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Embedded Human Control of Robot Using Myoetetric Interfaces

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ABSTRACT — *This project "MEMS Based Gesture Controlled Robot Using Wireless Communication (RF Technology)" the received tone is processed by the micro – controller (ARM7) and checks it with our defined function saved in its memory. According to operation has to be done, micro - controller sends a signals to the motor driver IC L293D which drives the motor. And with the help of motors the robot move Forward, Reverse, Left, Right or Stop. The MEMS Based head Controlled Using Wireless Communication view analysis It is mainly focused to overcome the limited working range of wireless controlled robots which uses RF circuit. MEMS based controlled robot provides the advantages of robust control and increases the working range as large as the coverage area of the service provider. All the devices such as HT 2E Encoder, L293D motor driver, motors, and power supply are connected to microcontroller.*

I. INTRODUCTION

1.1 INTRODUCTION

Micro electro mechanical systems (MEMS) (also written as micro-electro-mechanical, Micro Electro Mechanical or microelectronic and microelectromechanical systems) is the technology of very small mechanical devices driven by electricity and it merges at the nano scale into nanoelectromechanical systems (NEMS) and nanotechnology.

MEMS are separate and distinct from the hypothetical vision of molecular nanotechnology or molecular electronics. MEMS are made up of components between 1 to 100 micrometres in size (i.e. 0.001 to 0.1 mm) and MEMS devices generally range in size from 20 micrometres (20 millionths of a meter) to a millimeter. They usually consist of a central unit that processes data, the microprocessor and several components that interact with the outside such as micro sensors. This MEMS works on i2c protocol and having SDA, SCL pins. Here microcontroller acts as master and MEMS acts as a slave.

1.2 PROBLEM STATEMENT

The main aim of this project is to control the Robot using MEMS sensor and RF Technology . The MEMS will be tagged to the hand. Whenever the hand moves in a particular direction, the mechanical movement of the hand will be recognized by MEMS. MEMS convert this mechanical hand movement into equivalent electrical signals(X, Y, Z coordinates) and send it to the microcontroller. The communication between microcontroller and MEMS is i2c protocol. In this protocol microcontroller acts as a master and MEMS acts as a Slave.

Microcontroller having RF Tx which send the information to RF Rx which held at ARM7 controller . Based on this output robo movies according MEMS direction

And here a physical structure will be designed by using two motors which mimic a these two motors will be interfaced to the controller through a driver IC L293D. This robot's direction will be controlled based on the signals received by the MEMS through RF technology communication , as per the code logic.

1.3 PROJECT OBJECTIVE

The MEMS Based head Controlled Using Wireless Communication view analysis It is mainly focused to overcome the limited working range of wireless controlled robots which uses RF circuit. MEMS based controlled robot provides the advantages

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of robust control and increases the working range as large as the coverage area of the service provider. All the devices such as HT 2E Encoder, L293D motor driver, motors, and power supply are connected to microcontroller.

1.4 PROJECT SCOPE

This project "MEMS Based Gesture Controlled Robot Using Wireless Communication(RF Technology)" the received tone is processed by the micro –controller(ARM7) and checks it with our defined function saved in its memory. According to operation has to be done, micro -controller sends a signals to the motor driver IC L293D which drives the motor. And with the help of motors the robot move Forward, Reverse, Left, Right or Stop.

1.5 PROJECT OUTLINE

The project is organized into 6 chapters, namely introduction, Literature Review, Design approach, Result analysis and conclusion.Chapter2 contains the complete details about the Introduction of Embedded Systems and ATMEL Microcontroller. Chapter 3 describes about the design issues, software and hardware requirements for the Implementation of agricultural automation through webpage Chapter 4 consists of the result analysis, applications and advantages. Chapter 5 contains coding and chapter 6 contains conclusion and proposed works to enhance the project in the future.

II. PROJECT DESCRPITION

Block diagram mems based gesture controlled robot using rf technology wireless communication It contains block diagram of MEMS Based Gesture Controlled Robot Using RF Technology Wireless Communication.

Transmitter Section

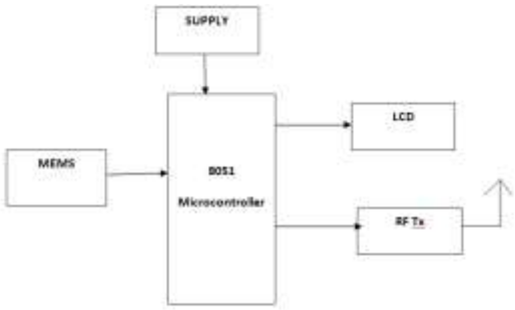

Fig:1 Block diagram of MEMS Based Gesture Controlled Robot transmitter section

The AC main Block is the power supply, which is of single-phase 230V ac. This should be give to step down transformer to reduce the 230V ac voltage to low voltage. i.e., to 6V or 12V ac this value depends on the transformer inner winding. The output of the transformer is give to the rectifier circuit. This rectifier converts ac voltage to dc voltage. Nevertheless, the voltage may consist of ripples or harmonics.

