

# JİROSKOP İLE GELİŞTİRİLMİŞ ELDİVEN FARE

## GYROSCOPE ENHANCED GLOVE MOUSE

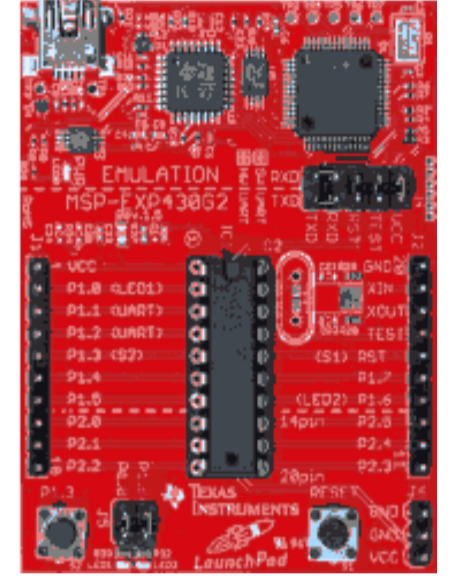
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### Özet

Bu projede "air mouse" olarak adlandırılan bir teknoloji sunulmaktadır. Fare (mouse), insan-bilgisayar etkileşiminde kullanılan önemli bir araçtır. Parmaklarını kullanmakta zorlanan kişiler için geliştirilmiş olan bu eldiven fare, üzerindeki sensör aracılığıyla elin havada yaptığı hareketleri algılamakta ve ekrandaki imleci (cursor) uygun yönde hareket ettirmektedir.



### 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. I<sup>2</sup>C (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

#### • I<sup>2</sup>C

- void init\_I2C() – Initialize I<sup>2</sup>C
- void I2c\_notready() – 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.

#### • Uart

- void InitUart() – Initialize UART
- void serialPrintInteger(int16\_t num) – Print 16-bit integer to serial console
- void serialPrintAscii(int16\_t num) – Print 16-bit value without ascii conversion

