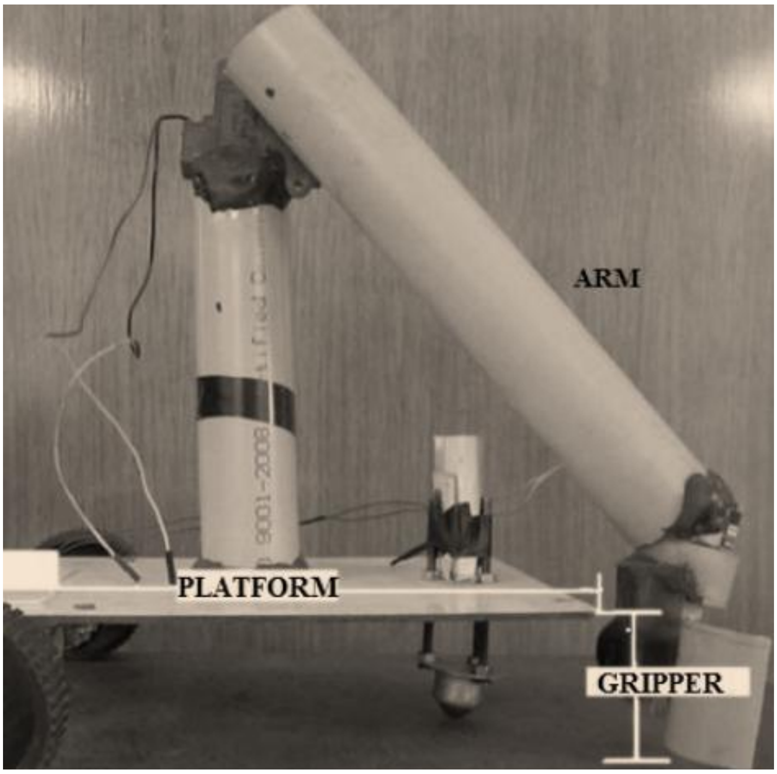


**Fig. 2: Robotic Arm**

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