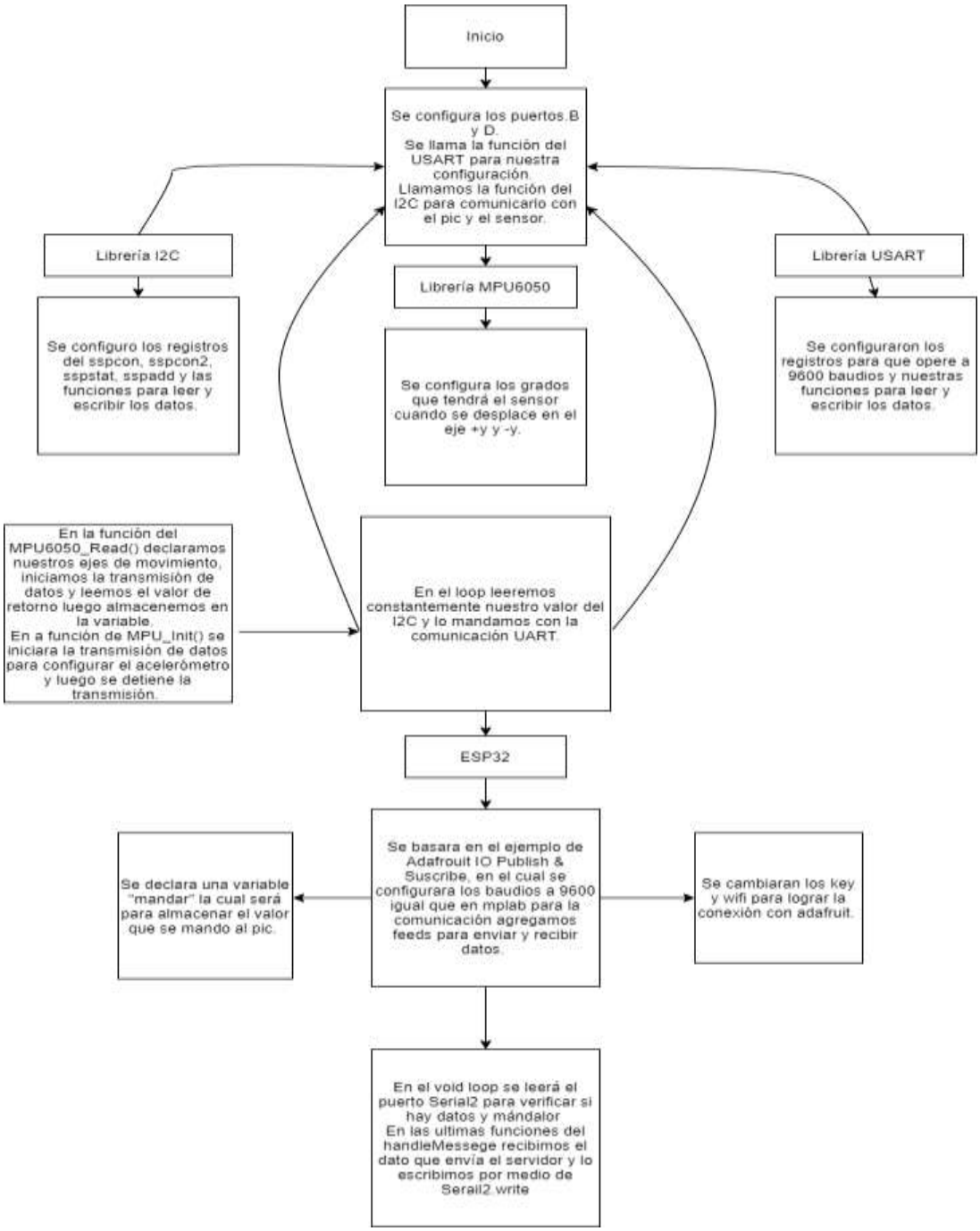
Universidad Del Valle De Guatemala 10/03/2021

