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IMPLEMENTATION OF SPEED CONTROL USING MEMS BASED ACCELEROMETER WIRELESSLY

T. S. Abirami[1], A. Induja[2], G. Dheena Dhayalan[3]

[123]UG student, Dept. of EIE, Madras Institute of Technology campus, Anna University, Tamilnadu, India

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Abstract -*In all industries, there are many ways to control the speed of the motor. In this report, the innovative way to control the speed is done using MEMS based accelerometer. The speed of the motor is most important parameter and in some cases, the motor present in the industries are very difficult to access manually. So, the wireless access can be done using RF module. The various components used are MEMS based accelerometer, Arduino UNO, XBee transceiver and DC motor. The accelerometer is connected with Arduino. The position of accelerometer is changed (i.e.) axis gets varied and the data are transmitted by the XBee transmitter. It is received by the XBee receiver connected to microcontroller which controls the speed according to the position of the accelerometer.*

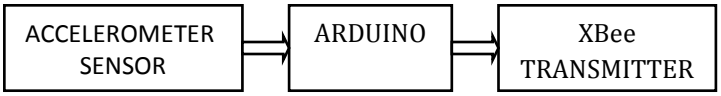
Key Words:MEMS (Micro-electromechanical system) based accelerometer, XBee transceiver, Arduino UNO

1.INTRODUCTION

There are various ways to control the speed of the motor. In this report, a different method to control the speed is incorporated using MEMS based accelerometer. This approach is made as wireless speed control by transmitting the axial values of the accelerometer through XBee transceiver. So it acts as a axial regulator to control appliances. The specific objectives of this project are to control the speed of the motor without any contact between the operator and motor and in case of any malfunction in the industries , we are not able to manually operate the motor so wireless access is useful in this case

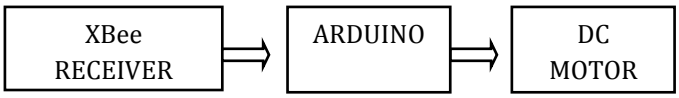
2. SYSTEM DESIGN

2.1 Transmission module



The transmission module consists of Accelerometer sensor, Arduino UNO and XBee transceiver.The MEMS based accelerometer is interfaced with Arduino UNO. The output of the accelerometer is read in the Arduino UNO and it is transmitted by the XBee transmitter.

2.2 Reception module



The reception module consists of XBee transceiver, Arduino UNO and DC motor. The data is received by XBee receiver. By this method, the speed of the DC motor is changed.

2.3MEMS based Accelerometer

An accelerometer sensor measures the acceleration, vibration and force etc. The maximum supply voltage is 3.6V. In this report, the ADXL345 which is the 3-axis accelerometer sensor is used.

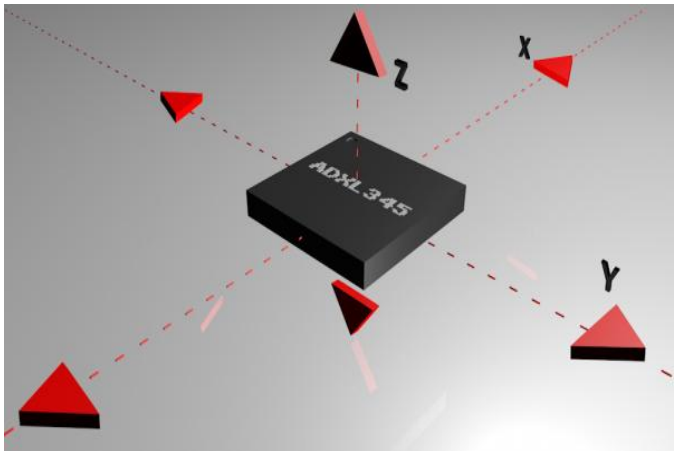


Fig-1: Three axis accelerometer

The main idea is to control speed of the DC motor. So the methodology includes the RF transmission and reception of accelerometer's axial positions that decides the speed of the DC motor.

In this method, the Arduino programming is done as follows. For the four different positions of the three axis accelerometer, the speed of the DC motor is varied. These X, Y and Z axis ranges are got when the Accelerometer sensor is changed to different positions

Table-1: Accelerometer sensor ranges

X-axis range	Y-axis range	Z-axis range	Speed of the DC motor
345 to 365	400 to 440	350 to 380	OFF state
410 to 440	350 to 370	350 to 390	Low speed
350 to 375	270 to 290	350 to 370	High speed
270 to 290	335 to 360	350 to 375	Very high speed

2.4 Interfacing the Accelerometer sensor with Arduino

An Accelerometer measures both static and dynamic acceleration forces. There are two types of Accelerometer sensor. They are two axis accelerometer and three axis accelerometer.

