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Identification in Advance Breast Cancer Detection Using the Embedded System with IOT Technology and Mlx90614 Temperature Sensor

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Abstract

Breast cancer is one of the toughest survival challenges in our life. Nowadays, in Indian women are highly flown by majorly in breast cancer. This is the second most perilous cancer in our world. Mammograms are the primary detecting device used all over the world, however, because of the air gaps, they haven't been as successful. Since 2018, proton therapy is a therapeutic technique but it is utilized after crossing over to the second stage. It can't treat metastasized cancer cells in different body parts. To overcome the drawbacks of wearable devices. This can be achieved with the help of MLX90614 temperature sensors and IoT for the Cayenne cloud by Arduino. The technique we are going to use for diagnosing is signal processing. Also, this would be a non-radiation, non-invasive, comfortable, and cost-effective manner that can be conveniently used as a breast cancer analysis technique.

Keywords: Breast cancer, MLX90614 temperature sensor, IoT technology, Cayenne cloud, Arduino, non-radiation, non-invasive, comfortable, cost-effective.

1. INTRODUCTION

Breast cancer is the leading & affected cancer in the overall world especially for women. This is commonly affected by the three types of protein molecules HER2, oestrogen, & progesterone. Utmost womanhood agonizes and perishes due to this breast cancer. These patients mostly struggle with their shyness while testing, especially with a mammogram. Breast cancer detection runs down enormous time and cost. These were the problems for both doctors and patients which lead to late diagnosis of this disease. The basic step to analysis with a mammogram, but there are challenges as pain occurs while taking an image, fatty deposition, air bubbles, and indifference of benign and malignant cancer cells. To overcome these problems, defects, and uncomfortableness, we have an idea using MLX90614 temperature sensor and IoT technology.

2. LITERATURE SURVEY:

2.1 Using the electrical impedance properties of the tissues, electrical impedance tomography (EIT) is a non-invasive method to scan the human breast. The primary causes of a notable rise in capacitance and conductance of malignant tumors, which leads to reduced impedance, are variations in cellular water content, extracellular fluids, packing density, and changes in the orientation of the cells. It is a quick, small, and affordable photography option. Since the scanning gadget doesn't release any ionizing radiation, expectant women can also use it. Large scale study will be needed.

2.2 Electrical impedance tomography (EIT) and electrical impedance mapping (EIM). are the two major types of noninvasive impedance imaging techniques. EIT imaging is founded on the substantial electrical impedance variation in static and dynamic between various tissue kinds. In EIM, a steady ac voltage is typically given to the body between a big reference electrode located somewhere else on the body and an array of numerous sensing electrodes encompassing the surface of the body to be imaged. Impedance imaging is another application of magnetic induction tomography MIT utilizes the interplay of an oscillating magnetic field with conductive material as opposed to electrical interactions with the body as required by EIT or EIM.

2.3 On gold screen-printed wires, two sensing devices were created. HER2 breast cancer biomarker impedimetric aptasensor for detection. Using electrochemical impedance spectroscopy, the biosensors were evaluated for their ability to identify the target protein at concentrations ranging from 1 pg/mL to 1 g/mL in phosphate buffered saline, diluted, and undiluted human blood. On gold screen-printed wires, two architectures were used to bind DNA aptamers. Ternary layers may increase the limit of detection, and electrochemical aptasensors are very hopeful for medical diagnostics.

2.4 EIT (Electrical impedance Tomography) and 2D EIM (Electrical impedance Mapping) [impedance calculation and impedance mapping] Mapping Impedance: Using MATLAB's built-in picture interpolation, a flattened 2-D normalized

impedance map was produced after each electrode's complex impedance was determined. After that, these images were compared to the recognized as phantom data.it can be applied both invasive or non-invasive, and non-imaging. The separation of benign lesions and malignant tumors is difficult.

