GESTURE CONTROLLED ROBOT

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ABSTRACT:

This paper is a design and implementation of a hand gestured robot. It consists of a Micro-Electro-Mechanical Accelerator Sensor (MEMS) which sense the gesture and produces an analog signal corresponding to the gesture and this analog signal is given to Analog to Digital converter (ADC).The signal from ADC will be transmitted through micro controller and HT12E. This will be received by the receiver circuit and this signal is given to driver module which controls the motors. The motor control and sensing circuitry will run on batteries. This is implemented by a hardware model.

INTRODUCTION:

Now a day's robots control is being performed by using a cell phone or a remote or by a wired connection. Robots are playing an important role in automation across all the sectors like construction, military, medical, manufacturing, etc. We have developed this gesture control robot by using MEMS (Micro-Electro-Mechanical accelerometer sensor). In this project we will use hand motion to drive the robot. So, for this purpose MEMS was used which works on acceleration. Finalizing the decision of making a gesture controlled robot that will be maneuvered by a hand gloved mounted with the transmission circuit assembly. The circuit assembly will consists of accelerometer & MEMS along with an RF transmitter, which together function as an input device to the Receiver circuit.

The controls of our robot are based on gesture of hand, which becomes simple for any person to handle it. The program compiled in that circuit runs according to that value, which make the both function accordingly. Three-axis accelerometer has been used in which, one axis will control the speed in forward or backward direction and other axis will control the turning mechanism. An accelerometer is an electromechanical device that is used to measure acceleration forces.

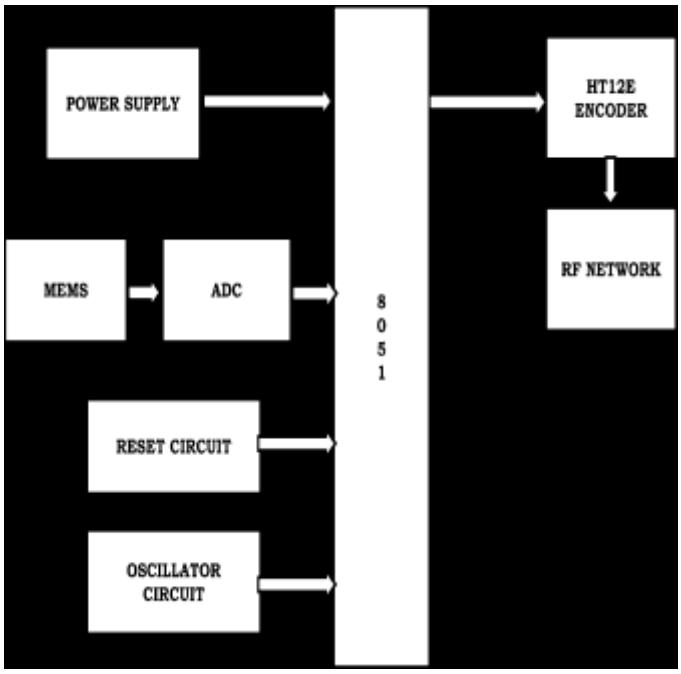
Accelerometers are being included into many electronic devices such as gaming devices, and the media players and smart phones like apple phone, I phone use accelerometers for a better use interface control and step counters. MEMS accelerometers are one of the simplest and most applicable systems.

The ranges of electromagnetic frequencies are above the audio range and below visible light. All broadcast transmission, from AM radio to satellites, falls into this range. Radio Frequency (RF) itself has become synonymous with wireless and high-frequency signals, describing anything from AM radio from 535 kHz to 1605 kHz to computer LANs at 2.4 GHz.
The RF transmitter module for this project is TLP434A (433.92MHz). This is an Ultra Small Wireless Transmitter ideal for remote control projects or data transfers. This compact unit operates between only 2V to 12V we are am using 5V and a range of up to 20m is possible with an antenna fitted with 12V battery. This module can work directly with HT12D or similar decoder. Here we are using microcontroller as a decoder.
When we are generating the data to be transmitted using Microcontroller. The data that is generated by the microcontroller is displayed on the LCD at the transmitter side and transmitted through RF transmitter (TLP434A). The RF transmitter will generate a carrier signal with a frequency of 433 MHz to transmit and the resulted signal is transmitted through antenna. The data that was transmitted by the antenna at the transmitter side is received by the antenna at the receiver side, and the resulted data is given to the RF receiver (RLP434A) which is a Compact Radio Receiver (RF) works directly with the TLP434A transmitter on an operating frequency of 433.92MHz. The resulted data from the RF receiver is received by the microcontroller serially. The data is decoded and displayed on the LCD at the receiver side.

