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DIGI ANGLE METER

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Abstract

Angular measurements are playing a very crucial role in measurements. For Angular measurements, there are a wide variety of devices available in metrology. But the measuring device can be preferred based on the type of the component to be measured, and the accuracy and precision required in the measurements. The accuracy of the device is the least count of each device. Angle measurements are accurate using digital devices. The device stores angle and inclinometer measurements in its memory for future use. So, our project aims to create a Digital Angle Measuring Device. It is possible for users to easily reuse and take accurate measurements. Our instrument is a revolutionary and versatile measuring tool that incorporates angle finder, protractor, and level into one, and is ideal for application in the auto industry, construction industry, drilling industry, and more. There are no special fixtures needed to calibrate it directly displays values. This document gives a brief overview about the different types of methods and instruments used by the people who are working with carpentry, interior and exterior designing to measure the angle between planes in their work. However they all are old methods and devices to measure the angles. Most of the time these devices used to not give accurate measurements and there are some devices which give accurate measurements but they are expensive,very large to carry and also difficult to handle. To solve these problems we have come up with an idea which gives a solution to the above problems. Which consists of an Arduino microcontroller and sensors.

Keywords: Arduino, Metrology, Inclinometer.

1. INTRODUCTION

Modern technology relies on massive infrastructure, of any construction, no matter how large or small is measured by engineers with a huge instrument that is more complex and requires a lot more time and money. It is so difficult to carry the instrument and cannot read in some

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conditions. We have come up with a device called the " **DIGI ANGLE METER** " which measures the angle between two surfaces with low cost and higher accuracy, it is easy to handle and carry. Not only that, it is an easy device to understand and operate even for the normal person instead of only engineers.

The aim of our project is to reduce the effort of workers in construction and other workers who always depend on the engineer, to make constructions perfect and we intend to increase knowledge of workers about the construction. The uses of angles are vast ranging from fun uses like in a game of carrom to more complex ones like planetary motion.Construction, architecture, sports, engineering, art, dance, etc. make use of the concept of angles. That apart, scientists and astronomers depend on the angles that celestial bodies make to study their movement and get down to concrete conclusions.

2. RELATED WORK

We have visited several cement labours and architects asked about the devices they used to measure the angle and difficulties faced by them. By the survey from the people we have come to know that the issues we have to resolve with our solution. We also went through the Existing devices and documentation proposed on this project. Angle measurements are of great importance in machine calibration. Due to large Abbe offsets and long travel at machine tools and measuring machines the angular motion errors and out-of-squareness of the guideways often contributes much more to the total error budget than the linear positioning; errors and straightness errors. Errors inherent in commonly used methods of measuring angular motion errors and squareness errors are analyzed in this paper. New methods, such as the reversal method for angular motion error measurement and the displacement method for angular and squareness error measurement. are proposed. These methods give an accuracy of about 0.02 arcseconds in pitch and yaw measurements and 0.1 arcsecond in squareness measurements. These errors are much smaller than the errors of other commonly used laser interferometric methods. Design of Measure Angle Tools as a Learning Tool for Learning Angle Measurement Precision Approach Path Indicator - BayuPurboWartoyo

3. IMPLEMENTATION

To measure angle between any two surfaces it requires a minimum of two persons and we need to take the angle at

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every point to get an accurate value. So, it becomes very difficult to get the accurate value and we have the devices to measure but they are very costly. Our problem statement is to create a device to measure the angle containing a strong body that can't be broken and with long time usage and rechargeable battery.The " **DIGI ANGLE METER** " is designed to measure the angles.The main part of our device is the MPU6050, which is a motion measurement electronic board that measures velocity, acceleration, displacement, and other factors. By using this we can measure the angles in 3 coordinate fashion and the measurement can be seen on the LCD. First we need to place the device in such a way that the base of the device is placed on the object plane. And moving the device upto the point where you want to measure and angle values can be seen on the LCD display which displays the angle value in xy,yz,xz planes fashion. We can measure in vertical, horizontal and in any inclined position.

When we are measuring in a horizontal plane the angle is displayed in the y-axis and the remaining two axes are angle values will be zero. When we move the device in vertical plane we get the angle measurement in z-axis position and remaining two axes shows zero. When we move the device in z-axis and it gives the value of angle in x-axis and remaining axes values will be zero. In this way we can measure the angles. The MPU6050 consists of a 3-axis Gyroscope with Micro Electro Mechanical System technology. When the gyros are rotated about any of the sense axes, the Coriolis Effect causes a vibration that is detected by a MEM inside MPU6050. Firstly we need to take the reference point or plane where we want to measure angle and then we have the device in such a way that we need to move the device from the start point of the measurement to the end of the measurement. So in this way the device calculates the value while moving the device, so the angle measurement can be seen on the LCD. MPU6050 consists of a 16-bit analog to digital converter hardware. Due to this feature, it captures three-dimension motion at the same time .We get the measurement in 3 coordinate fashion i.e measurement along x-axis, y-axis, z-axis. So, in this way we can calculate the angle in any position and at any angle. Errors inherent in commonly used methods of measuring angular motion errors and squareness errors are analyzed in this paper. New methods, such as the reversal method for angular motion error

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measurement and the displacement method for angular and squareness error measurement. are proposed. So,in this way our device calculates the angle between any planes.It can be used in measuring interior designing, plumbing, road construction.