2.5 Images are extracted using pre-trained CNN architectures, namely, google.net, visual geometry, group network. System performance declines in both speed and accuracy due to the intricacy of conventional machine learning methods like pre-processing, segmentation, and feature extraction. The 2-D input data immediately updates CNN's design. To complete the CNN training job, a vast amount of data that is lacking in the BC area must be collected. Using TL to move the features from a sizable collection is one method to deal with this. For the intent of distinguishing both malignant and benign cells using median pooling, networks are completely connected. Both hand-crafted features along with CNN features need to be used for further improvement in classification accuracy.

2.6 Five components (JUNB, YWHAB, TYROBP, NFYA, and PRDX1) selected for more study in biological samples after getting selected according to the CXCR4 related networks. A subset of 24 genes, possibly overexpressed in CTCs, was discovered by bioinformatics functional enrichment analysis. The CXCR4 chemokine receptor is important for these genes. To describe the manifestation pattern of all the molecules under examination, blood donors were employed as controls. JUNB expression was linked to a poor prognosis, enabling the creation of a novel biomarker and a possible therapeutic target for the removal of CTCs.

2.7 The patients underwent ABVS, HHUS, dynamic contrast-enhanced Magnetic Resonance Imaging (DCE-MRI) and mammography at the beginning of NAT and ABVS, HHUS and DCE. The patients underwent ABVS, HHUS, dynamic contrast-enhanced Magnetic Resonance Imaging (DCE-MRI) and mammography at the beginning of NAT and ABVS, HHUS and DCE-MRI at the halfway point of therapy and before the surgery. ABVS have some accuracy is differ from NPV and PPV.

2.8 Fluorescence microscopy finds major applications in cancer biology. The unique sample chamber, which houses the sensor technology, is made using a 3D printer. It helps to predict positive and negative values and also correlate with ABVs and MRI. Most of the parameter did not have an impact on the fluorometer output.

2.9 It distinguish breast cancer with WBC (Wisconsin Breast Cancer) record. Our goal is to associate and explain that the logistic algorithm and CNN may be used to find breast cancer with the condensed factors. Benign tumor and malignant tumors, where benign tumor is non-cancer and malignant is cancer tumor. The work hopes to assess breast cancer with 98.50% accuracy using an integrated polling ML approach.

2.10 The paper is on integrate with machine learning techniques with feature selection/feature extraction methods and compare their performances to identify the most suitable approach. Dimensionality reduction a machine learning technique. When feature extraction is employed, data visualization and understanding are not facilitated. Further, feature extraction lessens duration of training and storage needs.

