



## Measuring the Bio-Electrical Parameters of a Person Using Bio-Telemetry System for Health Care Monitoring

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### Article History:

Received on: 10 Nov 2020  
Revised on: 10 Dec 2020  
Accepted on: 12 Dec 2020

### Keywords:

LM35 Sensor,  
Max30100 Sensor,  
Ad8232 Sensor,  
EOG Sensor,  
Physio-Logical  
Parameters,  
Bio-Electrical  
Parameters

### ABSTRACT

Biotelemetry is a method of measuring a persons's Bio-electrical parameters and a Physio-logical parameters from a distance. It's like a updation of existing methods of measuring physiological parameters and bioelectrical parameters to a method of transmission of resulting data. This will help the consulting doctor for making a better diagnosis without movement or ensuring mobility of both the doctor and patient. Here the parameters of the wireless remote medical system for health monitoring include body temperature, blood oxygen saturation, pulse, electrocardiogram and Electrooculography. In order to measure, monitor and updating the data we require five sensors for each respective parameter so the respective five sensors are AD8232 sensor for measuring Electrocardiogram, pulse sensor for measuring pulse, EOG sensor for measuring Electrooculography, Max30100 sensor for measuring oxygen levels in blood and finally LM35 sensor used for measuring the hotness or coldness of a body. These are connected as one system using Arduino. Transferring of data to the cloud or update the data in cloud, whatever the data came from the sensors will be sent to a WiFi module called Node MCU ESP8266, through which the data will be uploaded on cloud platforms like Ubidots and Things speak. Finally from this Paper it gives the concept of Bio-Telemetry System, in other words a Medical Telemetry System. This system allows continuous monitoring of a patient's health condition, as well as updating that respective data into their medical history like cloud platform, thus improving the efficiency of nursing care through more effective time management.



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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL4.4064>

Production and Hosted by

IJRPS | [www.ijrps.com](http://www.ijrps.com)

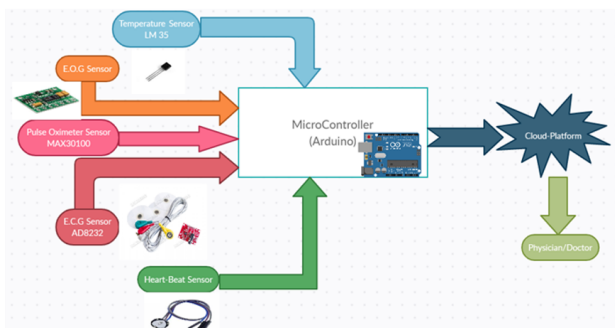
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### INTRODUCTION

From so many years back the people who are going for their health checkup's in some government or private hospitals are following a same procedure that is they will give the token number for the respective patient irrespective of the case and that patient has to wait until his/her number comes. Whenever his/her turn comes, he has to move to the doctor and thereby he needs to explain what is the problem he/she is facing with their health problem. But here they will face two problems that is if the doctor can cure his patient then he will proceed or sometimes the doctor will suggest another doctor for that particular patient.

When this will happened means if the doctor

belongs to a ear specialist or if the doctor is an ENT specialist and also the patient's problem also belongs to either ear, nose or throat then he will proceed but if the patients problem is not belongs to the doctor's study, then in this case the doctor will suggest this to other doctor. Again that patients has to meet the doctor by following same procedure that was explained above (Cornish *et al.*, 1996).



**Figure 1: Block Diagram of Bio-Telemetry System**

These cases usually takes a long time and here all the kits like monitors, calories checkers etc are will be there with doctor's itself. After some years unlike previous case here the kits are there with both doctors and patients, so Unlike the above cases here patients need not to wait for some time for consulting the doctor.