Digital 2 Helder Ovalle Barrios

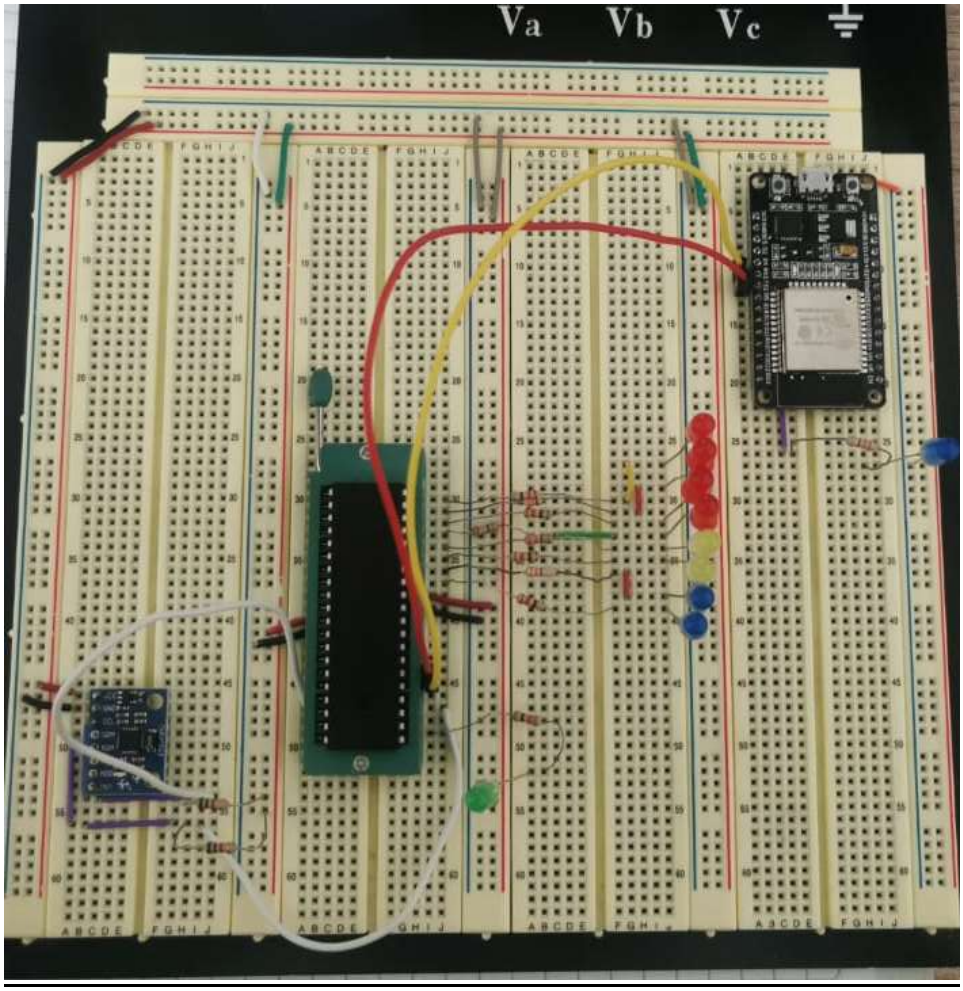
Sección: 20 18349

MiniProyecto#2

Diagrama de flujo:



Esquematico:



Link de github:

https://github.com/Helder1121/Labsdigitaldos/tree/main/Mini_proyectodos

Link de youtube:

https://www.youtube.com/watch?v=c1iKabxvNJ0

Link de Adafruit:

https://io.adafruit.com/Helder1131/dashboards

Progra comentada:

