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NBA Accredited

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UNIVERSITY OF MUMBAI

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A Project Report on

IOT Based Smart Healthcare Monitoring System

Submitted in partial fulfillment of the degree of

Bachelor of Engineering(Sem-8)

in

INFORMATION TECHNOLOGY

By

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1. Project Conception and Initiation

1.1 Abstract

- The IoT (Internet of Things) based health monitoring system is a network of interconnected devices that collect and transmit data about a person's health status to a centralized platform.
- The system uses various sensors and devices, such as wearables, smart health monitors, and website, to track vital signs, patients health data record or other health metrics in real-time.
- The IoT based health monitoring system has the potential to revolutionize healthcare by improving patient outcomes, reducing healthcare costs, and enhancing the quality of life for patients and caregivers.

1.2 Objectives

The main objective of the project are:

- To monitor health parameters using the sensors.
- To make a budget friendly health monitoring system.
- To display patient health data on LCD screen and also on the website.
- To record or store the patients health data.

1.3 Literature Survey

Sr N o.	Paper Title	Analysis	Year
1.	“An IoT Based Smart Healthcare System Using Raspberry Pi”	Here the author has concentrated over the idea of separating wireless sensor network and cloud computing.	2018
2.	“Simulation of Health Care Monitoring System in Internet of Things By Using RFID”	In this paper, there is a discussion over the security requirements of authentication. Particularly they have represented a ECC-based RFID authentication in terms of implementation and authentication.	2018

Sr No .	Paper Title	Analysis	Year
3.	“Remote Health care Monitoring System using Arduino Board over Distributed Ubiquitous Environment”	Here author concentrates on IoT based Smart Healthcare System. This paper proposes the efficient system for observing patient pulse rate and temperature. The system uses pulse sensor to keep track of heart rate of the patient.	2016

1.4 Problem Definition

- IOT enabled devices have made remote monitoring in the healthcare sector possible unleashing the potential to keep patient safe and healthy.
- Reducing healthcare costs significantly and improving treatment outcomes.
- IOT has application in healthcare that benefits patients, families, physicians, hospitals and insurance companies.

1.5 Scope

- Can monitor various health metrics, such as heart rate, SpO2 enabling early detection of health issues .
- Can help to reduce healthcare costs by minimizing hospital readmissions, preventing unnecessary tests and procedures .
- Can improve the quality of life for patients by providing peace of mind, reducing the burden of frequent medical visits.

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1.6 Technology stack

- **The hardware required for this project are:**

- ESP32 Board

- Max30100 pulse oximeter sensor

- DHT11 sensor

- Nodemcu Board

- LCD

- **The Software required for this project are:**

- Arduino IDE

- XAMPP

- Bootstrap

1.7 Benefits for environment & Society

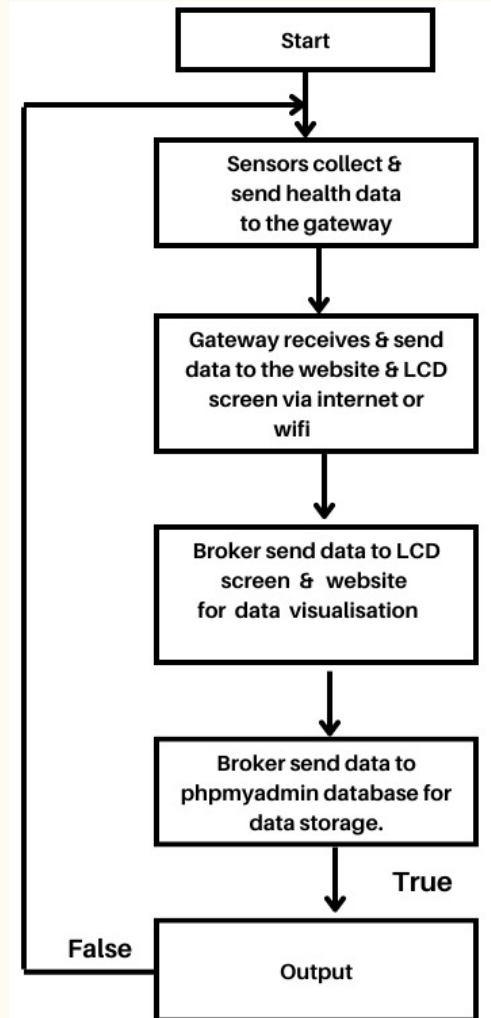
- The system can help to reduce healthcare waste by minimizing the use of disposable medical devices
- The system can improve energy efficiency as well as increase accessibility to healthcare by enabling remote patient monitoring and telemedicine, reducing the need for patients to travel to healthcare facilities.
- The system can empower patients by providing them with personalized health insights or health record, enabling them to take control of their health and wellness.