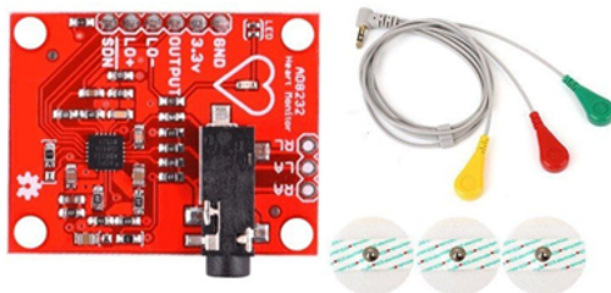


**Figure 2: MAX30100 Pulse-Oximetry Sensor**

Here the patients health parameters checks in their house itself with those kits thereby they will know about the problem as well as they gets cured from that by taking some precautionary and thereby they can proceed to their respective doctor thereby explain all about this (Fiorini *et al.*, 1998). So in this case the danger is going to be diminished as seen from the old cases. They can get cured very quickly. But here for buying those checking kits or devices they must afford some cost.

After some years the Internet of things plays a vital. Now the costless sensors and wearable technologies such as Apple Watch, Fitbit, and Microsoft Band

are available and can monitored remotely an individual's health with those. When taking those with the old one's, therefor instance in order to measure temperature and calories we requires two different devices, but here within a single device we can measure those two health parameters with low cost (Sverre and Orjan, 2014).



**Figure 3: AD8232 E.C.G Module**

This one has somewhat advantage but it cannot be suitable for sudden purposes or any urgents because only that particular person who is having those devices only can know their health status but his/her respective consultant nurse or doctor doesn't know about their's patients health. So as there is an advancement in technologies, A biotelemetry system can be introduced (Sinha and Ravi, 2015).



**Figure 4: Pulse Sensor**

This Bio-Telemetry System works like measuring the patients health parameters thereby sending this to doctor or transmitting this data into the cloud by this the patient's caretaker like nurse or doctor can known information regarding health of his/her patient's even though the doctor went to other countries or far away from their patients.

Therefore, the doctor can provide some medicines or treatment if necessary or if the patient's health system is normal then he can give a report as normal. Without going to the hospital the patient can be cured by the help of this system.

So Whenever there is a change in the patient's health condition immediately health care taker as well as



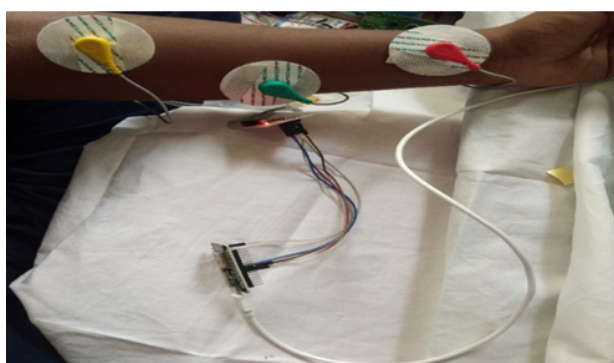
**Figure 5: E.O.G Sensor**



**Figure 6: LM 35 Temperature sensor**

patient will get alert message and thereby doctor will provide some procedures and medicines. So definitely these medicines will be with the patient, if not these medicines will be available nearby medical shop.

As Compared with the Old manner here the person cured completely within the less amount of time and that particular person's health will be monitored remotely (Hassanalieregh *et al.*, 2015; Haripriya *et al.*, 2016). If that person's health is fine for few days that results he is cured and with a good health.



**Figure 7: Connecting the Pads/Electrodes to the pulse sensing areas in our hand**

## METHODOLOGY

Figure 1 shows the functioning block diagram of the bio-telemetry system.

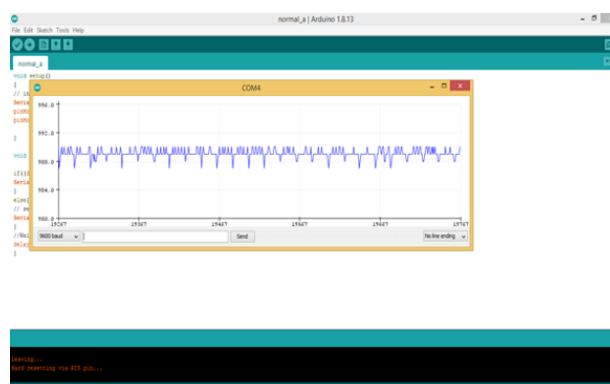
### Measuring Pulse Oximetry

MAX30100 sensor will detect both the heart-rate and Oxygen saturation as shown Figure 2. Heart rate is detected by the change in volume of the blood throughout the finger, whereas Blood Oxygen concentration can be measured by the absorption red

