MEMS Based Wireless Controlled Robot with Voice and Video Camera

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Abstract— MEMS is a Micro Electro Mechanical Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tilt and operates the electrical devices and announces the basic needs depending on tilt. The tilt is in left side or right side direction the related need will be announced. And it has the obstacle detection feature. This device is very helpful for paralysis and physically challenged persons. This device is portable and this system operation is entirely driven by wireless technology. User can wear it to any movable part and can operate it by tilting the MEMS sensor

Index Terms— MEMS , Gyroscope, Wireless Technology, MEMS sensor, Embedded Systems

1. INTRODUCTION

To design and construct gestures controlled device switching system and also a robot control wirelessly with a video camera on it for physically challenged. The user can wear this device to any movable part and with the simple gestures he can request the basic needs like water, food or medicine through robot operated wirelessly using MEMS (Micro Electro-Mechanical Systems*)* technology. User can also control the electrical devices like light; fan etc with the help of gestures. MEMS is a Micro Electro Mechanical Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tilt and operates the electrical devices and announces

the basic needs depending on tilt. For example if the tilt is to the forward then the device will be "ON" for the first time then next time it will be "OFF".

In the same way, if the tilt is to the left side then another device is going to be controlled.

The tilt is in left side or right side direction the related need will be announced. This device is very helpful for paralysis and physically challenged persons. This device is portable and this system operation is entirely driven by wireless technology. User can wear it to any movable part and can operate it by tilting the MEMS sensor.

➢ GYROSCOPE

Definition:-Gyroscope, any device consisting of a rapidly spinning wheel set in a framework that permits it to tilt freely in any direction. i.e. to rotate about any axis. The momentum of such a wheel causes it to retain its attitude when the framework is tilted; from this characteristic derive a number of valuable applications.

Gyroscopes are used in such instruments as compasses and automatic pilots onboard ships and aircraft, in the steering mechanisms of torpedoes, in anti-roll equipment on large ships, and in inertial guidance systems

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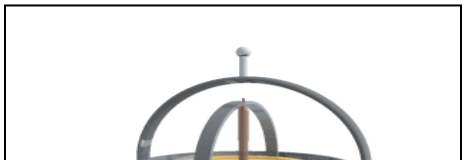
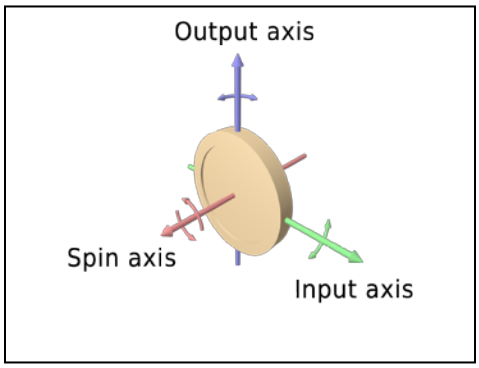


Figure 1- Gyroscope

- Working of Gyroscope



- Angular momentum of the wheel causes the gyroscope to resist changes in orientation and angular momentum.
- These changes can be detected and used for directional and acceleration feedback to the operator or system.
- Based on the gyroscope effect.
- Gyroscopes can work on multiple axis.
- Mechanical equivalents can be substituted for one or more gyroscope components.
- Fluid can be used in place of mounted gimbals to suspend the gyroscope

2. EMBEDDED SYSTEMS

An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints.

It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today. Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. For example, air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

3. OBJECTIVES

- Simple head movement based operation.
- Voice announcement of needs.
- Wireless data transmission.
- Robot with obstacle detection.

4. HARDWARE DESCRIPTION

Use of a Relay and Triac for switching the devices and APR-9600 voice chip for audio announcements, DC motors for Robot movement, Micro controller, which is programmed, with the help of embedded C instructions. This microcontroller is capable of communicating with

transmitter and receiver modules. The MEMS based sensor detects the tilt and provides the information to the microcontroller and the controller judges whether the instruction is right movement or left movement instruction and controls the operation respectively.

- Micro controller (16F877A)
- Crystal oscillator
- Regulated power supply (RPS)
- MEMS accelerometer sensor module
- RF transmitter and RF receiver
- Voice module
- DC Motors
- DC motors drivers
- Buzzer
- Camera

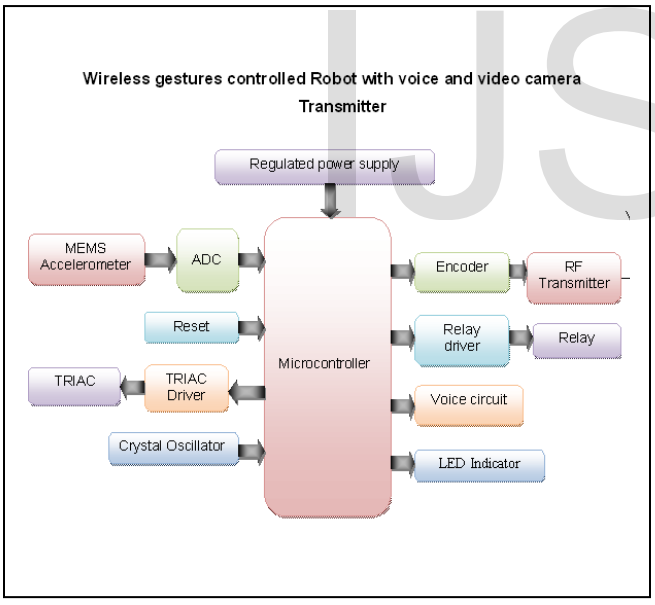


Figure 3- Wireless gestures controlled Robot with voice and video camera Transmitter