2. Project Design

2.1 Proposed System

- **Hardware Selection:** The hardware components of the system, including wearable devices, sensors, and gateway devices, must be carefully selected to ensure accuracy and reliability.
- **Data Collection:** The system must be designed to collect health data from wearable devices and sensors accurately and continuously.
- **Data Transmission:** The system should transmit the collected data securely and efficiently to a LCD Screen & Website to view their health data .
- **User Interface:** The system should have a user-friendly interface that allows users to view their health data .It should also be accessible via website on mobile or browser.

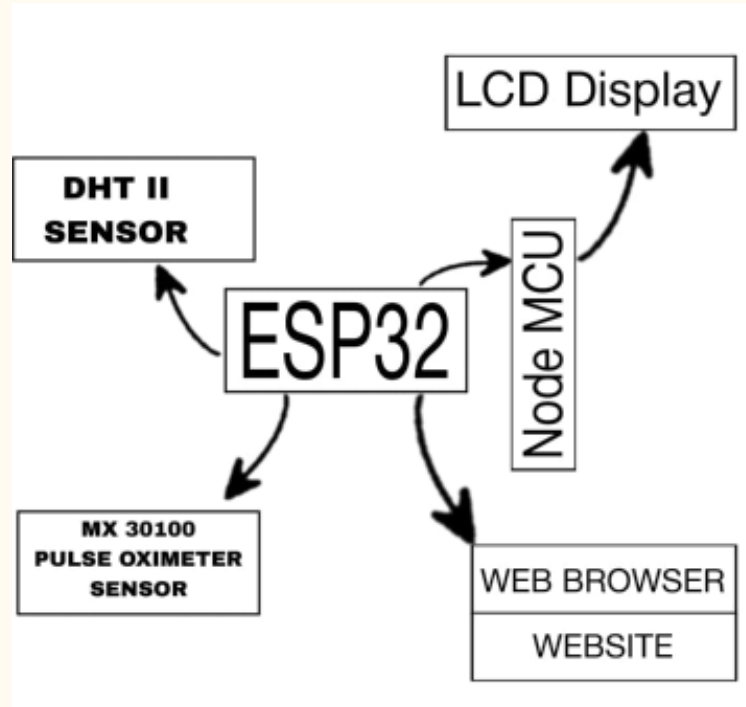
2.2 Design(Flow Of Modules)