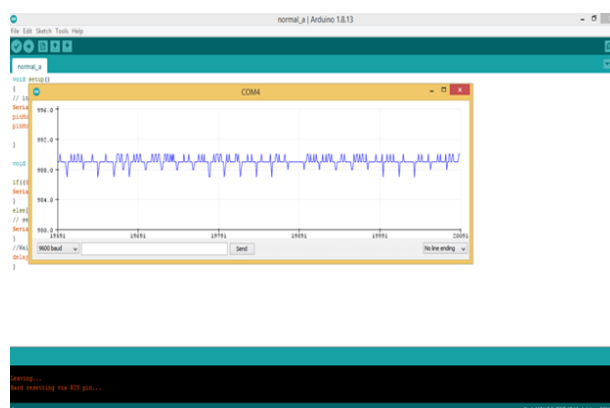
and Ir light by the haemoglobin.

### Measuring E.C.G

AD8232 is used to measure the electrical activity of the heart. This Electrical activity can be charted as an E.C.G. In this AD8232 it contains three electrodes which are going to placed at some places in our body where from that place get pulse or rhythm of the heart beat as shown in Figure 3.



**Figure 8: Output E.C.G Signal Captured in Serial Plotter**



**Figure 9: Output E.C.G Signal Captured in Serial Plotter**

### Measuring Pulse

This was mentioned in the above one i:e MAX30100, but here a pulse sensor can directly be used. Figure 4

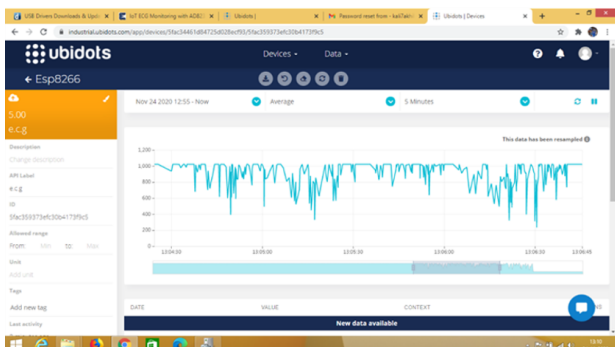
### Measuring E.O.G

It's a technique used to measure the corneo-retinal potential of the human eye. Also it can be used in recording eye movements Figure 5.

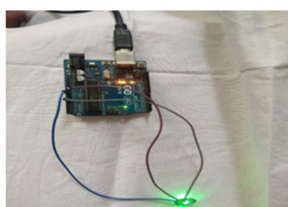
### Measuring Temperature

Temperature can be measured with the help of LM35 sensor measures the temperature between - 55 °C to 150°C Figure 6.

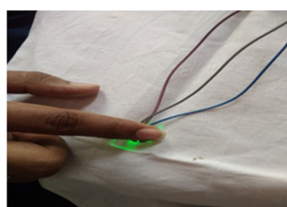
Finally in order to send the data to the cloud, Node MCU is required. Here Pulse Oximeter Sensor, E.C.G