Principal:

```
//**************************************************************************

// Palabra de configuración
```

```
//******************************************************************************

// CONFIG1

#pragma config FOSC = INTRC_NOCLKOUT // Oscillator Selection bits (INTOSCIO oscillator: I/O function on RA6/OSC2/CLKOUT pin, I/O function on RA7/OSC1/CLKIN)

#pragma config WDTE = OFF       // Watchdog Timer Enable bit (WDT disabled and can be enabled by SWDTEN bit of the WDTCON register)

#pragma config PWRTE = OFF      // Power-up Timer Enable bit (PWRT disabled)

#pragma config MCLRE = OFF      // RE3/MCLR pin function select bit (RE3/MCLR pin function is MCLR)

#pragma config CP = OFF         // Code Protection bit (Program memory code protection is disabled)

#pragma config CPD = OFF        // Data Code Protection bit (Data memory code protection is disabled)

#pragma config BOREN = OFF      // Brown Out Reset Selection bits (BOR disabled)

#pragma config IESO = ON        // Internal External Switchover bit (Internal/External Switchover mode is enabled)

#pragma config FCMEN = ON       // Fail-Safe Clock Monitor Enabled bit (Fail-Safe Clock Monitor is enabled)

#pragma config LVP = OFF        // Low Voltage Programming Enable bit (RB3 pin has digital I/O, HV on MCLR must be used for programming)


// CONFIG2

#pragma config BOR4V = BOR21V   // Brown-out Reset Selection bit (Brown-out Reset set to 2.1V)

#pragma config WRT = OFF        // Flash Program Memory Self Write Enable bits (Write protection off)


//******************************************************************************

// Importación de librerías

//******************************************************************************

#include <xc.h>

#include <stdio.h>

//#include "config.h"
```

```
#include "USART.h"
#include "MPU.h"

//*****************************************************************************
// Variables
//*****************************************************************************
#define _XTAL_FREQ 8000000



//*****************************************************************************
// Ciclo principal
//*****************************************************************************
void main(void){

   UART_TX_Init();
   TRISD2 = 0;    // LED Indicador
   TRISB = 0;     // Leds conectadas para demostrar la variable ay
   ANSELH = 0;

   MPU6050_Init();
   //**************************************************************************
   // Loop principal
   //**************************************************************************
   while(1)
         {
      RD2 = ~RD2;  // Blink LED verde
      MPU6050_Read();
      __delay_ms(50);
   }
```

```
   return;
}
//Se hizo con oscilador externo al inicio pero no era tan establa y mejor se
//hizo con uno interno.
```