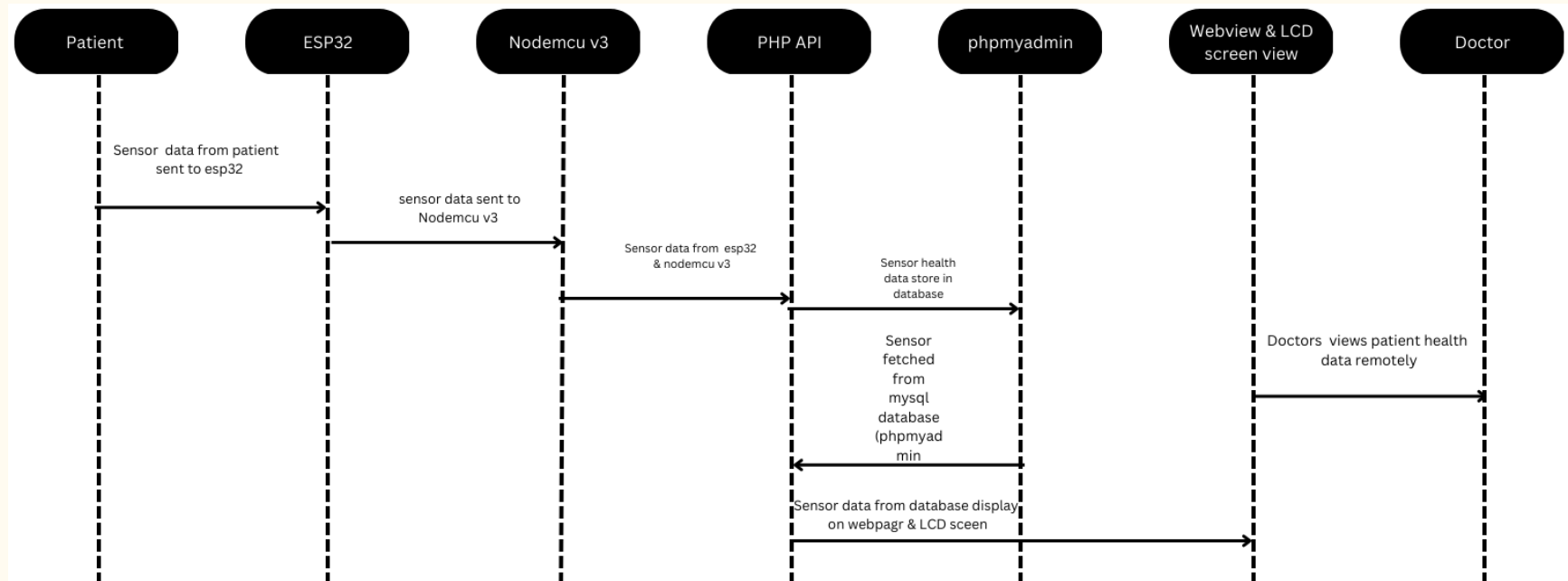
2.3 Description Of Use Case

- Hospitals/ Nursing Home: In hospitals/ nursing home , IoT-based healthcare monitoring systems are used to monitor patients' vital signs, track medical equipment, and ensure that healthcare providers have access to real-time data about patients' health status.
- Home Healthcare: IoT-based healthcare monitoring systems can be used to provide remote patient monitoring, allowing patients to receive care at home while still receiving support from healthcare providers.
- Elderly Care: IoT-based healthcare monitoring systems can be used to support the elderly, allowing them to live independently