**Figure 10: E.C.G Signal Captured in Ubidots (Cloud)**

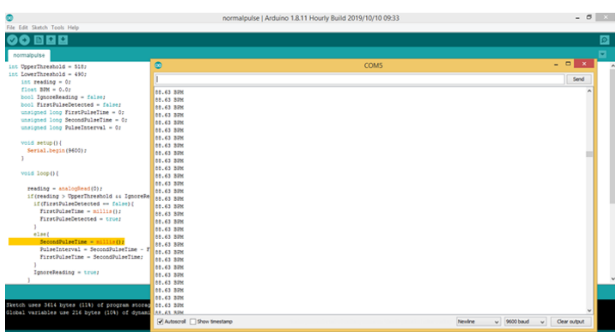


**Pulse Sensor**

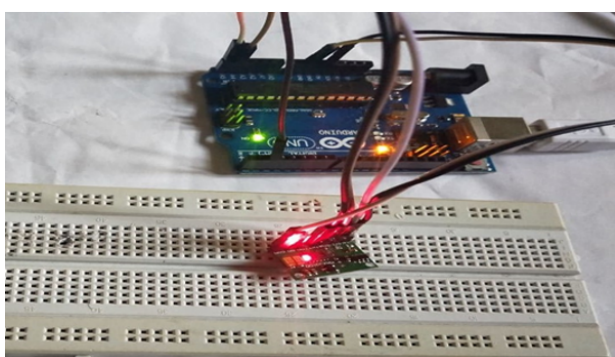


**Arduino**

**Figure 11: Hardware Connections using Pulse Sensor and Arduino**



**Figure 12: Shows the Pulse-rate Beats Per Minute**

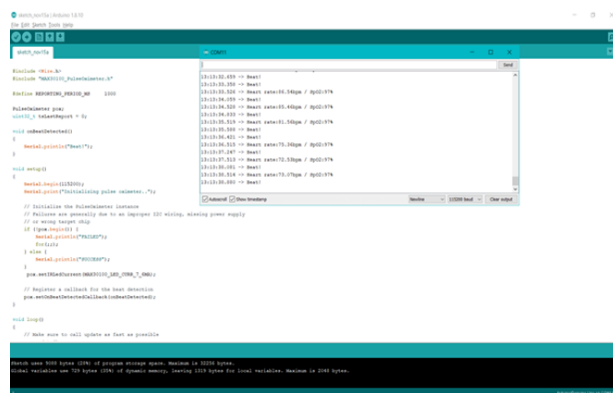


**Figure 13: Pulse-Oximetry**

**Table 1: Table for normal pulse rate for respective ages**

Age	Normal Heart Beat
6 years -17 years	70-100
18years and Older	60-100

Sensor, Heart Beat Sensor, LM35 Sensor, E.O.G Sensor's will give a corresponding output signal to the arduino which has Atmega328p microcontroller by taking the corresponding input signal from our body and this data is going to send to the cloud platforms like ubidots, Things peak through node MCU (Yang et al., 2016).



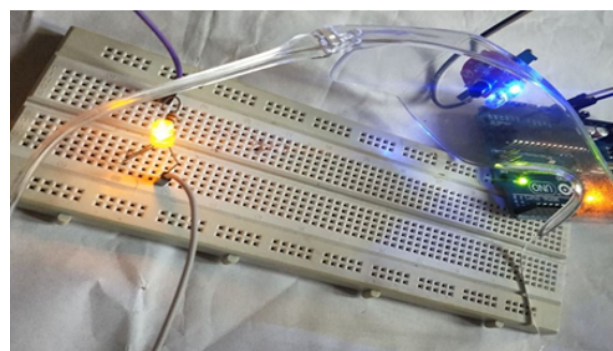
**Figure 14: Shows the Heart Beat and oxygen saturation levels in the Blood**

**RESULTS AND DISCUSSION**

**E.C.G Monitoring**

For this measurement AD8232 ECG sensor is used. Here the sensor pads also known as electrodes, will be placed at some particular places in our body (Ying et al., 2009). That too the places must be close to the heart or otherwise at that places it must have the Rhythm of the pulse. Thereby this Electrical activity of the heart is measured and will be charted as an ECG Figures 7, 8 and 9.

This E.C.G signal will be transmitted to the cloud (ubidots platform) and below Figure 10 describes it. Here i have considered two sample points from the signal for analyzing purpose.



**Figure 15: E.O.G Measurement**

**Pulse Monitoring**

Pulse-sensor working is very simple. It has two sides, one side has LED along with an light sensor

and on the other side it contains some circuit. For the purpose of amplification and noise cancellation work, the circuit is responsible (Kumar and Rahman, 2006). A vein in our human body or Fingertip is placed on that sensor in order to measure the heart beats Figures 11, 12, 13 and 14.