Librerias:

```
/*
 * File:   USART.c
 * Author: betov
 *
 * Created on 22 de febrero de 2021, 07:53 AM
 */
//Extraido de:
//https://deepbluembedded.com/mpu6050-with-microchip-pic-accelerometer-gyroscope-interfacing-with-pic/
//y combinacion del proyecto pasado que tambien era de:
////Extraido de https://electrosome.com/
#include <xc.h>
#include "USART.h"



//---------------[ UART Routines ]------------------
//--------------------------------------------------

void UART_TX_Init(void)
{
  BRGH  = 0;   // Set For High-Speed Baud Rate
  SPBRG = 12;  // Set The Baud Rate To Be 9600 bps
  //--[ Enable The Ascynchronous Serial Port ]--
  SYNC = 0;
```

```
  SPEN = 1;
  //--[ Set The RX-TX Pins to be in UART mode (not io) ]--
  TX_D = 1;
  RX_D = 1;
  TXEN = 1;  // Enable UART Transmission
}

void UART_Write(unsigned char data)
{
  while(!TRMT);
  TXREG = data;
}

void UART_Write_String(char* buf)
{
    int i=0;
    while(buf[i] != '\0')
        UART_Write(buf[i++]);
}
/*
 * File:   MPU.c
 * Author: betov
 *
 * Created on 9 de marzo de 2021, 01:08 AM
 */
//Extrado de: https://deepbluembedded.com/mpu6050-with-microchip-pic-accelerometer-gyroscope-interfacing-with-pic/
#include <xc.h>
#include "I2c.h"
```

```
#include "MPU.h"
#include "USART.h"  // for debugging serial terminal
#include <stdio.h>

//-------------[ MPU6050 Routines ]------------------
//---------------------------------------------------

void MPU6050_Init()
{
  // Power-Up Delay & I2C_Init
  __delay_ms(100);
  I2C_Master_Init();

  // Setting The Sample (Data) Rate
  I2C_Start(0xD0);
  I2C_Master_Write(SMPLRT_DIV);
  I2C_Master_Write(0x07);
  I2C_Master_Stop();

  // Setting The Clock Source
  I2C_Start(0xD0);
  I2C_Master_Write(PWR_MGMT_1);
  I2C_Master_Write(0x01);
  I2C_Master_Stop();

  // Configure The DLPF
  I2C_Start(0xD0);
  I2C_Master_Write(CONFIG);
  I2C_Master_Write(0x00);
```

```
  I2C_Master_Stop();

  // Configure The ACCEL (FSR= +-2g)
  I2C_Start(0xD0);
  I2C_Master_Write(ACCEL_CONFIG);
  I2C_Master_Write(0x00);
  I2C_Master_Stop();

  // Configure The GYRO (FSR= +-2000d/s)
  I2C_Start(0xD0);
  I2C_Master_Write(GYRO_CONFIG);
  I2C_Master_Write(0x18);
  I2C_Master_Stop();

  // Enable Data Ready Interrupts
  I2C_Start(0xD0);
  I2C_Master_Write(INT_ENABLE);
  I2C_Master_Write(0x01);
  I2C_Master_Stop();
}

void MPU6050_Read()
{
  char buffer[40];
  int Ax,Ay,Az,T,Gx,Gy,Gz;
  // Prepare For Reading, Starting From ACCEL_XOUT_H
  I2C_Start(0xD0);
  I2C_Master_Write(ACCEL_XOUT_H);
  I2C_Master_Stop();
```

```
  I2C_Start(0xD1);
  Ax = ((int)I2C_Read(0)<<8) | (int)I2C_Read(0);
  Ay = ((int)I2C_Read(0)<<8) | (int)I2C_Read(0);
  Az = ((int)I2C_Read(0)<<8) | (int)I2C_Read(0);
  T  = ((int)I2C_Read(0)<<8) | (int)I2C_Read(0);
  Gx = ((int)I2C_Read(0)<<8) | (int)I2C_Read(0);
  Gy = ((int)I2C_Read(0)<<8) | (int)I2C_Read(0);
  Gz = ((int)I2C_Read(0)<<8) | (int)I2C_Read(1);
  I2C_Master_Stop();

  PORTB = (Ay+16384)/128;//Conversion para los datos de la variable ay del
  //acelerometro

  sprintf(buffer," Ay = %d    ",Ay);
  UART_Write_String(PORTB);
}
/*
 * File:   I2c.c
 * Author: betov
 *
 * Created on 9 de marzo de 2021, 01:09 AM
 */
//Extraido de: https://deepbluembedded.com/mpu6050-with-microchip-pic-accelerometer-gyroscope-interfacing-with-pic/
#include <xc.h>
#include "I2c.h"

//---------------[ I2C Routines ]-------------------
//--------------------------------------------------
```

```
void I2C_Master_Init()
{
  SSPCON  = 0x28;
  SSPCON2 = 0x00;
  SSPSTAT = 0x00;
  SSPADD = ((_XTAL_FREQ/4)/I2C_BaudRate) - 1;
  SCL_D = 1;
  SDA_D = 1;
}

void I2C_Master_Wait()
{
   while ((SSPSTAT & 0x04) || (SSPCON2 & 0x1F));
}

void I2C_Master_Start()
{
   I2C_Master_Wait();
   SEN = 1;
}

void I2C_Start(char add)
{
   I2C_Master_Wait();
   SEN = 1;
   I2C_Master_Write(add);
}
```

```
void I2C_Master_RepeatedStart()
{
   I2C_Master_Wait();
   RSEN = 1;
}

void I2C_Master_Stop()
{
   I2C_Master_Wait();
   PEN = 1;
}

void I2C_ACK(void)
{
          ACKDT = 0;                    // 0 -> ACK
   ACKEN = 1;                  // Send ACK
   while(ACKEN);
}

void I2C_NACK(void)
{
          ACKDT = 1;                    // 1 -> NACK
          ACKEN = 1;                    // Send NACK
   while(ACKEN);
}

unsigned char I2C_Master_Write(unsigned char data)
{
   I2C_Master_Wait();
```

```
    SSPBUF = data;
    while(!SSPIF);  // Wait Until Completion
            SSPIF = 0;
    return ACKSTAT;
}

unsigned char I2C_Read_Byte(void)
{
    //---[ Receive & Return A Byte ]---
    I2C_Master_Wait();
    RCEN = 1;                   // Enable & Start Reception
            while(!SSPIF);      // Wait Until Completion
            SSPIF = 0;                      // Clear The Interrupt Flag Bit
    I2C_Master_Wait();
    return SSPBUF;              // Return The Received Byte
}

unsigned char I2C_Read(unsigned char ACK_NACK)
{
    //---[ Receive & Return A Byte & Send ACK or NACK ]---
    unsigned char Data;
    RCEN = 1;
    while(!BF);
    Data = SSPBUF;
    if(ACK_NACK==0)
       I2C_ACK();
    else
       I2C_NACK();
    while(!SSPIF);
```

```
   SSPIF=0;
   return Data;
}
```

