/// Arduino code for controlling 2 DDS boards ( for levitation and lateral frequency ) by receiving control signals through input pins 1-4 and generating 2 separate sine waves through output pins 5-10.

/// The assigned pins for the levitation sine wave are 4, 5, 6 and 7 while pins 1, 2, 3 and 8,9,10 are for the lateral frequency sine wave. The first DDS for levitation sinewave is generated by CLOCK1,DATA1 and LOAD1 while CLOCK2,DATA2 and LOAD2 are for the second DDS for lateral frequency.

// Declaration Part

// these constants won't change:

// input channels 1 to 4

// lateral frequency input pins 1,2 and 3

const int digitPin1 = 1; // the least significant bit

const int digitPin2 = 2; // the most significant bit

const int digitPin3 = 3; // lateral frequency status pin

#define DDS\_CLOCK1 125000000

const long fp = 2382000;

const long Z1 = 0; //to disactivate levitation frequency

const int digitPin4 = 4; // levitation frequency status pin

#define DDS\_CLOCK2 125000000

const long f1 = 2480000;

const long f2 = 2536000;

const long f3 = 2568000;

const long f4 = 2814000;

const long f5 = 2382000;

const long Z2 = 0; // to disactivate lateral frequency

// output channels 5 to 10

byte CLOCK1 =5;

byte LOAD1 = 6;

byte DATA1 = 7;

byte DATA2 = 8;

byte LOAD2 = 9;

byte CLOCK2 =10;

byte LED = 13;

byte LED\_state=0;

// variables will change

int Input1=0;

int Input2=0;

int Input3 =0;

int Input4=0; // levitation frequency detector

// initialisation of I/O pins

void setup() {

// initialize the input pin 1,2,3,4

pinMode(digitPin1, INPUT);

pinMode(digitPin2, INPUT);

pinMode(digitPin3, INPUT);

pinMode(digitPin4, INPUT);

// initialize the out pins 5 to 10

pinMode (CLOCK1, OUTPUT); // sets pin 5 as OUTPUT

pinMode (LOAD1, OUTPUT); // sets pin 6 as OUTPUT

pinMode (DATA1, OUTPUT); // sets pin 7 as OUPUT

pinMode (DATA2, OUTPUT); // sets pin 8 as OUTPUT

pinMode (LOAD2, OUTPUT); // sets pin 9 as OUTPUT

pinMode (CLOCK2, OUTPUT); // sets pin 10 as OUPUT

pinMode (LED, OUTPUT);

delay(200);

}

// both frequencies are controlled simultaneously

void loop()

{

Levitation();

Lateral();

}

// levitation frequency loop

void Levitation()

{

Input4 = digitalRead(digitPin4);

if(Input4==HIGH)

sendFrequencyPrimary(fp);

else

sendFrequencyPrimary(Z1); // set frquency to zero.

}

// lateral frequency loop

void Lateral()

{

Input1 = digitalRead(digitPin1);

Input2 = digitalRead(digitPin2);

Input3 = digitalRead(digitPin3);

if(Input1 == HIGH & Input2 == LOW & Input3 == LOW)// activate first frequency

sendFrequency(f1);

else if (Input1 == LOW &Input2 == HIGH & Input3 == LOW )// activate second frequency

sendFrequency(f2);

else if (Input1 == LOW &Input2 == HIGH & Input3 == HIGH )// activate third frequency

sendFrequency(f3);

else if (Input1 == LOW &Input2 == LOW & Input3 == HIGH )// activate fourth frequency

sendFrequency(f4);

else if (Input1 == HIGH &Input2 == LOW & Input3 == HIGH )// activate fourth frequency

sendFrequency(f5);

else // the current State is low

sendFrequency(Z2); // set lateral frequency to zero

}

////////////////////////////////////////////////////////////////////////////////////////////

void sendFrequencyPrimary(unsigned long frequency) // this function for making the levitation sinewave.

{

unsigned long tuning\_word1 = (frequency \* pow(2, 24)) / (DDS\_CLOCK1/256);

digitalWrite (LOAD1, LOW); // take load pin low

for(int i = 0; i < 32; i++)

{

if ((tuning\_word1 & 1) == 1)

outOne1();

else

outZero1();

tuning\_word1 = tuning\_word1 >> 1;

}

byte\_out1(0x00);

digitalWrite (LOAD1, HIGH); // Take load pin high again

digitalWrite (LOAD1, LOW);

}

void byte\_out1(unsigned char byte)

{

int i;

for (i = 0; i < 8; i++)

{

if ((byte & 1) == 1)

outOne1();

else

outZero1();

byte = byte >> 1;

}

}

void outOne1()

{

digitalWrite(CLOCK1, LOW);

digitalWrite(DATA1, HIGH);

digitalWrite(CLOCK1, HIGH);

digitalWrite(DATA1, LOW);

}

void outZero1()

{

digitalWrite(CLOCK1, LOW);

digitalWrite(DATA1, LOW);

digitalWrite(CLOCK1, HIGH);

}

////////////////////////////////////////////////////////////////////////////////////////////

void sendFrequency(unsigned long frequency) // this function for making the lateral sinewave.

{

unsigned long tuning\_word2 = (frequency \* pow(2, 24)) / (DDS\_CLOCK2/256);

digitalWrite (LOAD2, LOW); // take load pin low

for(int i = 0; i < 32; i++)

{

if ((tuning\_word2 & 1) == 1)

outOne2();

else

outZero2();

tuning\_word2 = tuning\_word2 >> 1;

}

byte\_out2(0x00);

digitalWrite (LOAD2, HIGH); // Take load pin high again

digitalWrite (LOAD2, LOW);

}

void byte\_out2(unsigned char byte)

{

int i;

for (i = 0; i < 8; i++)

{

if ((byte & 1) == 1)

outOne2();

else

outZero2();

byte = byte >> 1;

}

}

void outOne2()

{

digitalWrite(CLOCK2, LOW);

digitalWrite(DATA2, HIGH);

digitalWrite(CLOCK2, HIGH);

digitalWrite(DATA2, LOW);

}

void outZero2()

{

digitalWrite(CLOCK2, LOW);

digitalWrite(DATA2, LOW);

digitalWrite(CLOCK2, HIGH);

}