Research Article

The Gyroscope Design for Location Identification

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Abstract The axes of x, y and z can be identified by gyroscope which has ability to get accurate data of motions for space of three dimensions. Its applications are covered very widely such as in mobile phone, consumer electronics, etc. due to the robust sense abilities of direction and motion. In this paper, it is used to get data from motion and these data are shown in window and LCD screen. The experiment results show that it has good performance.

1. Introduction

The Android operation system (OS) [1-3] provides many sensors that let us to monitor the motion of device. Recently, the Android OS has become a popular platform for mobile phone. Motion sensor such as gyroscope is useful for monitoring device movement. The development of MEMS (micro-electromechanical system) gyroscope is by using the concept of pendulum and vibrating element. The movement which is an action of direct input of controlling but it can also be an actions of the physical environment moving and position. Analog Devices MEMS gyroscopes have ability to sense and measure the angular rate of an object under complex and severe operating conditions. MEMS gyroscope portfolio includes analog and digital output, high vibration and shock immunity, and temperature sensitivity control. Measure an object's rotation in rad/sec over a wide dynamic range and bandwidth [4-6]. The Arduino introduced in 2005 is a free used software and hardware tool such that all designers can develop their products. It is very easy to learn and connect to other devices and sensors. Now it has also become a popular test platform to learn, design and develop any applications [7, 8].

In this paper, the gyroscopeh based Arduino Test Platform is used to get 3D data then show them in window and LCD screen by means of Arduino based 2560 board manufactured by *DMATEK Ltd, Taiwan* [9]. The experimental results show the good performances are possessed.

2. The Arduino and Gyroscope Concept

The Arduino environment is a free software of integrated development environment (IDE) developed by Arduino corp. [10]. The free open-source Arduino Software IDE is an easy software such as it can be wrote code and upload easily to the mother board. It can be executed on Windows, Mac OS X, and Linux. The programs are written by language of Java or C and it is based on processing and other open-source software. This software can be comboned with any Arduino board. After the software is installed in personal computer successfully, then any applications can be developed by connecting any sensors. In this paper, the Arduino ADK is used by combining gyroscope sensor. The Arduino ADK is a microcontroller board based on the ATmega2560. It has a USB host interface to connect with Android based phones, based on the MAX3421e IC. It has 54 digital input/output pins, 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The ADK has 256 KB of flash memory for storing code (of which 8 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM [9].

The programming for gyroscope can be used by the libraries supported by Arduino. At first, the gyroscope borad should be connected with ADK, then select board type and COM port number. There are three steps should be done. First is compiling, 2nd is to upload the machine code to ADK, finally is to open serial window to monitor data of 3D motions. For program diagram is shown in Fig. 1. The data of gyroscope can be shown in window and LCD. The gyroscope diagram is shown in Fig. 2.

Figure 1: The diagram of Arduino program for gyroscope window
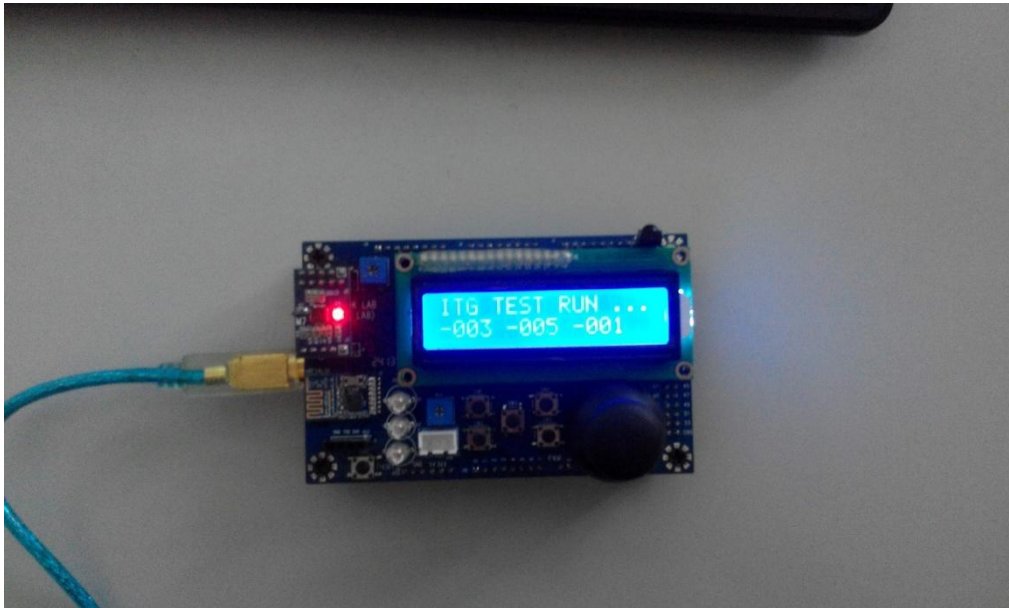

Figure 2: The diagram of gyroscope test platform

3. Experimental Results

In this section, the gyroscope board must be connected with motherboard at first. After connection is successful, the Arduino ADK will run the program. The initial setup gyroscope is successful if the red light of gyroscope board is on such as the diagram shown in Fig. 2. Then the data which unit is rad/s of gyroscope will be transferred to PC's window by using serial port such as in Fig. 3. Meanwhile, the data will be shown in LCD of motherboard which is shown in Fig. 4. In Fig. 3, The bigger value is implied the moving direction of x, y or z. The same conditions are also shown in Fig. 4.