Porgra de arduino:

```
// Adafruit IO Publish & Subscribe Example
//
// Adafruit invests time and resources providing this open source code.
// Please support Adafruit and open source hardware by purchasing
// products from Adafruit!
//
// Written by Todd Treece for Adafruit Industries
// Copyright (c) 2016 Adafruit Industries
// Licensed under the MIT license.
//
// All text above must be included in any redistribution.

/********* Configuration ************/

// edit the config.h tab and enter your Adafruit IO credentials
// and any additional configuration needed for WiFi, cellular,
// or ethernet clients.
#include "config.h"

/******** Example Starts Here ***********/

// this int will hold the current count for our sketch
int mandar = 0;
int LED2 = 0;
```

```
#define LED_PIN 2
#define RXD2 16
#define TXD2 17
// Track time of last published messages and limit feed->save events to once
// every IO_LOOP_DELAY milliseconds.
//
// Because this sketch is publishing AND subscribing, we can't use a long
// delay() function call in the main loop since that would prevent io.run()
// from being called often enough to receive all incoming messages.
//
// Instead, we can use the millis() function to get the current time in
// milliseconds and avoid publishing until IO_LOOP_DELAY milliseconds have
// passed.
#define IO_LOOP_DELAY 5000
unsigned long lastUpdate = 0;

// set up the 'counter' feed
AdafruitIO_Feed *mandarFeed = io.feed("mandar");
AdafruitIO_Feed *recibirFeed = io.feed("recibir");
AdafruitIO_Feed *LEDREDFeed = io.feed("LEDRED");

void setup() {
  pinMode(LED_PIN, OUTPUT);
  pinMode(22, OUTPUT);
  pinMode(23, OUTPUT);
  // start the serial connection
  Serial.begin(9600);
  Serial2.begin(9600, SERIAL_8N1, RXD2, TXD2);
  delay(1000);
```

```
  // wait for serial monitor to open
  while (! Serial);

  Serial.print("Connecting to Adafruit IO");

  // connect to io.adafruit.com
  io.connect();

  // set up a message handler for the count feed.
  // the handleMessage function (defined below)
  // will be called whenever a message is
  // received from adafruit io.
  recibirFeed->onMessage(handleMessage);
  LEDREDFeed->onMessage(handleMessage2);

  // wait for a connection
  while (io.status() < AIO_CONNECTED) {
    Serial.print(".");
    delay(500);
  }

  // we are connected
  Serial.println();
  Serial.println(io.statusText());
  recibirFeed->get();
  LEDREDFeed->get();

}
```

```
void loop() {
  if(Serial.available()){
    Serial.write("-");
    Serial2.write(Serial.read());
    //LED

   }
   if(Serial2.available()> 0){
    //Serial.write(Serial2.read());
    mandar = Serial2.read();
    Serial.println(Serial2.read());

   }

  // io.run(); is required for all sketches.
  // it should always be present at the top of your loop
  // function. it keeps the client connected to
  // io.adafruit.com, and processes any incoming data.
  io.run();

  //enviar=random(0,100);
  if (millis() > (lastUpdate + IO_LOOP_DELAY)) {
    // save count to the 'counter' feed on Adafruit IO
    Serial.print("Valor de PIC -> ");
    Serial.println(mandar);//Valor que se manda del pic
    mandarFeed->save(mandar);

    // increment the count by 1
```

```
    //count++;

    // after publishing, store the current time
    lastUpdate = millis();
  }
  delay(3000);

}

// this function is called whenever a 'counter' message
// is received from Adafruit IO. it was attached to
// the counter feed in the setup() function above.
void handleMessage(AdafruitIO_Data *data) {

  Serial.print("received <- ");
  Serial.println(data->value());

  if (data->toString() == "ON") { //enciende el LED azul
    digitalWrite(LED_PIN, HIGH);
  }
  if (data->toString() == "OFF") {    //apaga el LED azul
    digitalWrite(LED_PIN, LOW);
  }
}
void handleMessage2(AdafruitIO_Data *data) {

  Serial.print("received <- ");
  Serial.println(data->value());
```

```
  if(data->toString() == "ON"){      //enciende el LED azul
   digitalWrite(22, HIGH);
   Serial.print("LEDRED");
   }

  if(data->toString() == "OFF"){   //apaga el LED azul
   digitalWrite(22, LOW);
   Serial.print("LEDRED");
   }
}
```