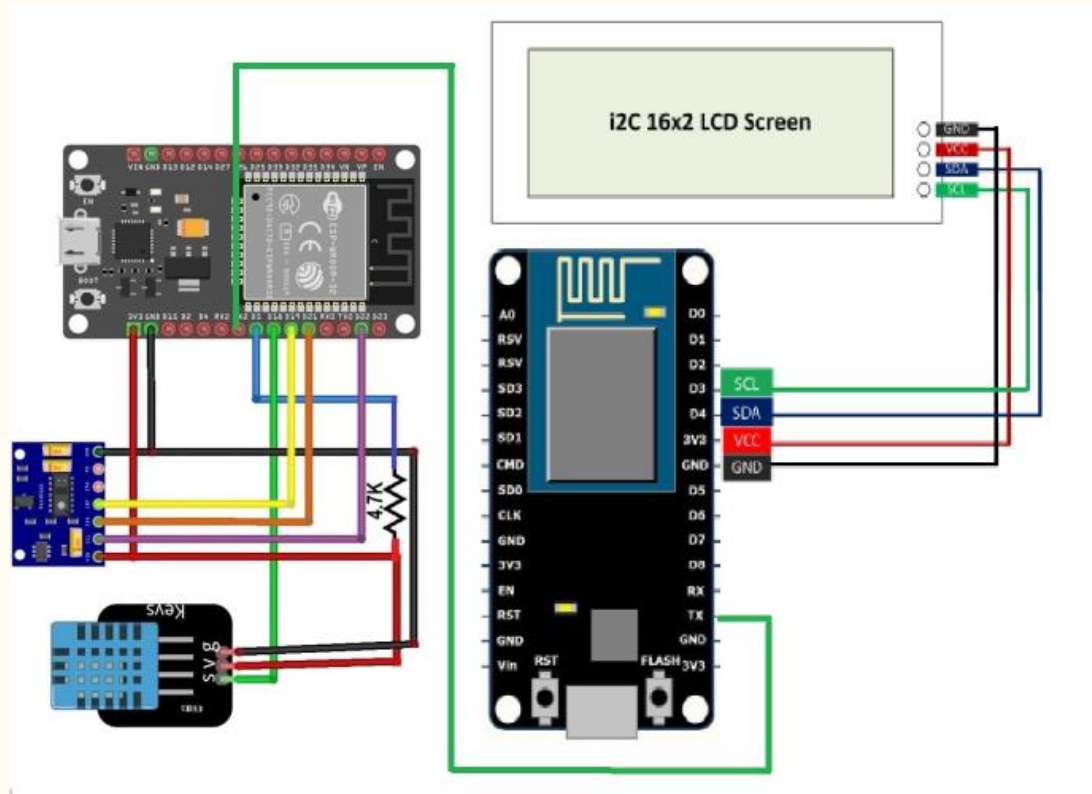
2.4 Block Diagram



2.5 Sequence Diagram



2.5 Circuit Diagram



3. Implementation

3.1 Login Page: To login to the system

```
<br>
<div class="login-box">
  <div class="white-box">

    <form class="form-horizontal form-material" id="loginform" action="login_back.php" method="POST">
      <h3 class="box-title m-b-20">Sign In</h3>
      <div class="form-group ">
        <div class="col-xs-12">
          <input class="form-control" type="text" placeholder="Username" name="username" required >
        </div>
      </div>
      <div class="form-group">
        <div class="col-xs-12">
          <input class="form-control" type="password" placeholder="Password" name="password" required>
        </div>
      </div>

      <div class="form-group text-center m-t-20">
        <div class="col-xs-12">
          <button class="btn btn-info btn-lg btn-block text-uppercase waves-effect waves-light" name="login" type="submit">Log In</button>
        </div>
      </div>

      <div class="row">
      </div>
```


3.2 Dashboard(2): To view health data or delete a patient from the patients list

```
$query = "SELECT * FROM `p_data` WHERE 1";
$result = mysqli_query($link,$query);

while( $row3 = mysqli_fetch_assoc( $result ) )
{
    $name = $row3['name'];
    $DOB = $row3['date'];
    $Email = $row3['email'];
    $address = $row3['address'];
    $id = $row3['id'];

    echo"<tr><td>{$name}</td>";
    echo"<td>{$DOB}</td>";
    echo"<td>{$Email}</td>";
    echo"<td>{$address}</td>";

    ?>

<td>

<div class="btn-group m-r-12">
<button aria-expanded="false" data-toggle="dropdown" class="btn btn-info dropdown-toggle waves-effect waves-light" type="button">Options <span class="caret"></span></button>

<ul role="menu" class="dropdown-menu">

<li><a href="delete.php?id=?php echo $row3['id'];?>">Delete</a>
<li><a href="details.php?id=?php echo $row3['id'];?>">View</a>

</ul>
</div>
```