3. FIELD SURVEY

3.1 Do you regularly examine your breast?

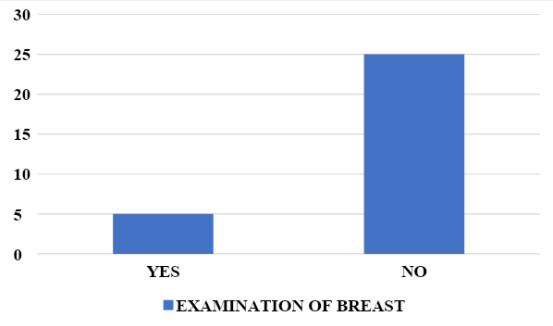

Figure no.: 1 Examination of breast

3.2 Do you feel uncomfortable to talk about with doctor/health advisor?

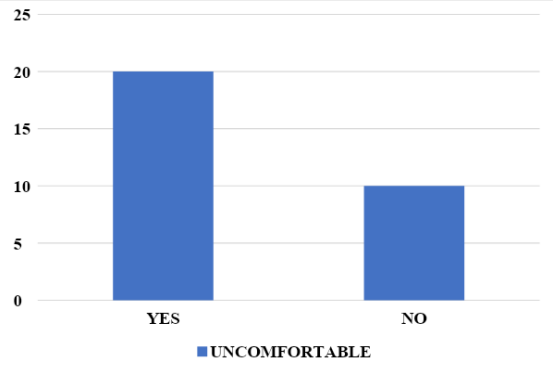

Figure no.: 2 Uncomfortable

3.3 Do you feel lumps/ cyst in your breast area?

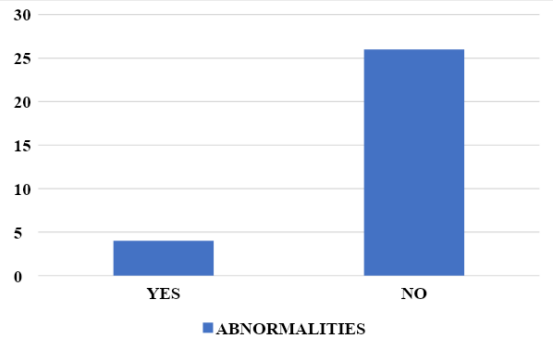

Figure no.: 3 Abnormalities

3.4 Do you follow regular exercise?

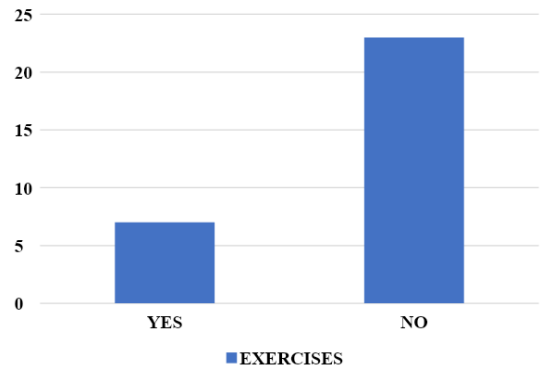

Figure no.: 4 Exercises

3.5 Do you have any doubt regarding breast cancer/ breast examination?

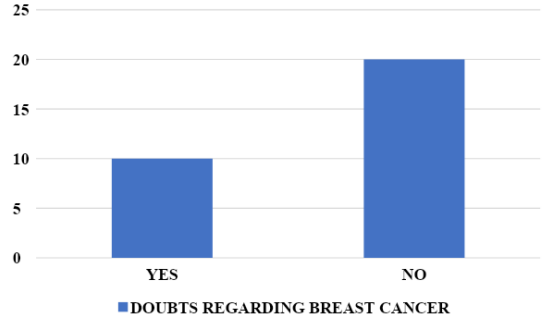

Figure no.: 5 Doubts regarding breast cancer

3.6 Does your living area have proper awareness about breast cancer?

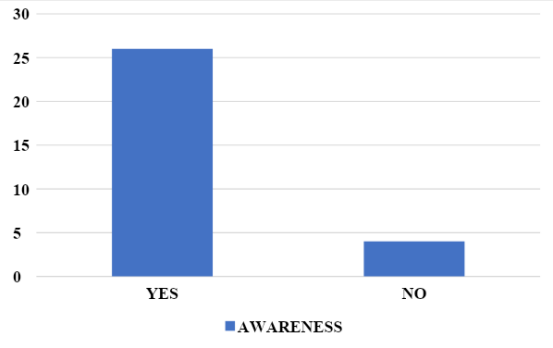

Figure no.: 6 Awareness

3.7 Will you check regularly if examination of breast cancer becomes household device?

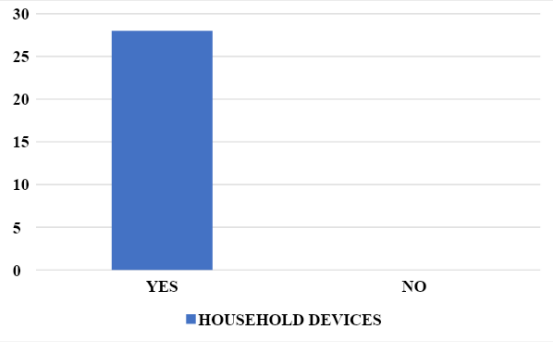

