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DESIGN AND IMPLEMENTATION OF ECG DEVICE

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Abstract:

In healing centers, electrocardiographic (ECG) observing has advanced from introductory heart rate and beat assurance to complex arrhythmia, myocardial ischemia, and drawn-out QT interim conclusion. A straightforward 3-lead ECG observing and heart rate estimation framework is 'proposed' in this paper.

For ease of utilization and to induce freed of awful association commotion, the proposed framework Bio potential cathodes of' the sort Ag/AgC1 are utilized (silver to silver chloride). The ECG flag is transmitted from the human body to the instrumented amplifier employing a patient's cable within the moment organize (IA) to decrease impedances. An analog dynamic sifting organize takes after the intensification organize.

At last, instead of conventional supreme parallel or serial ports, For more superior comfort, the mouthpiece input of a PC sound card has been effectively utilized as a meddle card.

Keywords: ECG, SENSOR, ELECTRODE, PATIENT.

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Introduction:

As the number of patients enduring heart infections climbs at an alarming rate, more Electrocardiogram (ECG) measures are being performed in clinics. The ECG could be a component of therapeutic gear that measures heart rate, changes over it to a flag, and shows it on a screen or broadsheet [1].

Today's analysts and engineers capture ECG signals utilizing modern checking frameworks that use wearable innovation, utilizing cutting-edge concepts and strategies from electrical designing, computer science, biomedical building, and pharmaceutical. A di that utilize wearable innovation while utilizing advanced concepts and techniques from an electrical building, Medication, biomedical building, and computer science. The electrocardiogram may be a demonstrative device that accurately measures and records the heart's electrical action. The electrical activity of the heart (ECG). The agnostic instrument that measures and logs the electrical movement of the heart is the electrocardiogram (ECG). These clarifications empower the conclusion of an assortment of natural disarranges, extending in seriousness from non-life-threatening to deadly. Wearable checking frameworks utilize cutting-edge and up-and- coming communication advances to capture and transmit biological signals over significant oparations[2].

The electrical activity of The heart during each cycle is graphically represented on an electrocardiogram (ECG). Use the voltage versus time diagram to plot the heart's electrical activity as it beats. Electrodes are placed on the skin to detect the heart's electrical activity. Cardiac muscle contracts and relaxes as a result of changes in electrical charge. These changes can be monitored using electrodes attached to the body's skin. The current distribution among cardiac cells serves as a signal for cardiac contraction. Pacemaker cells also produce these signals. The sinus node (SA node) in the heart's right atrium is the electrical current's origin. This nodule is called the heart's pacemaker because the cells that make up it generate their electrical impulses. The left atrium also experiences depolarization waves that originate in the sinus node of the right atrium. It then reaches the fibrous septum that separates the atria and ventricles. A current or stimulus is delivered to the atrioventricular (AV) node. AV nodes also act as backup pacemaker cells when the received signal is weak. Waves from the atria to the ventricles travel along the atrioventricular node. The bundle of His, located in the interventricular septum, receives depolarization waves after it migrates from the atrioventricular node. His fascicles spread to the right and left ventricles of the heart. That helps the "Purkinje fibers," the branching electrical pathways in the heart's left and right ventricles, to supply the muscles with electricity.[3]

Related work:

Hadeel N. Abdullah in February 2015. Moving from a straightforward appraisal of heart rate and basal cadence to diagnosing complex arrhythmias, myocardial ischemia, and QT interim prolongation. The ponder creates a straightforward 3-lead ECG observing and heart rate estimation framework. The prescribed Ag/AgCl (silver to silver chloride) sort biopotential terminals are utilized within the framework for ease of utilization and disposal of lousy association clamor. Within the moment organize (IA), the ECG flag is transmitted from the human body through the persistent cable to the instrumented intensifier to decrease impedances. An analog dynamic channel arrangement takes after enhancement.

At last, the PC sound card's receiver input is utilized as an interface card for straightforwardness input of the obsolete standard parallel or serial associations. [Four] 'On June 4, 2021, Shahrokh Sani. A model for a low-cost electrocardiogram (ECG) observing gadget has been made and utilized. The AD8232 board worked as a low-cost

Bardia Baraeinejad et al. in [2021] displayed a modern electrocardiogram (ECG) flag screen and computer program for flag preparation and AI-assisted determination. This equipment makes strides in ergonomics, adaptability, and battery life and maintains a strategic distance from the flag misfortune common in past adaptations. The plan maximizes vitality effectiveness by exchanging converters, ultra-low control components, and productive flag preparation. Bolsters microSD card capacity, smartphone communication, and constant checking of electrocardiograms for 14 days.