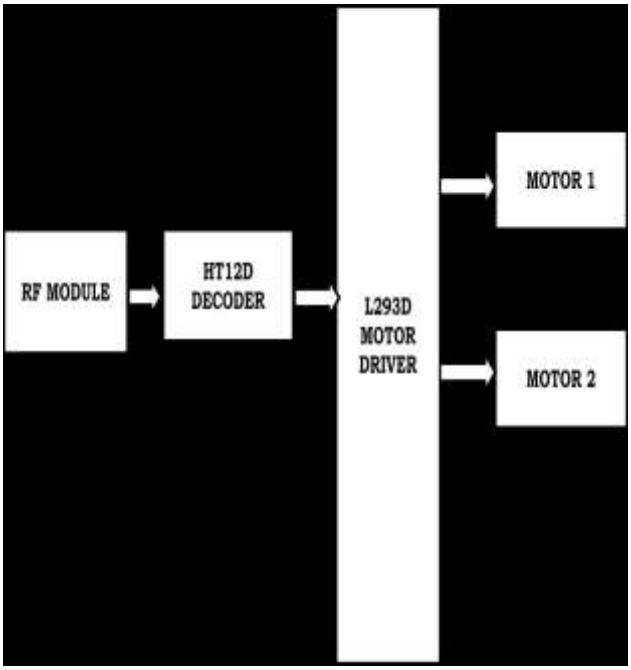
This is Ideal for robots, where commands can be sent directly to the robot, without the need for a hard-wired connection. Suitable for data rates of up to 4.8 KHz and the typical operating current is only 4.5mA. For example, firefighters and rescuers entering a building can use a heads-up display to track their location and monitor safe exit routes. an incident commander could track the location of multiple rescuers in the building from the command post.

BLOCK DIAGRAM:

BLOCK DIAGRAM OF TRANSMITTER CIRCUIT:



BLOCK DIAGRAM OF RECEIVER CIRCUIT:



MEMS (Micro-Electro-Mechanical accelerometer sensor):

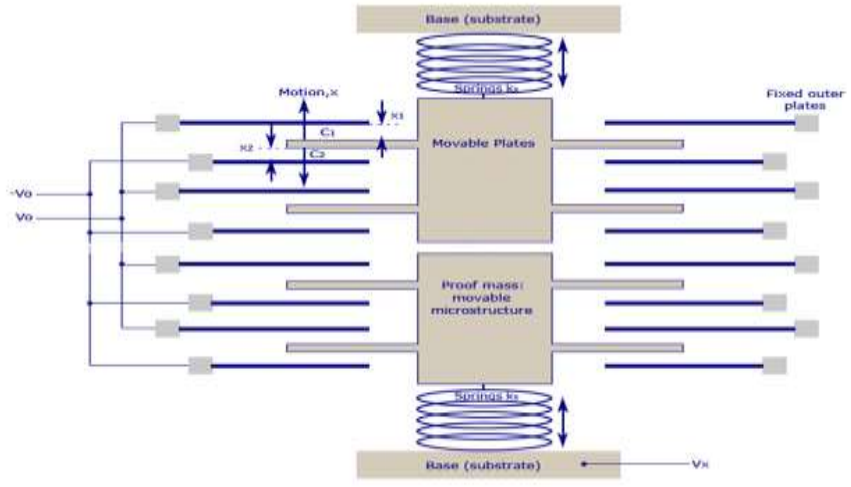
An accelerometer is an electromechanical device that measures acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic - caused by moving or vibrating the accelerometer.
One of the most commonly used MEMS accelerometer is the capacitive type. The capacitive MEMS accelerometer is famous for its high sensitivity and its accuracy at high temperatures. The device does not change values depending on the base materials used and depends only on the capacitive value that occurs due to the change in distance between the plates.
If two plates are kept parallel to each other and are separated by a distance'd', and if 'E' is the permittivity of the separating material, then capacitance produced can be written as

$C0 = E0.E_A/d = EA/d$ ……. (1)

$E_A = E_0E_A$ …….. (2)

A – Area of the electrodes g the change in capacitance and thus helps in the working of the MEMS

A change in the values of E, A or d will help in find in transducer. Accelerometer values mainly depend on the change of values of d or A. A typical MEMS accelerometer is shown in the figure below. It can also be called a simple one-axis accelerometer.If more sets of capacitors are kept in 90 degrees to each other you can design 2 or 3-axis accelerometer.
A simple MEMS transducer mainly consists of a movable microstructure or a proof mass that is connected to a mechanical suspension system and thus on to a reference frame. The movable plates and the fixed outer plates act as the capacitor plates. When acceleration is applied, the proof mass moves accordingly. This produces a capacitance between the movable and the fixed outer plates.
When acceleration is applied, the distance between the two plates displace as X1 and X2, and they turn out to be a function of the capacitance produced.



MEMS Accelerometer

WORKING:

Based upon the gesture, MEMS will be sending data to Analog to digital Converter which will give its digital output to micro controller. HT12E encoder will then send data to receiver circuit through an RF Network. In receiver circuit, HT12D decoder is placed which will receive this data and gives it to a L293D motor driver which will in turn drive the motors of robot according to the gesture.

HARDWARE ARRANGEMENT:

RESULT & CONCLUSION:

Robot is being controlled effectively and efficiently by hand gesture with the help of MEMS sensor. It is also ensured that the power consumption is low, as MEMS require low power to operate. It is made compact as all individual sensors are integrated on a single chip and MEMS are made up of components that are 0.001 to 0.1mm in size. Gesture position is being transmitted and received by using RF transmitter and receiver

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