EECS 363: Digital Filtering
Lab 5 - 2/25/2017
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Code:

Main File:

```
/*****************************************************************************/
/*                                                                           */
/* FILENAME                                                                  */
/*      main.c                                                                 */
/*                                                                           */
/* DESCRIPTION                                                               */
/*   TMS320C5505 USB Stick. Application 1. Getting started.                 */
/*   Take microphone input and send to headphones.                           */
/*                                                                           */
/* REVISION                                                                  */
/*   Revision: 1.00                                                         */
/*   Author  : Richard Sikora                                                */
/*---------------------------------------------------------------------------*/
/*                                                                           */
/* HISTORY                                                                   */
/*   Revision: 1.00                                                          */
/*   5th March 2010. Created by Richard Sikora from TMS320C5510 DSK code.    */
/*                                                                           */
/*****************************************************************************/
/*
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 *
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 *
*/

#include "stdio.h"
#include "csl_i2s.h"
#include "csl_intc.h"
#include "usbstk5505.h"
#include "usbstk5505_led.h" // added for led control
#include "aic3204.h"
//#include "usbstk5505_gpio.h"//added, compiles without
//#include "usbstk5505_i2c.h"//added, compiles without
#include "PLL.h"
#include "stereo.h"
#include "stereo.c"
#include "Dsplib.h"
#include "coefficients.h"  //header for coefficients with length 41
#include "coefficients1.h" //header for coefficients with length 16


Int16 left_input; //do these interfere with declarations in aic3204.c?
Int16 right_input;
Int16 left_output;
Int16 right_output;
Int16 mono_input;
Int16 x;
Int16 y;

static DATA *dbptr = db;
//static DATA *dbptr1 = db1;

#define SAMPLES_PER_SECOND 1500000
unsigned long i = 0;
unsigned long xstart = 0;
unsigned long j = 0; //added for led control
short toggle = 0; //added for led control


/* ------------------------------------------------------------------------ *
 *                                                                          *
 *  main( )                                                                 *
 *                                                                          *
 * ------------------------------------------------------------------------ */
interrupt void codec_read_isr(void);

void main( void )
{
  //  static DATA *dbptr = db;
    /* Initialize BSL */
    USBSTK5505_init( );
    USBSTK5505_LED_init(); //added for LED control
```

```
      /* Initialize PLL */
      pll_frequency_setup(100);

    /* Initialise hardware interface and I2C for code */

    aic3204_hardware_init();

    /* Initialise the AIC3204 codec */
      aic3204_init();

    printf("\n\nRunning Getting Started Project\n");
    printf( "<-> Audio Loopback from Stereo IN --> to HP/Lineout\n" );

      /* Setup sampling frequency and 30dB gain for microphone */
    set_sampling_frequency_and_gain(SAMPLES_PER_SECOND, 0);// was 30 dB; I changed.

    asm(" bclr XF");

    IRQ_plug(RCV2_EVENT, &codec_read_isr);
    IRQ_enable(RCV2_EVENT);
    IRQ_globalEnable();

      while(1)
      {

     // begin segment for led control
     if (j++ == SAMPLES_PER_SECOND)
      {
      toggle = 1-toggle;
      asm(" SSBX INTM");
      if (toggle)
        USBSTK5505_LED_on(0);
      else
        USBSTK5505_LED_off(0);
          j = 0;
      }
     // end segment for led control
     asm(" RSBX INTM");
      }

   /* Disable I2S and put codec into reset */
    aic3204_disable();

    printf( "\n***Program has Terminated***\n" );
    SW_BREAKPOINT;
}

/* ----------------------------------------------------------------------- *
 *                                                                         *
 *  End of main.c                                                          *
 *                                                                         *
 * ----------------------------------------------------------------------- */
interrupt void codec_read_isr(void)
{
```

```
    if (I2S2_IR & RcvR)
    {
        left_input = I2S2_W0_MSW_R;         // Read Most Significant Word of first
channel
        right_input = I2S2_W1_MSW_R;        // Read Most Significant Word of second
channel

        x = left_input;
        fir(&x,h,&y,dbptr,NX,NH);
        //fir(&x,h1,&y,dbptr1,NX1,NH1);  // averaging the 16 most recent inputs
        left_output = y;
        right_output = right_input;          // Directly connect inputs to outputs.

        I2S2_W0_MSW_W = left_output;         // Left output
        I2S2_W1_MSW_W = right_output;        // Right output
    }
    return;
}
```

Header File for length 41:

```
/*
 * coefficients.h
 *
 *  Created on: Feb 22, 2017
 *      Author: Karan
 */

#ifndef COEFFICIENTS_H_
#define COEFFICIENTS_H_

#define NX 1
#define NH 41
/*                                      */
/* The type DATA is equivalent to       */
/* short and Int16.                     */
/*                                      */
#pragma DATA_SECTION(db,".dbuffer")
DATA db[NH+2];

#pragma DATA_SECTION(h,".coeffs")
DATA h[NH] =
{ /* filter impulse response */
  -293,
  -215,
  2,
  328,
  494,
  340,
  20,
  -115,
  90,
  320,
```

```
  27,
  -944,
  -1930,
  -1812,
  -29,
  2621,
  4272,
  3358,
  21,
  -3721,
  27423,
  -3721,
  21,
  3358,
  4272,
  2621,
  -29,
  -1812,
  -1930,
  -944,
  27,
  320,
  90,
  -115,
  20,
  340,
  494,
  328,
  2,
  -215,
  -293,
};

#endif /* COEFFICIENTS_H_ */
```

Header File for length 16:

```
/*
 * coefficeints1.h
 *
 *  Created on: Feb 24, 2017
 *      Author: Karan
 */

#ifndef COEFFICIENTS1_H_
#define COEFFICIENTS1_H_


#define NX1 1
#define NH1 16
#define INPUT_LENGTH 16
/*                                      */
/* The type DATA is equivalent to       */
/* short and Int16.                     */
/*                                      */
```

```
#pragma DATA_SECTION(db1,".dbuffer")
DATA db1[NH1+2];

#pragma DATA_SECTION(h1,".coeffs")
DATA h1[NH1] =
{ /* filter impulse response */
  -293,
  -215,
  2,
  328,
  494,
  340,
  20,
  -115,
  90,
  320,
  27,
  -944,
  -1930,
  -1812,
  -29,
  2621,
};

#endif /* COEFFICIENTS1_H_ */
```