The computer program coordinates into web-based stages and Android apps through the Web of Things (IoT). This component offers nearby and cloud capacity and employs AI to discover arrhythmias. Utilizing the Counterfeit Neural Arrange and K-Nearest Neighbors strategies on the test information set, the arrhythmia location calculation gets 98.7% precision, whereas the Choice Tree approach accomplishes 98.1% precision. [6]

Materials and procedure

a) Arduino UNO

b) Breadboard

c) Jumper wires m-f & m-m

d) ECG heart monitoring sensor

e) DSO 138 oscilloscope

3.3 Design Architecture

The project includes an Arduino Uno chip, a Post board, an ECG heart monitoring sensor, and a DSO138 oscilloscope. as explained in figure(1-1):

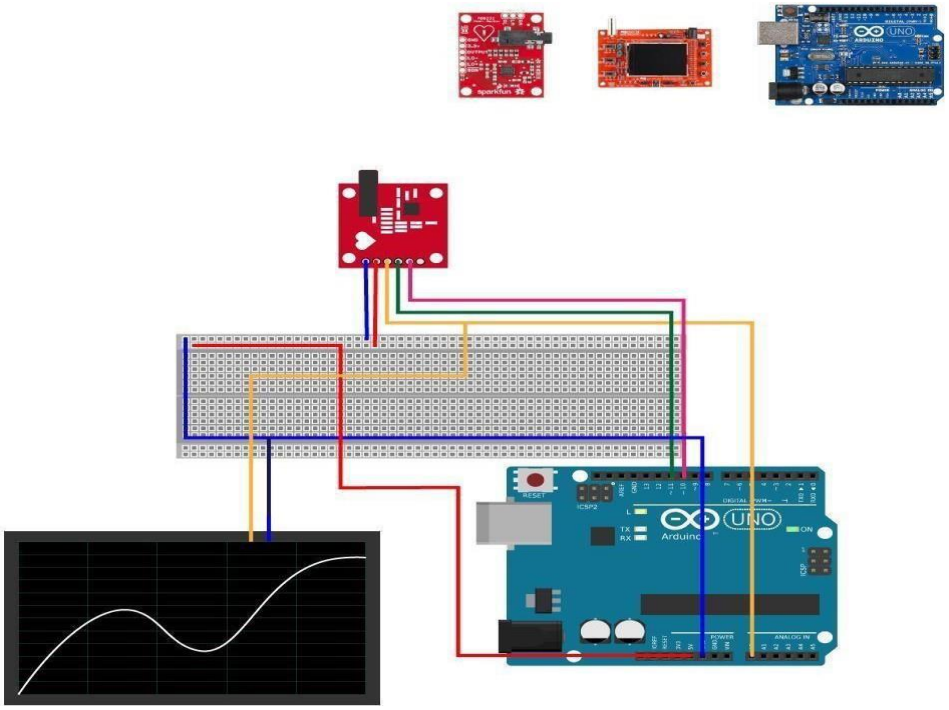


Figure (1-1): The proposed system

All the components were connected, the Arduino was programmed, and part of the code explained in fig (1-2)

```
int BPM = 0;
int beat_old = 0;
float[] beats = new float[500];
int beatIndex;
float threshold = 620.0;
boolean belowThreshold = true;
PFont font;
void setup () {
  size(1000, 400);
  println(Serial.list());
  myPort = new Serial(this, Serial.list()[2], 9600);
  myPort.bufferUntil('\n');
  background(0xff);
  font = createFont("Ariel", 12, true);}
```

Figure (1-2): part of the code.

Fig (1-3) the electrode

The sensor shown in fig(1-3) consists of Three different colored cables connected to the patient. The patient must be laid down in a flat position with no body attached to the ground so that the pulses can be detected and recorded without any noise.

The Red electrode RA was put on the Right arm, the yellow electrode LA was located on the left arm, and the green RL was placed on the right leg. The final connection of the system is explained in fig(1-4).

