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Smart Device For Monitoring And Managing Irritable Bowel Syndrome (Ibs)

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Abstract: Irritable Bowel Syndrome (IBS) is a chronic gastrointestinal disorder characterized by symptoms such as abdominal pain, bloating, and irregular bowel movements, which significantly affect the quality of life. The proposed Smart Device for Monitoring and Managing Irritable Bowel Syndrome aims to provide an efficient and real-time solution for tracking physiological parameters related to IBS. The system integrates various sensors to monitor key indicators such as abdominal muscle activity, stress levels, body temperature, and diet patterns. Data collected from these sensors are processed using a micro-controller and transmitted to a mobile application for visualization and analysis. This continuous monitoring helps users identify potential triggers and patterns associated with symptom flare-ups, promoting personalized disease management. The device also includes an intelligent alert and recommendation system that provides lifestyle and dietary suggestions based on the user's recorded data trends. By combining IoT technology, biomedical sensing, and data analytic, this project offers a practical and user-friendly approach to improving IBS management. The system not only empowers patients to take control of their health but also provides valuable data for medical professionals to enhance diagnosis and treatment strategies.

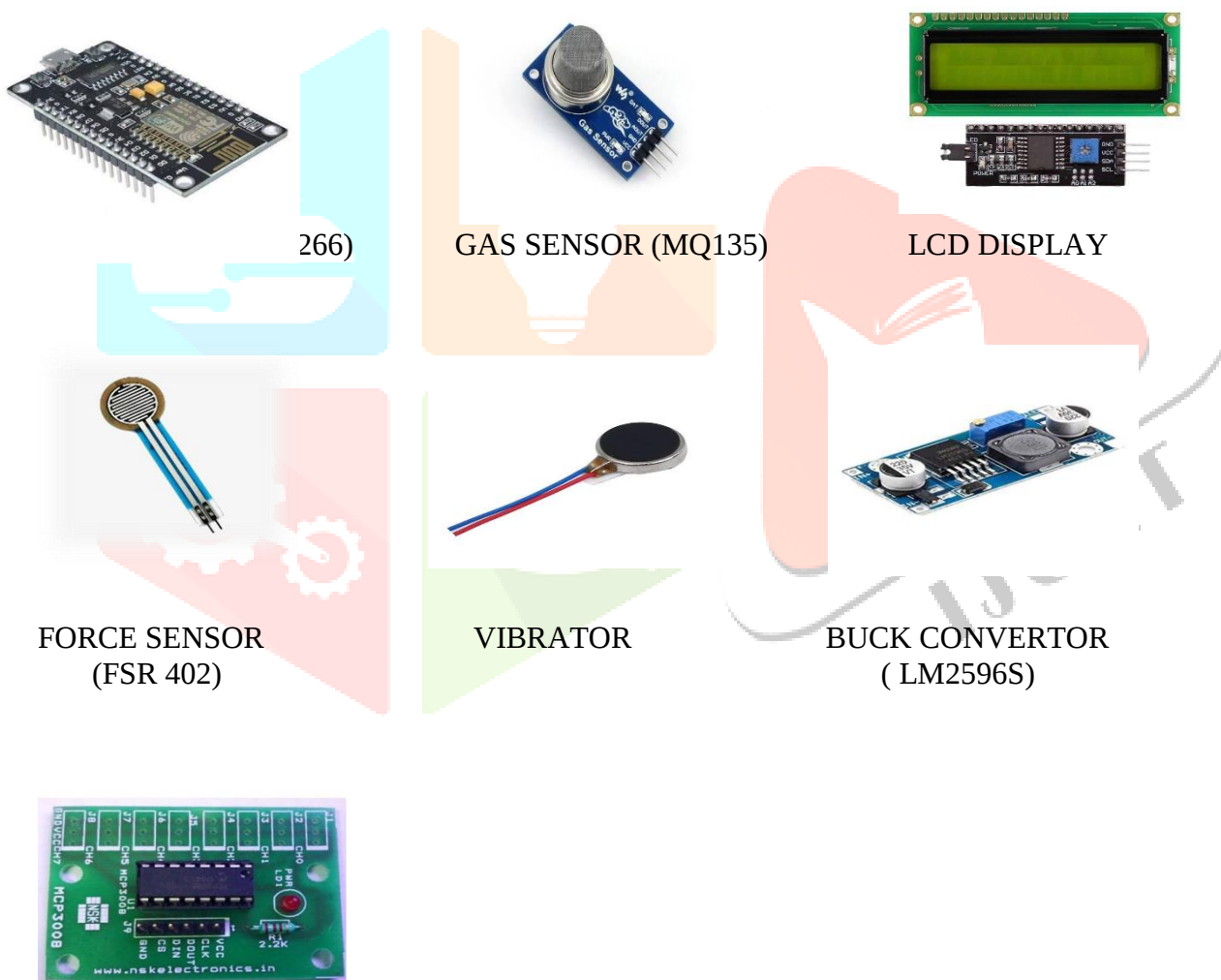
Index Terms: Irritable Bowel Syndrome (IBS), Smart Health Monitoring, IoT, Biomedical Sensors, DataAnalytics, Mobile Application, Personalized Healthcare.