#### • Mouse

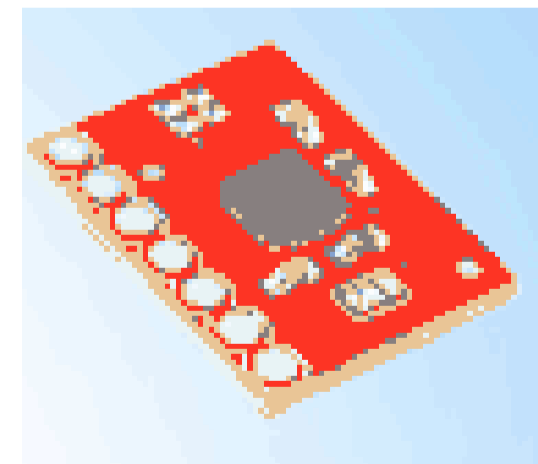
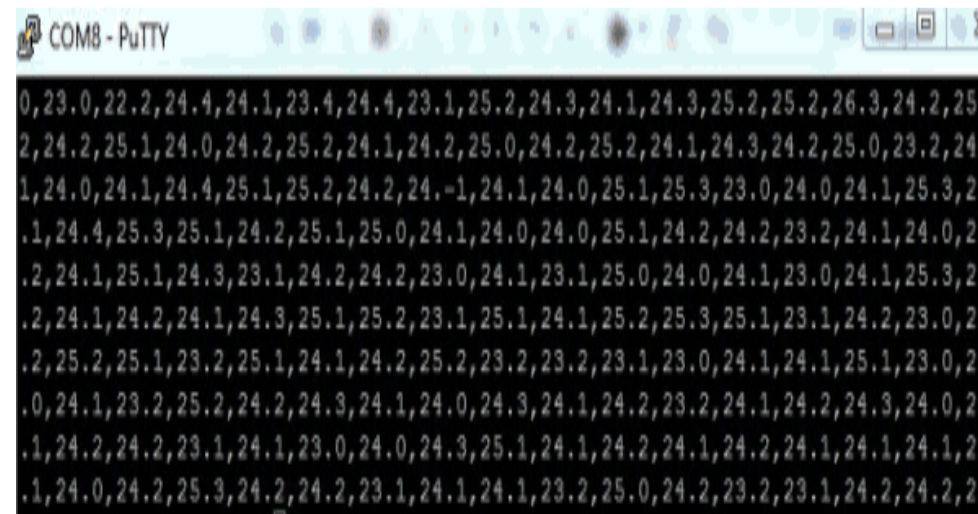
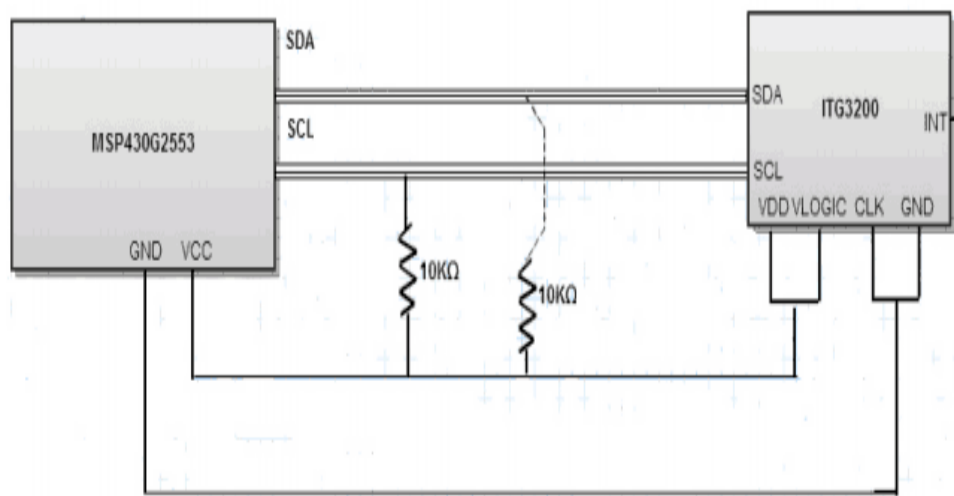
- int16\_t removeHandShaking() – Provide a low pass filter for hand shaking
- int16\_t calibrateMouse() – Calibrate mouse with  $n^2$  growth rate

### Results

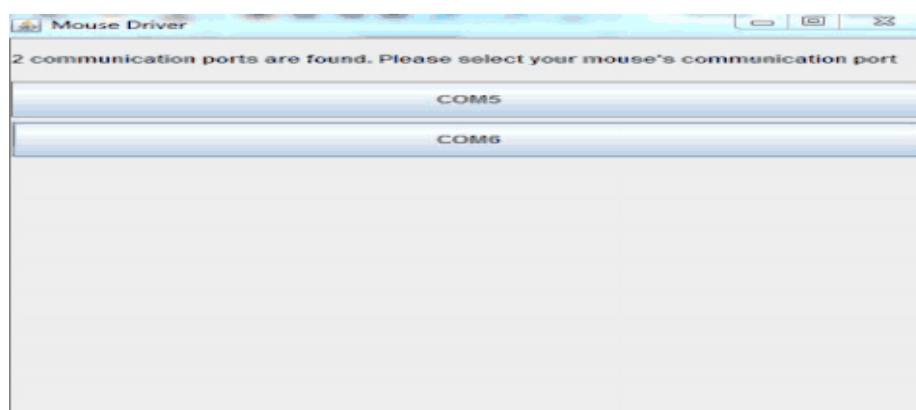
After testing the raw motion values, it is found that ADC (Analog to digital converter) registers of gyroscope have inner voltage values. Those values are removed while reading on hardware application.

Mouse is calibrated with  $n^2$  with constant divider algorithm after calibration tests.

### Hardware Block Diagram



### Software Graphical User Interface



### 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.

After calibration is done, circuit is implemented on a glove for making it user friendly. Female socket for ITG-3200 is glued to a rubber in palm provides portability for gyroscope.

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