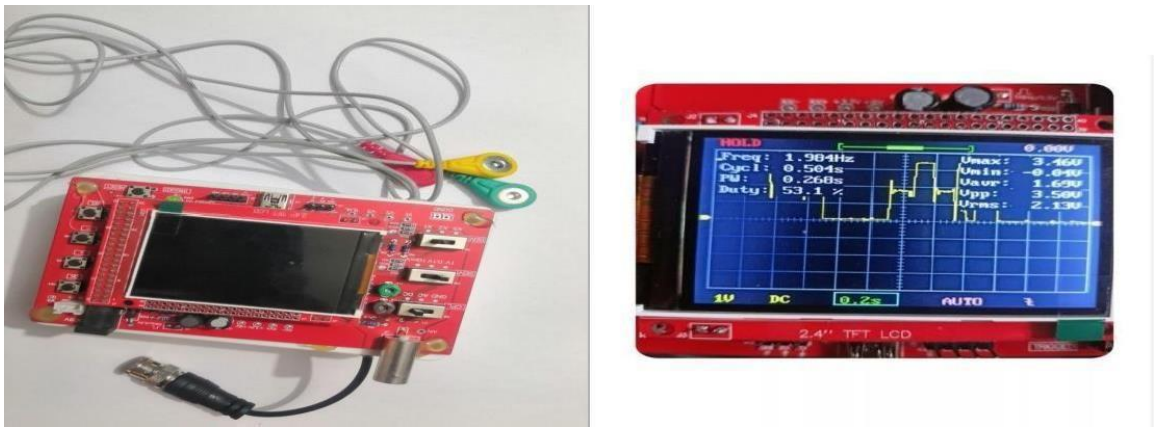


Fig (1-4): the final connection of the system.

Results:

The results explained in fig (1-5) are of a 9 years old female kid at rest. Fig (1-6) shows the results of 21 years old adult male at rest, and fig (1-7) shows the results of the same adult man in case of running.

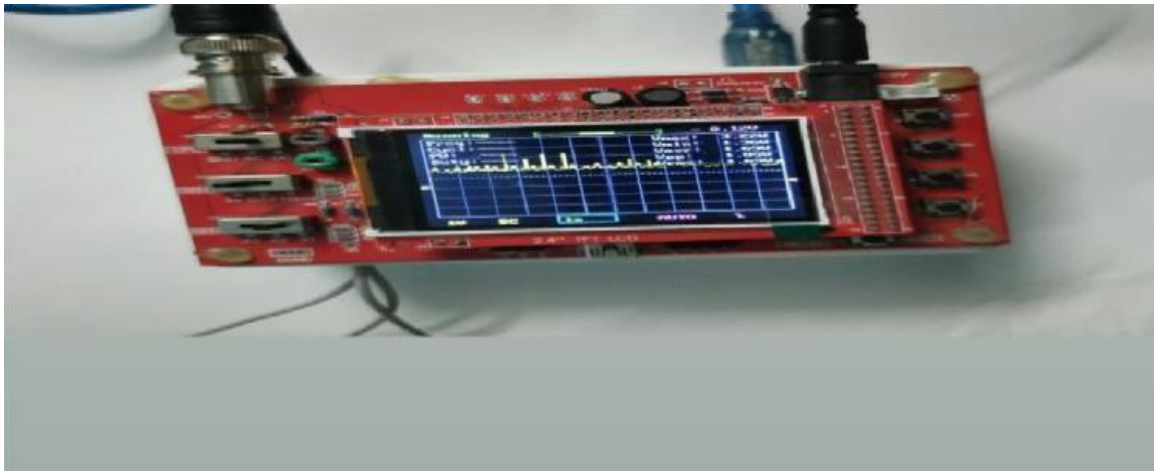


Figure (1-5): 9 years old female kid result.

