Development of a Cardiogoniometry Device

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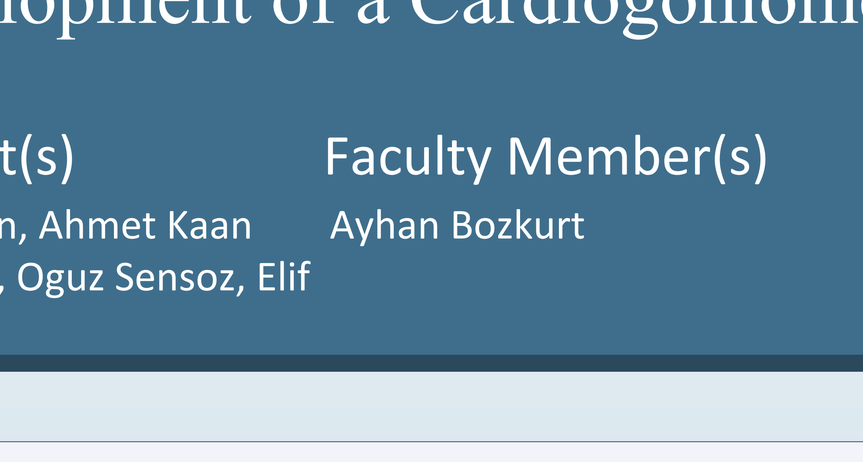
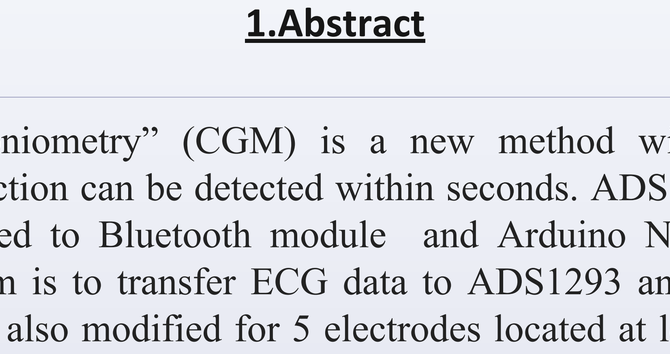
1.Abstract

"Cardiogoniometry" (CGM) is a new method with which a hidden infarction can be detected within seconds. ADS1293 is used and connected to Bluetooth module and Arduino Nano for this purpose. Aim is to transfer ECG data to ADS1293 and display it. ADS1293 is also modified for 5 electrodes located at left-right leg, left-right arm and back.





2.Programming

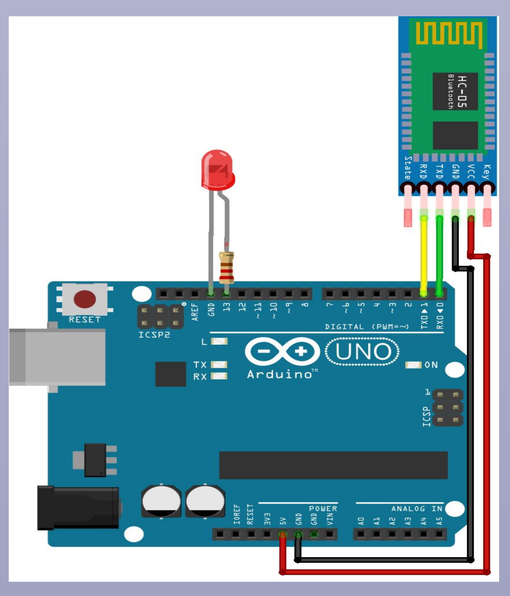
ADS1293 is supported by SPI interface which enable a communication between ADS1293 and Arduino Nano. Bluetooth module is also connected with Arduino Nano.

2.1Arduino Nano

HC05/06 Arduino Bluetooth Module is used and coded.This code shown above sets the output pin at 13 which our lamp/led connected, and let the android program for controlling the led with bluetooth module.

TX part has to connected to the RX port of Arduino Nano and RX port has to connected to the TX port for proper interaction.

```
char data = 0;
void setup()
{
    Serial.begin(9600);
    pinMode(13, OUTPUT);  //Pin setted to 13
}
void loop()
{
   if(Serial.available() > 0)
   {
      data = Serial.read();
      Serial.print(data);
      Serial.print("\n");
      if(data == '1')
         digitalWrite(13, HIGH);   //LED turns ON if data is 1
      else if(data == '0')
         digitalWrite(13, LOW);    //LED turns OFF if data is 0
   }
}
```



2.2 Touch Sensor and ADS1293

Touch sensor understands our movement however does not show on the ECG Plotter which is shown in above picture`s graph. So we used VIDLE for VPython to make communication between arduino and ECG Plotter.

This code helps python code to work on arduino board, so we completed the communication between arduino and ECG plotter screen.we can draw the signals on the screen by touching the arduino board.

```
sketch_jan18a

// the setup routine runs once when you press reset:
void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(115200);
}

// the loop routine runs over and over again forever:
void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);
  // print out the value you read:
  //Serial.println(sensorValue);
  Serial.print(sensorValue);
  Serial.print("\n");
  delay(10);        // delay in between reads for stability
}
```


```
//define the used pin number on the arduino
int mosi = 11;
int miso = 12;
int sck = 13;
int drdyb = 6;
int csb = 10;
char wordStr;
int counter = 0;
int VALUES = 100;
int DataReady;


void setup() {
  Serial.begin(9600);
  SPI.begin();
  //the imprtant parmiter for SPI communication
  SPI.setBitOrder(MSBFIRST);
  SPI.setDataMode(SPI_MODE2);// check the mode for the AFE
  SPI.setClockDivider(SPI_CLOCK_DIV2);// this means 8MHz SCLK to the AFE

  //set the pines mode as output/ input
  pinMode (mosi, OUTPUT); //no need because it's not sending any data to the AFE
  pinMode (miso, INPUT);
  pinMode (sck, OUTPUT);
  pinMode (csb, OUTPUT);
  pinMode (drdyb, INPUT);
}


void loop() {
  digitalWrite(csb, LOW);
  digitalWrite (mosi, HIGH);
  delay(0.32);
  digitalWrite(csb, HIGH);
  DataReady = digitalRead(drdyb);

  if ((DataReady == HIGH) && (counter < VALUES)){
    //this will make the serial communication start
    wordStr = digitalRead(miso);  // this is used for reading only or we need to save on variable
    Serial.println(wordStr);
    counter = counter + 1;
  }
  digitalWrite(csb, LOW);
}
```

The code for ADS1293 and Arduino Nano is shown in left side. Pin configurations is done by looking at datasheet of ADS1293.At the end, the signals above can be obtained by touching ADS1293.

3.Future work and Conclusion

Our future work will be about developing a robotic instrument. Similarly we are planning to develop this device more as a result when a patient's heart activity starts we want to see and analyze this activity accurately and quickly. This new instrument will be helpful doctors during their operations, treatments and controls.

4.References

Arduino Bluetooth Basic Tutorial. Retrieved from https://create.arduino.cc/projecthub/mayooghgirish/arduino-bluetooth-basic-tutorial-d8b737

Texas Instruments. (2014, December). Ads1293 low-power, 3-channel, 24-bit analog front-end for biopotential measurements. Retrieved from http://www.ti.com/lit/ds/symlink/ads1293.pdf