To avoid these ripples the output of the rectifier is connect to filter. The filter thus removes the harmonics. This is the exact dc voltage of the given specification. However, the circuit operates at 5V dc voltage. Therefore, we need a regulator to reduce the voltage. 7805 regulator produces 5V dc voltage.

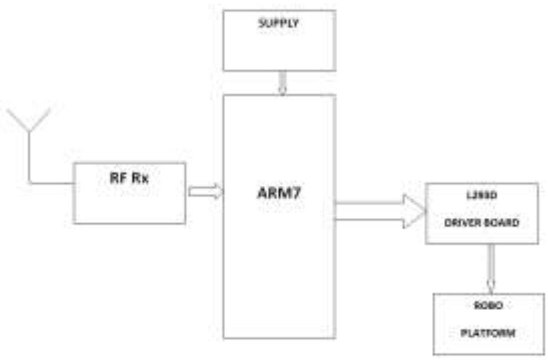

Fig 2: block diagram of MEMS Based Gesture Controlled Robot receiver

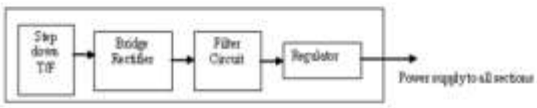

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Fig 3 Description of transmitter and receiver block diagrams:-

Transmitter section

The above transmitting diagram indicates the transmitting section which includes an accelerometer whose output is in continuous form as the encoder can only understands the digital data we are using the comparator for converting the analogy data to digital data and this data is to be transmitted so we are using radio transmitter which transmits the serial data converted by the encoder from parallel data.

Receiver section

The above receiving block diagram indicates the receiver section the transmitted data by the transmitter is received by the RF receiver and the serial data is given as input to the decoder which converts the serial data to parallel data and is given as input to the microcontroller which consists of a predefined program to fulfill our task, depending upon the data received the controller generates some signals to the motor driver. Here the purpose of the motor driver is to drive the motors and here LED's and buzzer are used for some specific indications Various types of modules like ping module.

HARDWARE TOOLS

In this project the hardware requirements are following:

- Atmel microcontroller
- Power supply
- L293d motor driver
- DC motors
- RF transmitter and receiver
- MEMS sensor
- HT 2E Encoder
- HT 2D Decoder
- LCD
- 433 MHz RF Receiver STR-433
- 433 MHz RF Transmitter STT-433

Power supply unit

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

Microelectromechanical systems (MEMS, also written as micro-electro-mechanical, MicroElectroMechanical or microelectronic and microelectromechanical systems and the related micromechatronics) is the technology of very small devices; it merges at the nano-scale into nanoelectromechanical systems (NEMS) and nanotechnology. MEMS are also referred to as micromachines in Japan, or micro systems technology (MST) in Europe.

MEMS are separate and distinct from the hypothetical vision of molecular nanotechnology or molecular electronics. MEMS are made up of components between 1 to 100 micrometres in size (i.e. 0.001 to 0.1 mm), and MEMS devices generally range in size from 20 micrometers to a millimetre (i.e. 0.02 to 1.0 mm). They usually consist of a central unit that processes data (the microprocessor) and several components that interact with the surroundings such as micro sensors. At these size scales, the standard constructs of physics are not always useful. Because of the large surface area to volume ratio of MEMS, surface effects such as electrostatics and wetting dominate over volume effects such as inertia or thermal mass.

The potential of very small machines was appreciated before the technology existed that could make them (see, for example, Richard Feynman's famous 1959 lecture There's Plenty of Room at the Bottom). MEMS became practical once they could be fabricated using modified semiconductor device fabrication technologies, normally used to make electronics. These include molding and plating, wet etching (KOH, TMAH) and dry etching (RIE and DRIE), electro discharge machining (EDM), and other technologies capable of manufacturing small devices. An early example of a MEMS device is the resonistor – an electromechanical monolithic resonator.