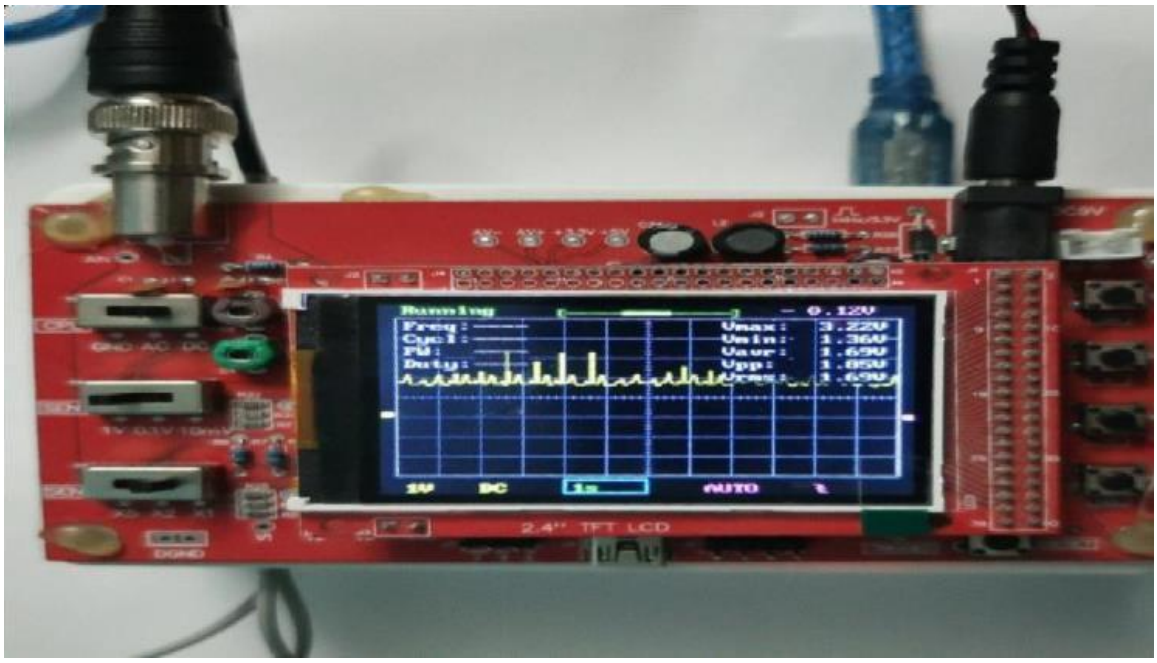


Fig (1-6): 21 years old adult male result.

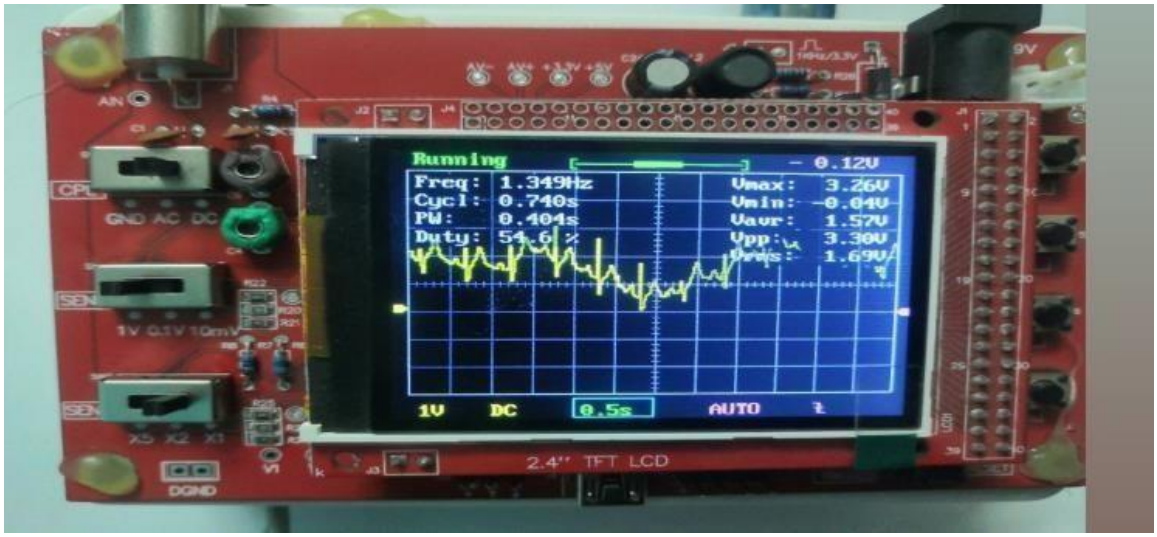
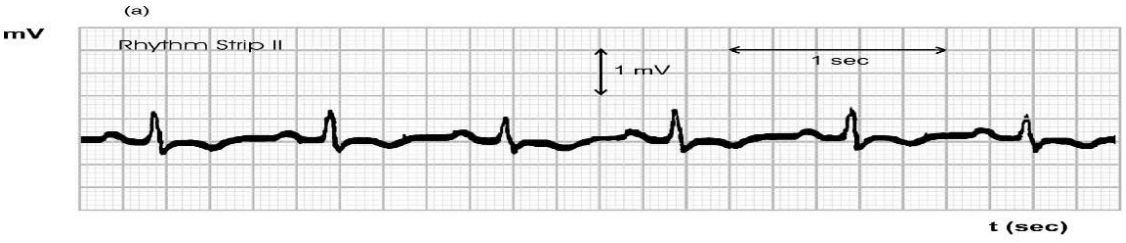


Fig (1-7): 21 years old running adult male

The obtained results were the same as the standard results in many medical references, as shown in figure (1-8).



Fig(1-8):the normal ecg wave90[7].

Discussion and conclusion:

The ECG device is one of the diagnostic tools used in the medical field. Measuring and displaying the electrocardiography to keep the patient healthy. The electrode is comfortable for the patient, and there's no need to use the annoying gel on the patient's body. The newly designed device is small, low cost, simple to use, has a minimum amount of noise produced, and the accuracy of the results is perfect, approximately 90%.

Recommendations:

1. In the future, a sensor to measure blood pressure and sugar levels could be added to this device because they are essential for heart health and safety.
2. A device that detects anemia and the percentage of oxygen in the blood can be added.
3. Chart can be supplemented with a gadget that displays the chart on paper.
4. The system could be connected to the internet to be an (IoT) based system.

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