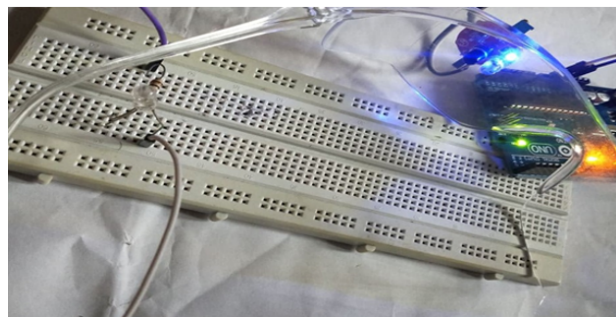


Figure 16: E.O.G Measurement

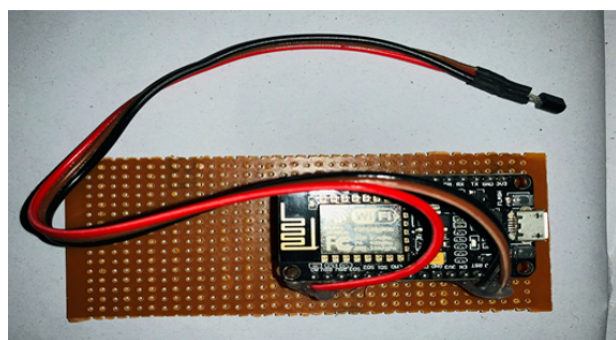


Figure 17: Hardware Connections for Temperature Measurement

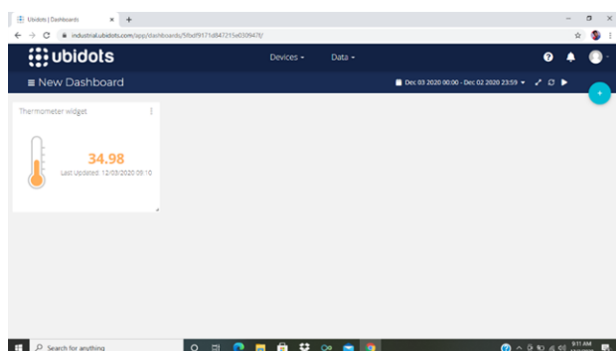


Figure 18: Measured temperature in Celcius and updated in ubidots

### Monitoring Oxygen Levels in Blood

The Corresponding Heart Beat is Table 1 for normal heart beat and respective ages.

### Measurement of E.O.G

Here EOG graph is represented with a led. Figure 15 shows that when there is an action of blinking the led glows representing the change in EOG graph and Figure 16 shows that when there is no

action of blinking the led doesn't glow representing no change in EOG graph.

### Monitoring of temperature

With the LM35 temperature sensor can measure the hotness or coldness of the body. Here the temperature is going to measure in celcius Figures 17 and 18.

### CONCLUSIONS

The sensors that includes from above one's this system can used for health parameters measurement of a person. But this Bio-Telemetry System is used only for temporary purpose; moreover every system that was advanced in Medical field like Virtual Monitoring is for temporary purpose only except the Physical meet of the doctor. In order to get completely cured the patient must have to meet the doctor. With this system the doctor will know in advance about the patient's problem thereby he will be with his equipment to cure that patient. Then there will be no delay for testing purpose also patient will get cured. This Bio-Telemetry System is one of the advanced System in the medical field. If this Bio-Telemetry System is integrated with the Ambulatory-Monitoring system it helps the health caretakers like Doctors and Nurses Prepare in providing a treatment in the Trauma. With the help of this System the doctor will have an idea about the Patient's health also those patients need not to visit the hospital for health check-up because with the help of phones or any other communication devices the doctor can share the report to that particular patient. Therefore with this system the doctor will know in advance about the patient's health thereby the doctor will be ready with his treatment and procedures so without moving to the tests because the doctor will know about the patients health condition and parameters with the help of this Bio-telemetry system he will give treatment by this the patients will get cured and recover back with good health.

### Funding Support

The authors declare that they have no funding support for this study.

### Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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