Operation

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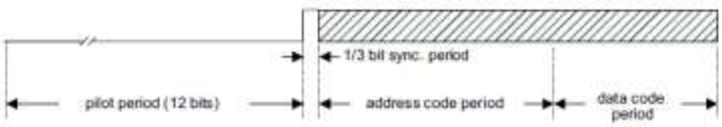
The series of encoders begin a 4-word transmission cycle upon receipt of a transmission enable (TE for the HT12E or D8~D11 for the HT12A, active low). This cycle will repeat itself as long as the transmission enable (TE or D8~D11) is held low. Once the transmission enables returns high the encoder output completes its final cycle and then stops as shown below.

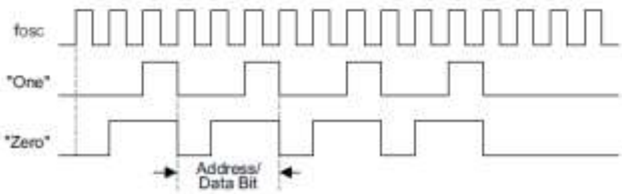
Information word. If L/MB=1 the device is in the latch mode (for use with the latch type of data decoders). When the transmission enable is removed during a transmission, the DOUT pin outputs a complete word and then stops. On the other hand, if L/MB=0 the device is in the momentary mode (for use with the momentary type of data decoders). When the transmission enable is removed during a transmission, the DOUT outputs a complete word and then adds 7 words all with the _1_ data code.An information word consists of 4 periods as illustrated below.



Composition of information

Address/data waveform

Each programmable address/data pin can be externally set to one of the following two logic states as shown below.

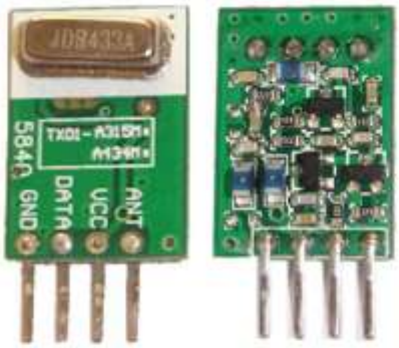


Address/Data bit waveform for the HT12E

Address/data programming (preset)

The status of each address/data pin can be individually pre-set to logic _high_ or _low_. If a transmission- enable signal is applied, the encoder scans and transmits the status of the 12 bits of address/ data serially in the order A0 to AD11 for the HT12E encoder and A0 to D11 for the HT12A encoder. During information transmission these bits are transmitted with a preceding synchronization bit. If the trigger signal is not applied, the chip enters the standby mode and consumes a reduced current of less than 1_A for a supply voltage of 5V. Usual applications preset the address pins with individual security codes using DIP switches or PCB wiring, while the data is selected by push buttons or electronic switches.

The STT-433 is ideal for remote control applications where low cost and longer range is required. The transmitter operates from a1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance. Output power and harmonic emissions are easy to control, making FCC and ETSI compliance easy. The manufacturing-friendly SIP style package and low- make the STT-433 suitable for high volume applications.



The STR-433 uses a super-regenerative AM detector to demodulate the incoming AM carrier. A super regenerative detector is a gain stage with positive feedback greater than unity so that it oscillates. An RC-time constant is included in the gain stage so that when the gain stage oscillates, the gain will be lowered over time proportional to the RC time constant until the oscillation eventually dies. When the oscillation dies, the current draw of the gain stage decreases, charging the RC circuit, increasing the gain, and ultimately the oscillation starts again. In this way, the oscillation of the gain stage is turned on and off at a rate set by the RC time constant. This rate is chosen to be super-audible but much lower than the main oscillation rate. Detection is accomplished by measuring the emitter current of the gain stage. Any RF input signal at the frequency of the main oscillation will aid the main oscillation in Restarting. If the amplitude of the RF input increases, the main oscillation will stay on for a longer period of time, and the emitter current will be higher. Therefore, we can detect the original base-band signal by simply low-pass filtering the emitter current.

The average emitter current is not very linear as a function of the RF input level. It exhibits a 1/ln response because of the exponentially rising nature of oscillator start-up. The steep slope of a logarithm near zero results in high sensitivity to small input signals.

CONCLUSION

We proposed a fast and simple algorithm for hand Embedded human controlling robot using myoeteric intrerfaces . We have demonstrated the effectiveness of this computationally efficient algorithm on real images we have acquired. In our system of hand Embedded human controlled robots, we have only considered a limited number of gestures. Our algorithm can be extended in a number of ways to recognize a broader set of gestures. The gesture recognition portion of our algorithm is too simple, and would need to be improved if this technique would need to be used in challenging operating conditions. Reliable performance of hand gesture recognition techniques in a general setting require dealing with occlusions, temporal tracking for recognizing dynamic gestures, as well as 3D modeling of the hand, which are still mostly beyond the current state of the art.

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