3.3 To view the patients health data or status

```
<tr>
    <th>Heart Rate</th>
    <th>SpO2</th>
    <th>Humidity(<th>Temprature(D.C.)</th>
    <th>Time</th>
</tr>
<thead>

<tbody>

<?php
include "connection.php";

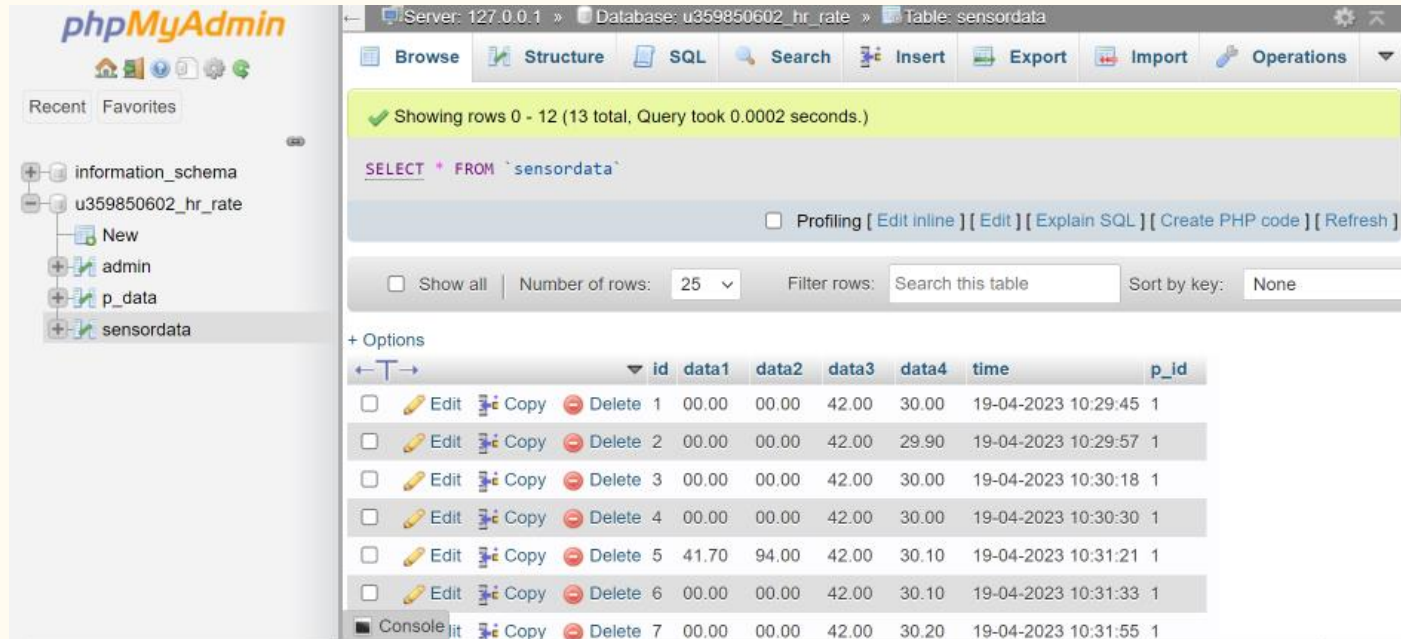
$select_path="SELECT * FROM `sensordata` WHERE 1";

$var=mysqli_query($link,$select_path);

while($row=mysqli_fetch_array($var))
{
    $m=$row['data1'];
    $t=$row['data2'];
    $h=$row['data3'];
    $x=$row['data4'];
    $time=$row["time"];

?>
    <tr>
    <td><p><?php echo $m; ?></p></td>
    <td><p><?php echo $t; ?></p></td>
    <td><p><?php echo $h; ?></p></td>
    <td><p><?php echo $x; ?></p></td>
    <td><p><?php echo $time; ?></p></td>
    </tr>
<?php
```

3.4 phpMyAdmin local database with the patients health data stored in SQL format



The screenshot displays the phpMyAdmin web interface. On the left, the database structure is shown, with the 'u359850602_hr_rate' database selected. The 'sensordata' table is highlighted. The main panel shows the table's structure and a list of rows. The table has 7 columns: id, data1, data2, data3, data4, time, and p_id. The rows show patient health data, including heart rate (data1, data2), blood pressure (data3, data4), and time (time).