Figure no.: 7 Household devices

3.8 Will you screen your breast regularly?

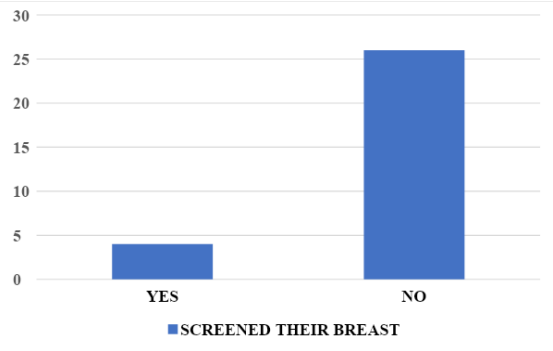

Figure no.: 8 Screened their breast

3.9 Difficulties faced:

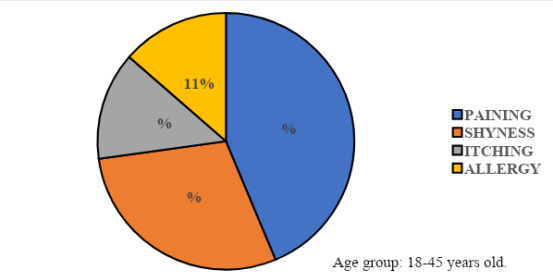

Figure no.: 9 Difficulties faced

3.10 Complete Analysis of Field Survey

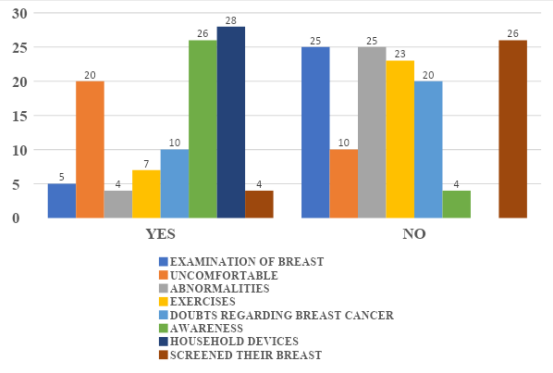

Figure no.: 10 Complete analysis of field survey

3.11 Temperature data:

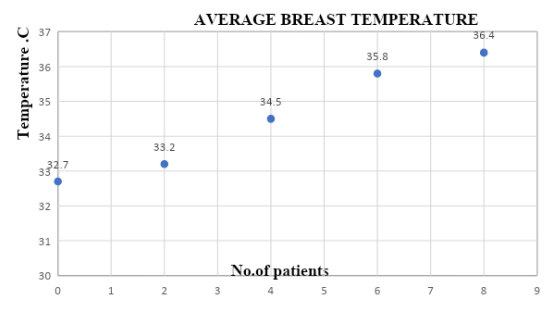

Figure no.: 11 Average Breast temperature

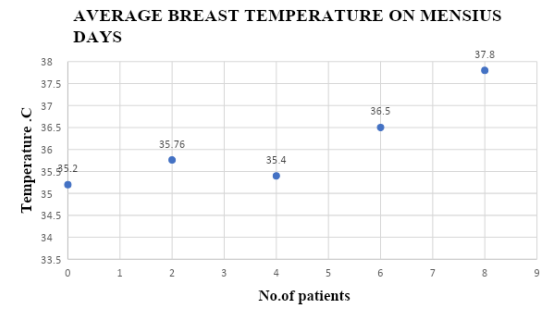

Figure no.: 12 Average Breast temperature on meniscus days

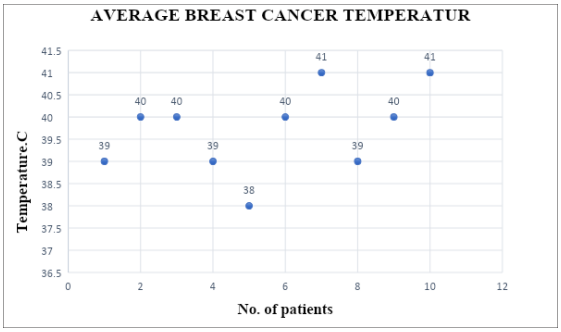

Figure no.: 13 Average Breast cancer temperature

- The average breast temperature 32.7 c – 36.4. C
- The average temperature on periods: 35.2 – 37.8.C

Temperature ranges:

- Benign cancer=38-39.87.C
- Malignant cancer=40-43.6.C

*Data taken from Mohan's mendicity, Madurai – from the base paper.

