

# **Course: Summer Industrial Training 2015**

**Lab Report:** Lab No: 5, Air Mouse

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## **Executive Summary:**

This project was carried out to develop an hovering in-air mouse using the onboard accelerometer MMA8451Q atop the FRDM KL25Z board and implemented using the 'MMA8451Q' and 'USBMouse' APIs.

## **Project Description:**

In-air mouse was implemented using the onboard accelerometer (MMA8451Q) readings obtained, which are actually the voltage readings corresponding to the tilt and distance in the X-Y axes. The values are then multiplied with a sensitivity factor

## **API Description:**

The two important APIs used in this project are -

- USBMouse - This interface is a class in mbed that configures the various aspects related to USB mouse such as cursor coordinates, relative distance, clicking and scrolling etc. Member function of this API used in this project is 'move(x,y)' which moves the cursor in X-Y plane.
- MMA4851Q- This is the interface for the onboard accelerometer atop the FRDM KL25Z board. Syntax: MMA8451Q <object>(DataPin,ClockPin,I2CSlaveAddress).

Member function used from this library was 'getAccX()' and 'getAccy()' which returns the acceleration value in a range of -1 to +1.

### **Output Observed:**

After the correct interface was carried out, it was observed that the mouse cursor moves as per the direction of tilt of the FRDM KL25Z board. Hovering of the cursor on computer screen was proportionate to the degree of tilt of accelerometer in X-Y axes. The sensitivity was adjusted and observed.

### **Test and Debug:**

- ✓ Tried to implement clicks using the other member functions of the MMA8451Q accelerometer class. Requires TSI Sensor library.
- ✓ Tested the various values for sensitivity of the accelerometer values.
- ✓ Debugged the 'int16\_t' data-type error. Learnt the use of '\_t'.
- ✓ Used a serial plotter to study the variation in coordinate axes just for the accelerometer testing.

### **Learning Outcomes:**

- Learnt the interface of FRDM KL25Z as an in-air mouse.
- Studied the important APIs like the USBMouse and MMA8451Q interface along with their member functions to carry out operations like move and click.
- Learnt the concepts of absolute and relative coordinate mapping for the mouse cursor.

## APPENDIX A

### Code:

```
#include "mbed.h" // Library for mbed platform

#include "MMA8451Q.h" // Library to employ the I2C communication with
onboard accelerometer

#include "USBMouse.h" // Library file for using USB Mouse functions

#define MMA8451_I2C_ADDRESS (0x1d<<1) // Global declaration for the
slave address of the register.

USBMouse mouse; // an object 'mouse' created

int main()
{
    MMA8451Q acc (PTE25, PTE24, MMA8451_I2C_ADDRESS); //
        Data pin, clock, accelerometer I2C slave address used as
        argument

    int16_t Xaxis, Yaxis ; // Variables defined for three axes

    int sen=100 ; // Variable for sensitivity

    while (1)
    {
        Xaxis = sen*(acc.getAccX()); // X axis acceleration between -1 to +1
        Yaxis = -sen*(acc.getAccY()); // Y axis acceleration between -1 to +1
        mouse.move(Xaxis, Yaxis); // Format to move the cursor and
            also to send serial data to plotter

        wait(0.01); // delay for 0.01 milliseconds
    }
}
```