Server: 127.0.0.1 » Database: u359850602_hr_rate » Table: sensordata

Showing rows 0 - 12 (13 total, Query took 0.0002 seconds.)

`SELECT * FROM `sensordata``

☐ Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

☐ Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

+ Options

<input type="checkbox"/>	Edit	Copy	Delete	1	00.00	00.00	42.00	30.00	19-04-2023 10:29:45	1	
<input type="checkbox"/>	Edit	Copy	Delete	2	00.00	00.00	42.00	29.90	19-04-2023 10:29:57	1	
<input type="checkbox"/>	Edit	Copy	Delete	3	00.00	00.00	42.00	30.00	19-04-2023 10:30:18	1	
<input type="checkbox"/>	Edit	Copy	Delete	4	00.00	00.00	42.00	30.00	19-04-2023 10:30:30	1	
<input type="checkbox"/>	Edit	Copy	Delete	5	41.70	94.00	42.00	30.10	19-04-2023 10:31:21	1	
<input type="checkbox"/>	Edit	Copy	Delete	6	00.00	00.00	42.00	30.10	19-04-2023 10:31:33	1	
<input type="checkbox"/>	Edit	Copy	Delete	7	00.00	00.00	42.00	30.20	19-04-2023 10:31:55	1	

4. Testing

4.1 Functional Testing

- **Unit Testing**

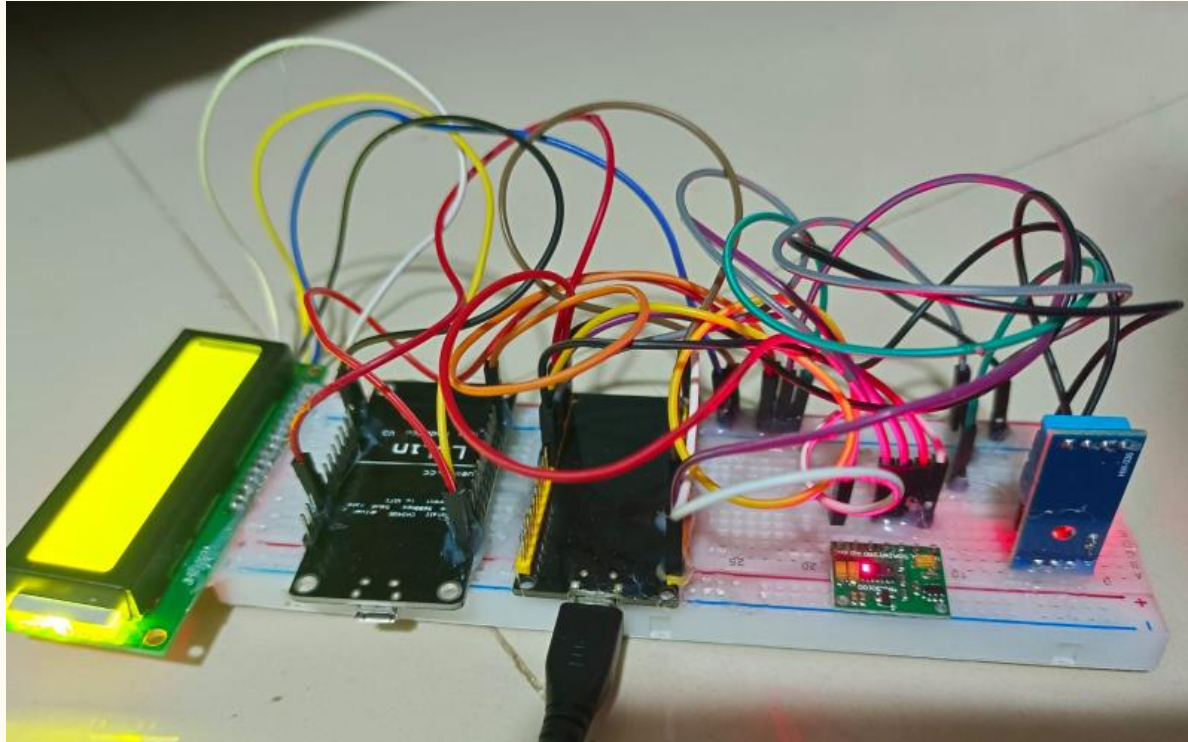
Unit testing is the first level of testing, which is typically performed by the developers themselves. It helped us understand the desired output of each module, which we had broken down into separate units and in classifying the cry categories on the basis of algorithm that we have used.