In this paper, the Arduino, gyroscope module is used to test and teach students to learn basic theoretical and implemental applications of gyroscope. From this topic of course of gyroscope control for Arduino board, good experimental results are got in this paper.
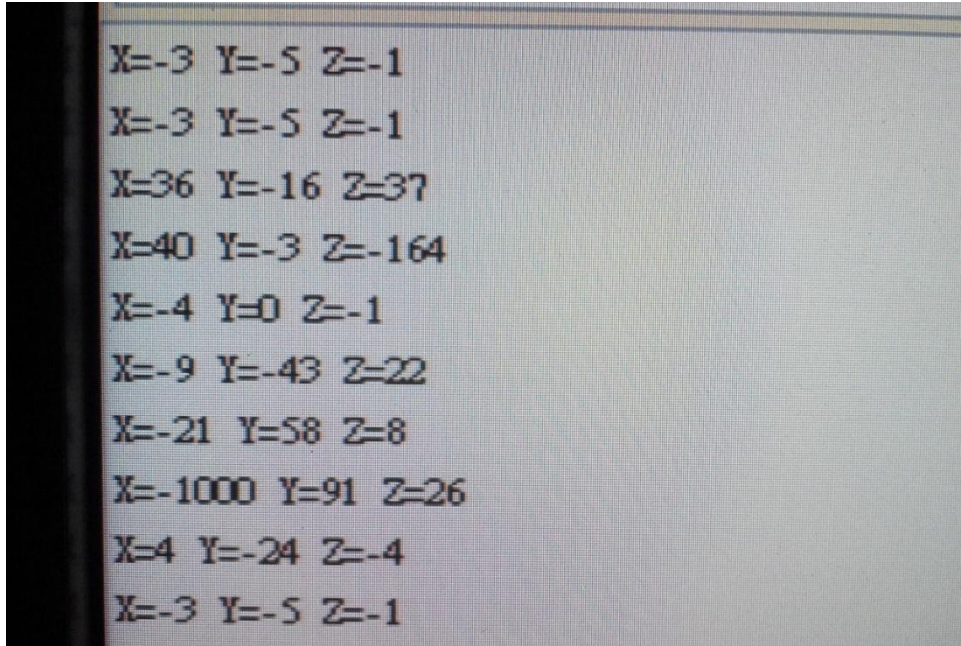

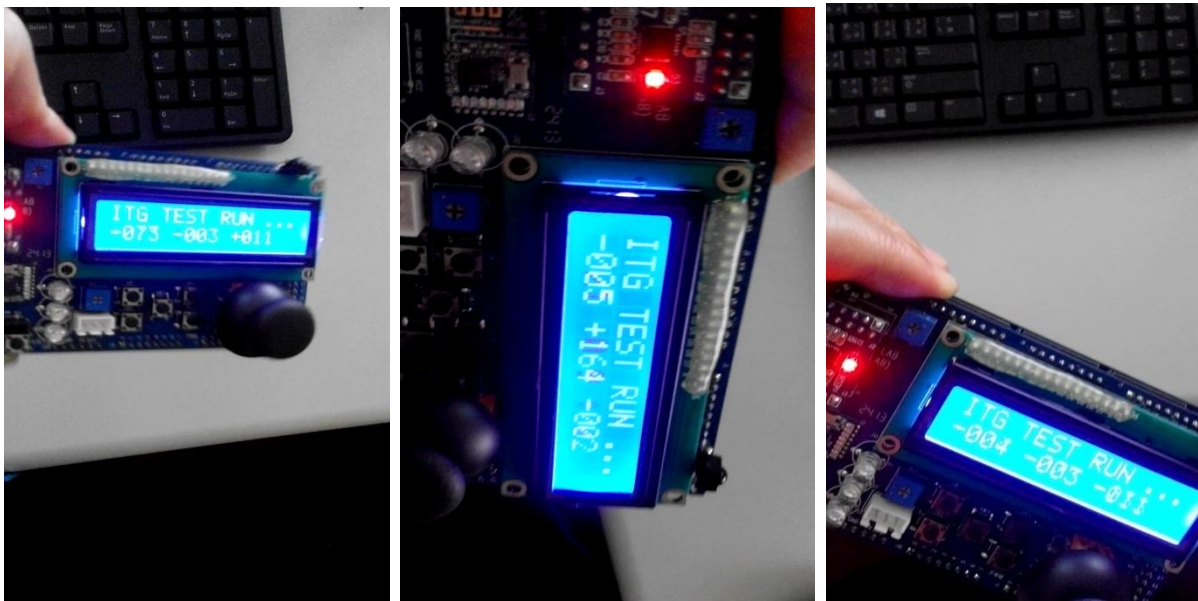*Figure 3: The PC's window shows the data transferred from gyroscope*

Figure 4: The gyroscope data of 3 directions are shown in LCD screen of motherboard

4. Conclusion

In this paper, the gyroscope control for Arduino board has been developed successfully. This is verified by the motherboard and gyroscope module. The development of gyroscope control application can be used to develop other different useful applications such as robotic, consumer electronics and vehicle electronics, etc. The experimental results demonstrate that good performances are achieved.

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