

# TILT DETECTOR

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## ABSTRACT

The Tilt Detector is used to detect the change in angular position of the system or an object and visually indicate the direction of tilt. The paper represents the total idea about this project and the working of it.

**Keywords:** Accelerometer, Angular Position, Arduino Uno, Direction of Tilt, Visually

## I. INTRODUCTION

Detecting the change in angular position of a system or an object is necessary for applications such as motion sensing and motion control. There must be some device which can detect that change in angular position of a system. One such device is a Tilt Detector which detects the change in tilt with the help of accelerometer.

## II. TILT DETECTOR

The Tilt Detector is a device which detects the change in angular position of the system or an object and visually indicates the direction of tilt.



Figure 1: Image of a tilt detector

## III. CONCEPT

An Accelerometer, which is an electromechanical device comes under the family of Micro-Electro-Mechanical Systems or MEMS devices.

Tilt detection is a simple application of an accelerometer where a change in angular position of a system or an object in any direction is detected and indicated visually through LED's. An Arduino Uno board is used to process the data received from the accelerometer and switch on the corresponding LED to indicate the direction of tilt.

#### IV. CIRCUIT DESIGN

The circuit only requires an Arduino Uno board, an Accelerometer module and few other components for construction.

Pins A0 to A5 of the board are connected to pins ST, Z-axis, Y-axis, X-axis, GND and VCC of the accelerometer module, respectively. The values for the accelerometer are predefined by user according to the requirement in the tilt level by using Self-Test pin (ST). Pins 8 to 12 of the board are connected to LED's.

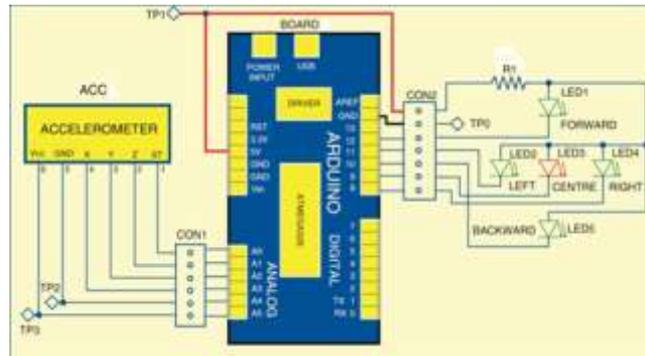


Figure 2: Circuit diagram

#### V. WORKING

When there is a change in angular position of the system or an object on which the accelerometer is mounted, logic levels are provided to VCC and GND of the accelerometer module through pins A5 and A4, respectively. The microcontroller of the board receives data for X, Y and Z axis from the accelerometer at pins A3, A2 and A1, respectively. This data is continuously compared with predefined values for each axis.

If the received value for any axis crosses the predefined value, the corresponding LED (Green) is lit. If the angular tilt is within the threshold limit for each direction, the LED in the center (Red) is lit.

#### VI. TESTING

To test the circuit, check for the voltage levels at the test points as shown in the test points table below:

Table 1: Test points

TEST POINTS	
Test Point	Details
TP0	0V, GND
TP1	5V
TP2	Low
TP3	High

For functional testing of the circuit we need to trigger the values for LED's after assembling the circuit. The steps involved in this process are:

- Connect the Arduino board to the computer with USB cable.
- Open the source code (test.ino) in the Arduino IDE and burn it on the Arduino board.
- Open the serial port from Arduino environment and press reset button.



## VII. RESULTS

The results can be seen by opening the serial port in the Arduino environment as shown in the Fig. 5 below:

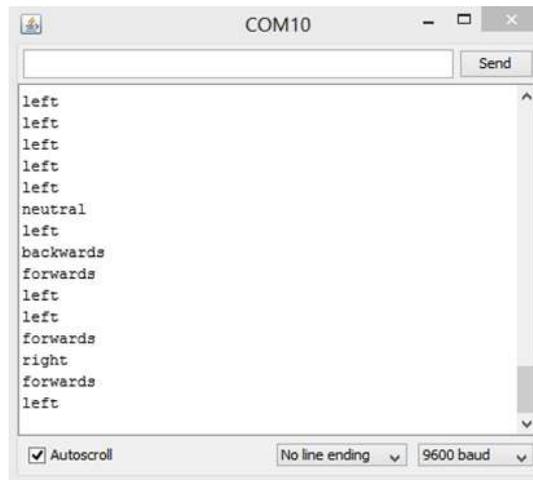


Figure 5: Screenshot of result

## VIII. CONCLUSION

In summary, a Tilt Detector is a device that visually indicates the direction of tilt made by the system or an object. It can be used for various applications like tilt detection, obstacle detection, motion inputs, and earthquake sensing. It can also be used in theft protection, disk drive protection, mobile devices, gaming systems, etc.

## REFERENCES

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