Test case No.	Test Condition	Test Steps/ Procedure	Test Data	Expected Result	Actual Result	Pass/Fail
1	View Screen (dashboard.php)	If path is "/" Then dashboard.php is viewed.	View Screen	System needs to show the home page to the user	Home page run on the user screen	Pass
2	Capturing sensor health data	Using iot equipment such as sensors , micro controller detect or sens the patients health data.	Patient health data	Sensors should be able to sens the health data accurately.	Sesnsors captured or sens the health data successfully.	Pass
3	View Patient health data record . (details.php)	After clicking on "view" button data stored in database is retrieved	Details	Display patients health data records stored in database.	System shows patients health data records stored in database.	Pass

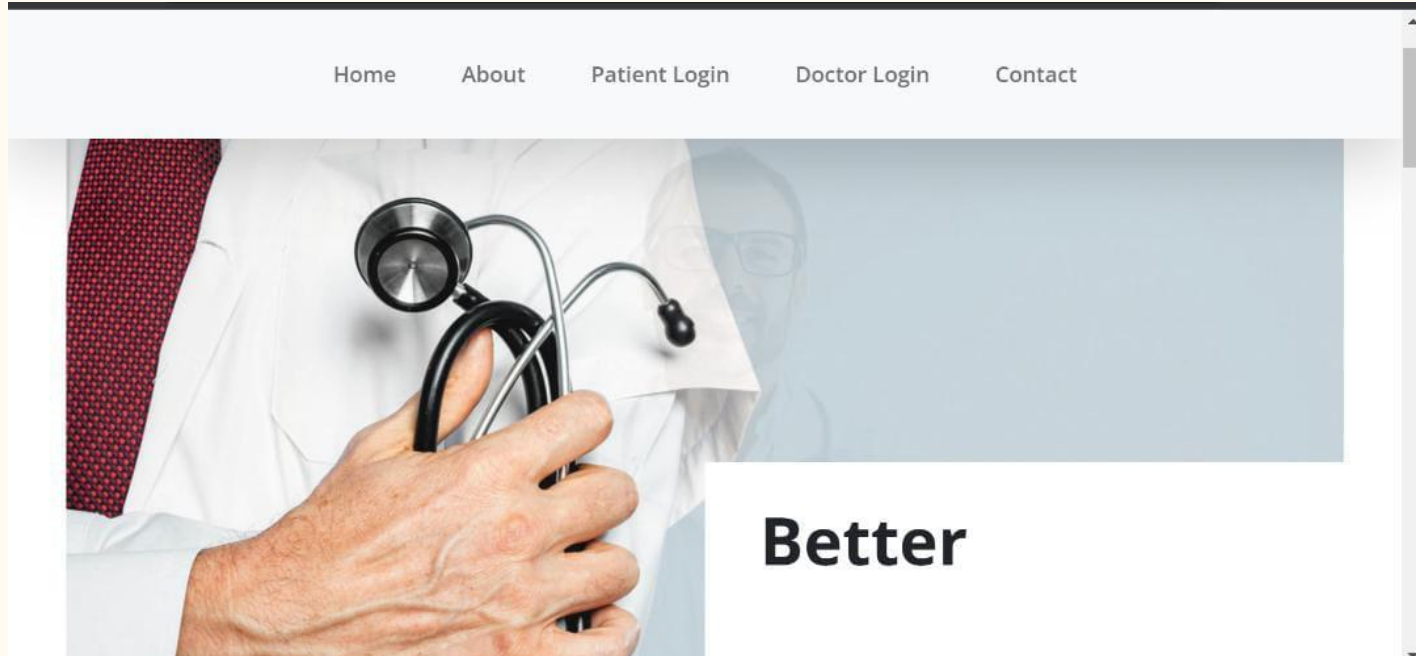
5. Result



5.1 Hardware Setup



5.2 Login Page



5.3 Dashboard

The screenshot shows a web application interface for a 'Patient List'. At the top right, there is a 'Log Out' button. On the left, a sidebar contains a user icon and a menu with 'Administration', 'Patient List', and 'Add Patient'. The main content area features a search bar labeled 'Search:'. Below it is a table with columns: Name, DOB, Email, Address, and Options. A single entry is visible: Divya Shepal, 2002-02-16, divyashepal@gmail.com, dombivali. The 'Options' column for this entry contains a blue button labeled 'Options -'. At the bottom left, it says 'Showing 1 to 1 of 1 entries'. At the bottom right, there are 'Previous' and 'Next' navigation links, with the 'Next' link being highlighted in blue.

Log Out

Patient List

Administration

Patient List

Add Patient

Search:

Name	DOB	Email	Address	Options
Divya Shepal	2002-02-16	divyashepal@gmail.com	dombivali	Options -

Showing 1 to 1 of 1 entries

Previous 1 Next

5.4 Patients health data record page



log out

Clear

Heart Rate	SpO2	Humidity(%)	Temperature(D.C.)	Time
00.00	00.00	42.00	30.00	19-04-2023 10:29:45
00.00	00.00	42.00	29.90	19-04-2023 10:29:57
00.00	00.00	42.00	30.00	19-04-2023 10:30:18
00.00	00.00	42.00	30.00	19-04-2023 10:30:30
41.70	94.00	42.00	30.10	19-04-2023 10:31:21
