Abstract

This project presents a prototype of a technology called air mouse. Since a mouse provides human-computer interaction, it requires a motion sensor. An Invensense product, ITG-3200 gyroscope and Texas Instruments product, MSP430G2553 microcontroller is used in the project. A gyroscope is a device that measures orientation based on principles of angular momentum. As a mouse sensor which requires motion in two dimension, orientation around X and Y axis are used. PC (Inter-Integrated Circuit) bus structure is created between MSP430 and ITG-3200 and UART (Universal Asynchronous Receiver/Transmitter) module is created between MSP430 and software driver on computer for serial communication.

Hardware library is created for both driving the bus to read gyroscope values and communicate over UART. Calibration for converting degree/second values into 2D mouse motion values are also made on hardware application. These values are sent to software driver and read into a buffer with a java API called RXTX. After values are read, OS (Operating System) mouse cursor is moved with another java API called Robot according to the values in the buffer.

ITG-3200 Library

- PC
  - void init_I2C() - Initialize PC
  - void I2C_nextready() - Check if bus is available
  - void init_gyro() - Configure gyroscope
  - int16_t readX() - Read X motion
  - int16_t readY() - Read Y motion
  - int16_t readZ() - Read Z motion
  - int16_t readWhoAmI() - Read slave address of ITG-3200
  - int16_t readSampleRateDivider() - Read configuration value of sample rate divider
  - int16_t readLowPassFilter() - Read configuration value of low pass filter.

Software Graphical User Interface

Hardware Block Diagram

Results

After testing the raw motion values, it is found that ADC (Analog to digital converter) registers of gyroscope have inner voltage values. Those values are removed while reading on hardware application.

Mouse is calibrated with n² with constant divider algorithm after calibration tests.

Future Work

Since OS mouse works on a 2D scene, yaw orientation (Z axis) is removed from the system. Yaw can be added for implementing the mouse on 3D systems. A control byte before two motion bytes can be added to the protocol for left click, right click and centering the mouse cursor.

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