4. EXISTING METHOD

Mammogram and Proton therapy are used majorly for screening and therapeutic technologies, currently which are popular technologies. The existing systems are using X-rays are passed to specify the part for viewing the cancer by mammogram. Biopsy test is used, in case of failure of mammogram. BMRI (Breast Magnetic Resonance Imaging) used for clear identification of breast cancer. The temperature variation occurred in their breast one who suffered from cancer. Hence, the IR (infrared) technologies like imaging technique, tomography, and sensor are performed. The temperature measuring system are also used in it, like thermocouple, temperature sensor, thermistor and IR thermal sensor are also performed. Even though these much techniques are available in it, the patient cannot diagnose and treated hundred percentage.

5. PROPOSED METHOD:

To design a circuit for analyzation of breast cancer in advance identification. The circuit must be in simple nature and a lifelong usable one. The patient must feel free and comfortable while using it. Hence, it must be a non-contact of a breast. It should be non-invasive, non-radiation, cost-effective, and more accurate. It is used as a confirmatory test for advanced breast cancer levels.

5.1 Aim

Our aim is to find out the breast cancer identification in advance.

5.2 Motivation

- Breast cancer patient must analyse their breast in a cost-effective manner, with non-radiation, comfortably and to avoid post-analysis in their sessions.
- "Avoid post-analysis of breast cancer and Devoid rate of death of breast cancer."
- In 2023, the WHO (World Health Organization) theme is to "Close the care gap" for cancer patients.
- Our project works on breast cancer and promotes the quote of the world health organization.

5.3 Objective

- To detect breast cancer early, improving survival and lowering morbidity.
- To find an easy analysis method that helps to enhance the comfortability of patients and a better chance for survival.
- To reduce the cost of care.

6. METHODOLOGY

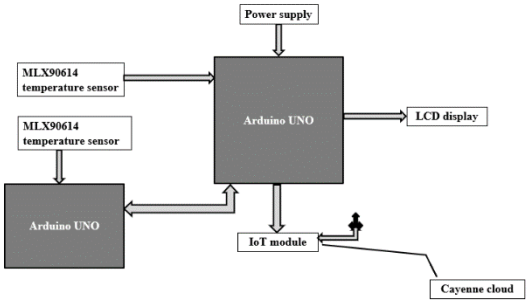

Figure no.: 14 Block diagram

In this project, we use power supply as alternating current AC as 220V. This can't adopt by utilized requirements. Hence, we choose step down transformer to lower the power input source as 12V. But the sources are used to accept only direct current DC. The DC power source is done with the help of four diodes which performs forward and backward bias and acts as a bridge rectifier. This produce 9V DC power supply. Due to multiple conversion of power process, there is possible to occur spice errors as voltage fluctuation. On rectifying this, the capacitor is used as a filter. On holding of requirement power supply of 5V we involve regulator 7805 as producing of 5V. This all conclude as DC power supply unit with LED for identification of power utility. The Arduino UNO boards run with 5V power and temperature sensor connected with it as per I2C protocol. Arduino UNO board used because all in one as oscillator, integrated chip, microcontroller, etc. Node MCU acts as IoT module which has the ability to connect with Wi-Fi ability objects. It runs with 3.3V power inbuilt of 1.8V ohmic resistor response. From the MLX90614 temperature sensor collects the temperature data from the environment and breast into two as ambient and object temperature. The LCD unit is attached with main Arduino UNO board for notifying its output and entire error identification. Through Wi-Fi ability we can connect with mobile and laptop for receiving both sensors value with the cloud cayenne app which is the source for storing purpose up-to one year by denoting as ranges and wave form.