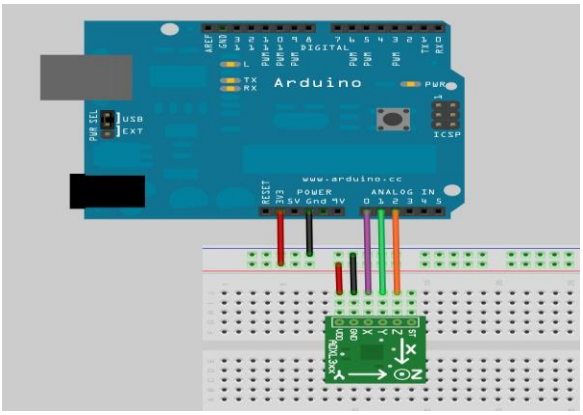


Fig-2: Interfacing the sensor with Arduino

The three axis accelerometer is preferred in this method due to its accuracy. The VCC and GND of the accelerometer are connected to VCC and GND of the microcontroller togivepower supply. The x, y and Z pin of the accelerometer is connected to any three analog pins of Arduino.

3. REAL TIME IMPLEMENTATION

3.1 Serial monitor in Arduino

Initially, the accelerometer is interfaced with the Arduino and it is calibrated. For different positions of the accelerometer, the analog values are read in the serial monitor of the Arduino. The figure below shows the value which are printed in the serial monitor.

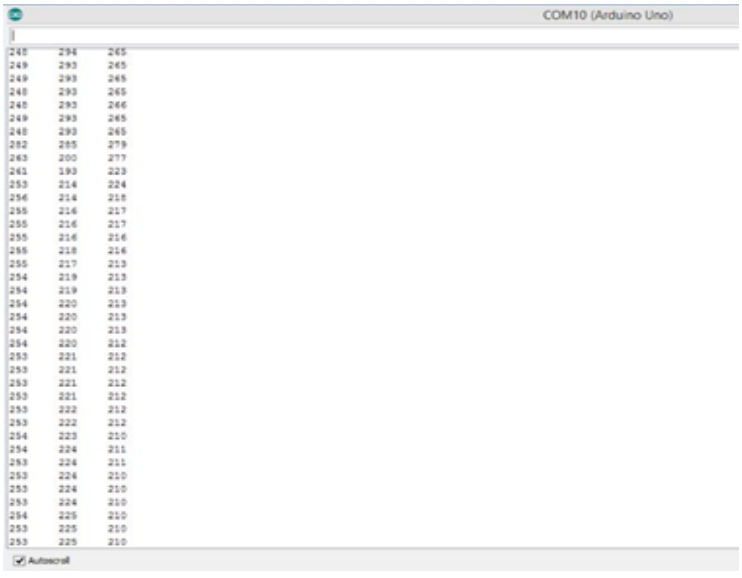


Fig-3: Accelerometer reading in Serial monitor

3.2 Transmission module

The figure below denotes the transmission module of the speed control using MEMS based Accelerometer.

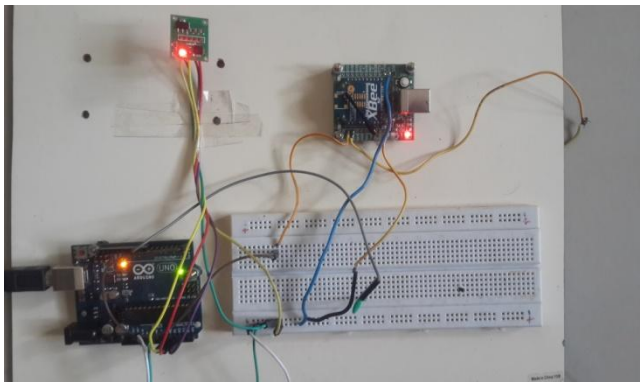


Fig-4: Transmission module

3.3 Reception module

The figure below denotes the reception module of the speed control using MEMS based Accelerometer.

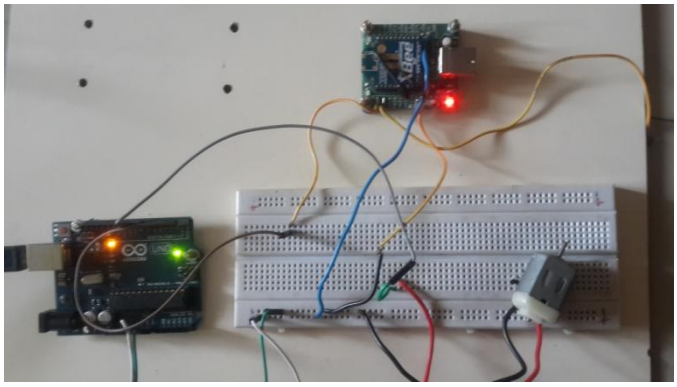


Fig-5: Reception module

4. CONCLUSIONS

Thus the online simulation using Arduino and hardware implementation of MEMS based Accelerometer and RF transceiver has been carried out. Accelerometer is the positional sensor which is used to detect the changes in position. As the position varies, the speed of the DC motor is varied wirelessly using RF module.This method is entirely customizable so that user can change the speed and the position as they needed.

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BIOGRAPHIES

T. S. Abirami B.E. in Electronics and Instrumentation Engineering, from Madras Institute of Technology, Chennai, TN-India.

A.Induja B.E. in Electronics and Instrumentation Engineering, from Madras Institute of Technology, Chennai, TN-India.

G. Dheena Dhayalan B.E. in Electronics and Instrumentation Engineering, from Madras Institute of Technology, Chennai, TN-India.