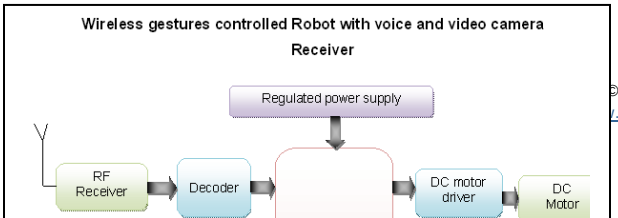


Figure 4- Wireless gestures controlled Robot with voice and video camera Receiver

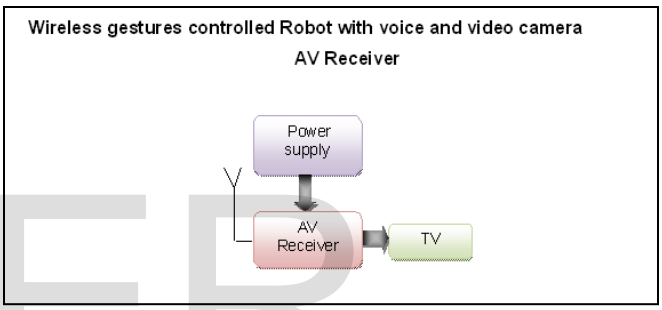


Figure 5- Wireless gestures controlled Robot with voice and video camera AV Receiver

5. PERIPHERAL FEATURES:

- High sink/source current 25mA
- Timer0: 8-bit timer/counter with 8-bit prescaler can be incremented during sleep via external crystal/clock
- Timer2:8-bit timer/counter with 8-bit period register prescaler and post scalar.
- Capture, Compare, PWM (CCP) module
- Capture is 16-bit, max resolution is 12.5ns
- Compare is 16-bit, max resolution is 200 ns
- 8-bit 5 channel analog-to-digital converter
- Synchronous serial port (SSP) with SPI (Master/Slave) and (Slave)

MEMS sensor MMA 7260 Q:

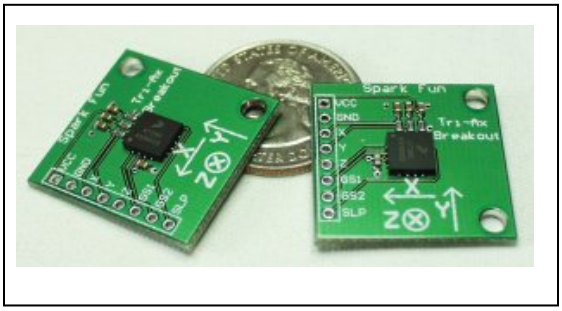


Figure 6 - MEMS sensor MMA7260Q

The MMA7260Q is a 3-axis accelerometer .An accelerometer measures acceleration (change in speed) of anything that it's mounted on. Single axis accelerometers measure acceleration in only one direction.

Dual-axis accelerometers are the most common measure acceleration in two directions, perpendicular to each other. Three-axis accelerometers measure acceleration in three directions.

Accelerometers are very handy for measuring the orientation of an object relative to the earth, because gravity causes all objects to accelerate towards the earth. A two-axis accelerometer can be used to measure how level an object is. (This would be a good place to fill in equations to calculate a body's angle from the X and Y accelerations on the body). With a three-axis accelerometer, you can measure an object's acceleration in every direction.

6. ADVANTAGES

- Wireless controlling of robot using MEMS accelerometer sensor.
- Wireless controlling of devices.
- Fast response.
- Efficient and low cost design.

7. DISADVANTAGES

- Limited distance for communication
- Limited user interface.

8. APPLICATIONS

- Can be used to detect persons in restricted areas.
- Can be used in mines.
- Can be used to detect terrorists in buildings.
- The user can wear this device to any movable part and with the simple gestures he can request the basic needs like water, food or medicine through robot operated wirelessly using MEMS (Micro Electro-Mechanical Systems*)* technology

9. RESULT

"Wireless Gestures controlled Robot with Voice and Video Camera" was designed such that the robot can be operated using RF technology and the PIR sensor detects the human presence and when the presence of human was being detected it stops, the picture of the human being was captured using wireless camera and buzzers an alarm system.

10. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology implementation done much easier way.

11. FUTURE SCOPE

"Wireless Gestures controlled Robot with Voice and Video Camera" is a gestures controlled device switching system and also a robot control wirelessly with a video camera fixed on it for physically challenged persons. The system is designed to operate Robot using MEMS accelerometer sensor wirelessly using RF technology and also displays the audio, video signals in TV by using audio & video transmitter (Camera). The robot also consists of voice module which announces the basic needs like food, water etc. The micro controller is programmed in such a way that the robot can be operated using MEMS accelerometer technology wirelessly using RF communication.

We can be extended this application using Zigbee technology, which increases operating wireless distance from transmitter section to the receiver section.

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Resonator Fiber Optic Gyroscope with Digital Serrodyne Scheme Using a Digital Controller

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Fiber Optic Gyroscope

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