6.1 Flow process

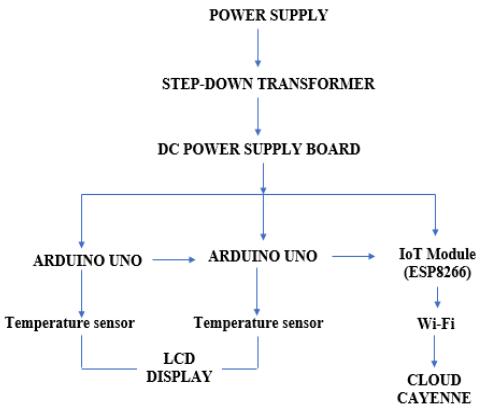

Figure no.: 15 Flow chart

6.2 Coding

MAIN ARDUINO UNO CODING:

```
#include <Adafruit_MLX90614.h>

Adafruit_MLX90614 mlx = Adafruit_MLX90614();
int new_temp=0,
   new_obj=0,
   old_temp=0,
   old_obj=0;
```

```
void setup() {
  Serial.begin(9600);
  while (!Serial);

  if (!mlx.begin()) {
   // Serial.println("Error connecting to MLX sensor. Check wiring.");
    while (1);
  };
}

void loop()
{
   new_temp=mlx.readAmbientTempC();
   new_obj=mlx.readObjectTempC();

 /*if (new_temp != old_temp)
  {
  old_temp = new_temp;
  Serial.print("a");
  Serial.print(new_temp);
  }
  if (new_obj != old_obj)
  {
  old_obj = new_obj;
  Serial.print("o");
  Serial.print(new_obj);
  }*/
  /*Serial.print("m");
  Serial.print(mlx.readAmbientTempF());
  delay(1000);
  Serial.print("b");
  Serial.print(mlx.readObjectTempF());
  delay(1000);*/
  Serial.print("a");
  Serial.print(new_temp);
   delay(1000);
  Serial.print("o");
  Serial.print(new_obj);
   delay(1000);
  Serial.println();
  delay(1000);
}

delay(1000);
lcd.setCursor(0, 1);
lcd.print("BLADDER ABNORMAL");
delay(1000);
lcd.clear();
}
}
```

SUBORDINATE ARDUINO UNO CODING:

```
#include <Adafruit_MLX90614.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(8, 9, 10, 11, 12, 13);
Adafruit_MLX90614 mlx = Adafruit_MLX90614();

int New_Temp=0,
    New_Obj=0,
    Old_Temp=0,
    Old_Obj=0;

void setup()
{
  lcd.begin(16, 2);
  lcd.print("welcome");
  delay(1000);
  Serial.begin(9600);
  while (!Serial);

  if (!mlx.begin()) {
    //Serial.println("Error connecting to MLX sensor. Check wiring.");
    while (1);
  };
}

void loop()
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("A:");
  lcd.print(mlx.readAmbientTempC());
  lcd.print("C");
  lcd.setCursor(9,0);
  lcd.print("O:");
  lcd.print(mlx.readObjectTempC());
  lcd.print("C");
  /*lcd.setCursor(0,1);
  lcd.print("A:");
  lcd.print(mlx.readAmbientTempF());
  lcd.print("F");
  lcd.setCursor(9,1);
  lcd.print("O:");
  lcd.print(mlx.readObjectTempF());
  lcd.print("F");
  delay(500);*/

 New_Temp=mlx.readAmbientTempC();
 New_Obj=mlx.readObjectTempC();

 if (New_Temp != Old_Temp)
```

```
 {
 Old_Temp = New_Temp;
 Serial.print("A");
 Serial.print(New_Temp);
 }
 if (New_Obj != Old_Obj)
 {
 Old_Obj = New_Obj;
 Serial.print("O");
 Serial.print(New_Obj);
 }

/*Serial.print("M");
 Serial.print(mlx.readAmbientTempF());
 delay(500);
 Serial.print("B");
 Serial.print(mlx.readObjectTempF());
 delay(500);*/
  Serial.print("A");
 Serial.print(New_Temp);
  delay(200);
  Serial.print("O");
 Serial.print(New_Obj);
  delay(200);
 Serial.println();
 delay(200);


}
void serialEvent()
 {
 while (Serial.available()>0)
Serial.println(Serial.readString());
}
```