00.00	00.00	42.00	30.10	19-04-2023 10:31:33

6. Conclusion and Future Scope

6.1 Conclusion

This work aims to establish an internet-based communication system to improve health, with a focus on designing an IoT-based smart healthcare monitoring system using an ESP32 microcontroller. The system uses a pulse rate and temperature sensor to detect heart rate and temperature, respectively, and sends data to the cloud and LCD display, allowing patients to monitor their health status. Doctors can also view the data on a specific website, creating a continuous patient monitoring system with potential benefits for enhancing patient outcomes.

6.2 Future Scope

- IoT based Remote Patient Monitoring System can be enhanced to detect and collect data of several anomalies for monitoring purpose .
- More research on problems associated with having data online, data privacy as IoT is managed and run by multiple technologies and multiple vendors are involved in it. Security algorithms and certain precautions by the users will help avoid any security related threats in IoT network.
- Web UI can be enhanced to perform several activities which include controlling the hardware, real-time graphs, history and analysis graphs to observe anomalies etc.

References

- [1] Raghavendra K K, Sharanya P S, Shaila Patil.“An IoT Based Smart Healthcare System Using Raspberry Pi”, Int. J. of Research and Scientific Innovation (IJRSI), 5(6), June 2018, pp.103-106.
- [2] R.Rubasri, D.Aravind, M.Valan Rajkumar3.“Simulation of Health Care Monitoring System in Internet of Things By Using RFID”, Int. J. of Engineering and Computer Science, 7 (6), June 2018, pp.23952-23970.
- [3] Sowmya G, Sandeep B L, “Remote HealthCare Monitoring System Using Arduino Board over Distributed Ubiquitous Environment” , Int. J. of Advanced Research in Computer and Communication Engineering, 5(4), April 2016, pp.816-819..

Paper Publication

Paper entitled **‘IOT Based smart Healthcare Monitoring System’** is submitted at **‘IEEE-2023 International Conference on Advanced Computing Technologies and Applications (ICACTA)’** by **‘Divya Shepal’** , **‘Prof. sonal Jain’**.

Thank You