4. EXPERIMENTAL RESULTS

In this project it includes design and construction of an Angle measuring device .This device uses Arduino Nano,MPU-6050,it is a 3-Axis Accelerometer and Gyro Sensor module uses MPU-6050 which is a little piece of motion processing technology.TheArduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor.MPU6050 is a Micro Electro-mechanical system (MEMS), it consists of three-axis accelerometer and three-axis gyroscope. It helps us to measure velocity, orientation, acceleration, displacement and other motion like features.The MPU6050 includes an embedded temperature sensor that can measure temperature over the range of -40 to 85°C with accuracy of ±1°C.

In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. Specially MPU6050 as it combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon together with an onboard Digital Motion Processor capable of processing complex 9-axis Motion Fusion algorithms and it is a motion measurement electronic board that measures velocity, acceleration, displacement, and other factors.I2C is a serial communication protocol, so data is transferred bit by bit along a single wire (the SDA line). Like SPI, I2C is synchronous, so the output of bits is synchronized to the sampling of bits by a clock signal shared between the master and the slave. The clock signal is always controlled by the master. As it stores our predetermined formula and coding for angles. In our measuring device the device mainly depends on MPU6050 and Arduino Nano. In our device we can get the angle in 3-dimensions ways. But the thing is that first we need to keep a device in some reference position,so by taking that reference angle it can measure the required angle. This device is playing a very crucial role in measurements.

Working in hardware section

The MPU6050 will first measure acceleration and path detection, and the data will then be transferred to the Arduino, which will house all functions and formulae.By using this we can

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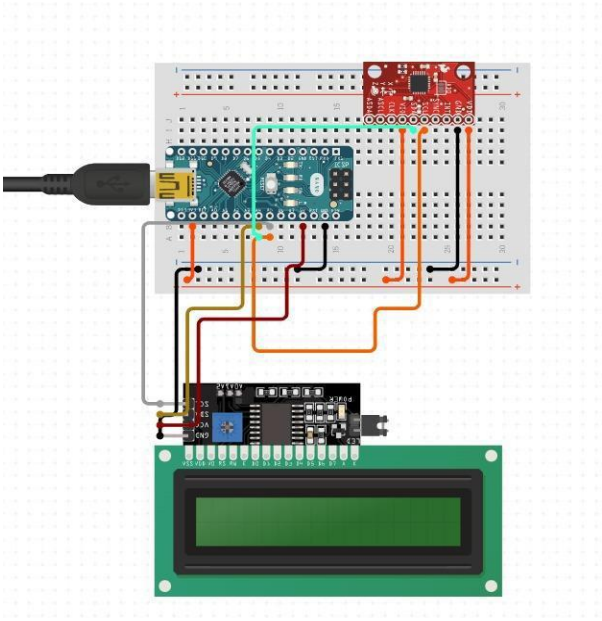
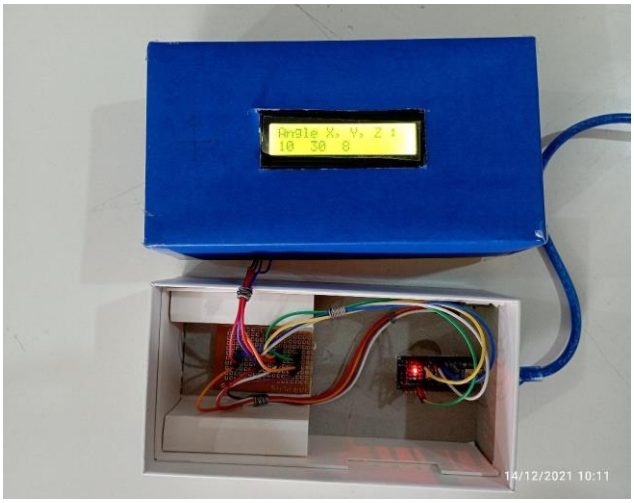
measure the angles in 3 coordinate fashion and the measurement can be seen on the LCD. First we need to place the device in such a way that the base of the device is placed on the object plane. And moving the device upto the point where you want to measure and angle values can be seen on the LCD display which displays the angle value in xy,yz,xz planes fashion.It is used to detect rotational velocity along the XY, YZ, ZX planes as shown in below figure.When the gyros are rotated about any of the sense axes, the Coriolis Effect causes a vibration that is detected by a MEM inside MPU6050. We can measure in vertical, horizontal and in any inclined position. Firstly we need to take the reference point or plane where we want to measure angle and then we have the device in such a way that we need to move the device from the start point of the measurement to the end of the measurement. So in this way the device calculates the value while moving the device, so the angles measurement can be seen on the LCD. MPU6050 consists of a 16-bit analog to digital converter hardware. In the Arduino itself the calculations will be done, and the result will be displayed on the LCD.



Schematic Diagram Of DIGI ANGLE METER



Prototype

5. CONCLUSION

By use MPU6050 we can easily find the angle in any position that is,in horizontal position, vertical position and in any inclined position.This makes the work very easy.It is the main part of our measuring devices due to this the cost of the product is very low.This can be used in

various fields such as in carpentry, plumbing, interior and exterior designing and in roads construction.Angular measurements are playing a very crucial role in measurements. For Angular measurements, there are a wide variety of devices available in metrology. But the measuring device can be preferred based on the type of the component to be measured, and the accuracy and precision required in the measurements. The accuracy of the device is the least count of each device.

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