IoT CODING:

```
#define CAYENNE_PRINT Serial
#include <CayenneMQTTESP8266.h>
// WiFi network info.
char ssid[] ="cancerproject";
char wifiPassword[] ="123456789";
char red1;
// Cayenne authentication info. This should be obtained from the Cayenne Dashboard.
char username[] = "254bebd0-d95a-11ed-9ab8-d511caccfe8c";
char password[] = "b38a5ae49cd57070ee97ce178e4427e6c77d45fc";
char clientID[] = "34ade8d0-d95a-11ed-8485-5b7d3ef089d0";

// email id:breastcancermonitoring@gmail.com
//p.W: 123456789
int a=0,b=0,c=0,d=0,e=0,A=0,B=0,C=0,D=0,E=0,F=0;
void setup()
```

```
{
  Cayenne.begin(username, password, clientID, ssid, wifiPassword);
  Serial.begin(9600);
  delay(200);
}
void loop()
{
  Cayenne.loop();

 if(Serial.available()>0)
{
  char redl=Serial.read();delay(200);

   if(redl=='A')
{
  float sen1=Serial.parseFloat();
  Cayenne.virtualWrite(1,sen1);delay(200);
}

 if(redl=='O')
{
  float sen2=Serial.parseFloat();
  Cayenne.virtualWrite(2,sen2);delay(200);
}

if(redl=='a')
{
  float sen3=Serial.parseFloat();
  Cayenne.virtualWrite(3,sen3);delay(200);
}
if(redl=='o')
{
  float sen4=Serial.parseFloat();
  Cayenne.virtualWrite(4,sen4);delay(200);
}
}
}
```

6.3 Result

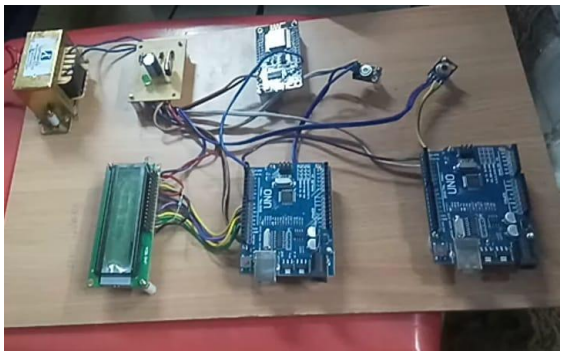

Figure no.: 15 Project Kit

7. CONCLUSION

We have proposed an advanced identification of breast cancer detection as non-contact, non-invasive, non-radiation, comfortable, and cost-effective. The patient must feel free and they can use it in their home as a household device. It acts as an assenting test. The temperature sensor which we used here consists of a lens to sense the temperature. Near to the breast, we kept our senses and measures them even though we wore clothes.

8. FUTURE WORK

Breast divides into four lobes hence temperature sensors need to add two more for time saving. The additionality supports the testers comfort zone. Ongoing study about the breast cancer stages identify.

9. DESIGN & CONSTRAINTS

DESIGN	
Project Title	Identification In Advance Breast Cancer Detection Using The Embedded System With IoT Technology And MLX90614 Temperature Sensor.
Program Concentration Area	Biomedical Instrumentation
CONSTRAINTS	
Economic	It is an inexpensive prototype which supports common women for regular breast screening.
Environmental	The materials used in this breast screening device don't create any negative impact upon the environment because it is non-radiation, non-invasive and non contact of breast.
Sustainability	As the size and weight of this device is less while compared with other diagnosing device, it have better sustainability.
Manufacturability	This prototype is made by sensors and controllers so it will be easy to manufacture. It will be of great use to the patients with its simplest design structure.
Ethical	No ethical standards or formal process in relation to it have been violated during the design of the prototype.
Health and Safety	The prototype of breast cancer screening is a device which is used for periodical check-up. The major aim of this device is to avoid radiations. It makes patients to detect the cancer at early stage.
Social	This self-monitoring device creates awareness among women for regular monitoring. The future improvement in the design of prototype will be of great use to every woman.
Political	No import of materials is required for this prototype.
Other	NIL
Standards	
For self-diagnosing device	IEC 60601-2-45 Medical electrical equipment - Part 2-45: Particular requirements for basic safety and essential performance of mammographic X-ray equipment and mammographic stereotactic devices

Table no.:1

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