I. INTRODUCTION

Irritable Bowel Syndrome (IBS) is a prevalent functional gastrointestinal disorder marked by chronic abdominal discomfort, bloating, abnormal gas accumulation, and changes in bowel habits. The fluctuating nature of IBS symptoms often leads to interruptions in daily activities and adversely impacts the quality of life of affected individuals. Conventional approaches for managing IBS largely depend on intermittent clinical evaluation, prescription medications targeting symptom control, and recommendations for lifestyle and dietary changes. However, these strategies often lack a personalized, real time feedback loop that addresses symptoms as they arise, potentially prolonging discomfort and inhibiting effective self management. To bridge this critical gap in IBS care and bring eccentric innovation to gastrointestinal health monitoring, the proposed project introduces a comprehensive, wearable system capable of detecting and managing IBS symptoms including abdominal bloating and irregular intestinal gas activity in real time. The core objective of this project is to empower IBS patients with a portable, noninvasive tool designed to deliver continuous physiological monitoring and immediate symptom relief interventions, independent of hospital settings or medical personnel. Such autonomy promises enhanced privacy and accessibility, especially for individuals in rural or remote areas with limited health care infrastructure. Central to the system's architecture is the Node MCU micro controller, renowned for its improbability and compact form

factor, which orchestrates data collection, processing, and trigger actions based on sensor inputs. The system leverages an MQ135A gas sensor to monitor exhaled gases that provide indirect but meaningful insights into intestinal gas dynamics—a leading contributor to IBS related bloating and discomfort. Alongside this, a Force Sensitive Resistor (FSR) is built into an ergonomic abdominal belt to quantify abdominal pressure variations, offering a direct, noninvasive measure of bloating severity that correlates well with patient reported symptoms.

Recognizing the limitations of the Node MCU in handling multiple analog inputs simultaneously, the project incorporates an MCP3008 10bit Analog to Digital Converter (ADC), enabling seamless integration and acquisition of data from both pressure and gas sensors. Data integrity and real time analysis are prioritized throughout, with sensor outputs continuously processed by the Node MCU. For user friendly visualization, an I2Cbased LCD display is included, which presents real time statistics of abdominal pressure and gas concentration directly on the wearable device. This immediate feedback mechanism distinguishes the system from existing solutions that might require smart phones, cloud connectivity, or periodic data uploads, which can introduce delays or privacy concerns.



ADC CONVERTOR (MCP3008)

II. PROPOSED WORK

The proposed work aims to develop a smart device that helps monitor and manage Irritable Bowel Syndrome (IBS). The system will use sensors to measure factors like abdominal pressure, temperature, and gas levels. Data collected will be sent to a mobile app for real-time display and analysis. The app will track symptoms, diet, and stress to help identify triggers. This device will assist users in managing IBS effectively through continuous monitoring and personalized feedback.

KEY COMPONENT**1. NodeMCU(ESP 8266)**

The NodeMCU acts as the brain of the system, controlling all components and managing communication between sensors and the mobile application. It processes the data received from different sensors and sends it wirelessly through Wi-Fi or Bluetooth. Its compact design, low power consumption, and built-in connectivity make it ideal for portable health monitoring applications.

2. Gas Sensor(MQ 135)

The gas sensor is used to detect intestinal gases that may indicate digestive disturbances related to IBS. It measures variations in gas concentration, helping to identify unusual patterns in the digestive system. The collected data assists in understanding the relationship between gas levels and symptom flare-ups.

3. Force Sensor(FSR 402)

The force sensor monitors abdominal pressure or bloating levels by detecting small changes in applied force. It provides valuable information about discomfort or muscle contractions associated with IBS. The sensor's readings help in tracking symptom intensity and physical responses over time.

4. LCD Display

The LCD display presents real-time data from all sensors, allowing the user to easily view health parameters. It serves as a quick and accessible interface for users to check their current condition without needing a smartphone. The display ensures that monitoring is convenient and user-friendly.

5. Vibrator(1034 Micro vibrator motor)

The vibrator acts as an alert mechanism to notify users when abnormal sensor readings are detected. It provides immediate feedback through gentle vibrations, helping users take timely action. This feature enhances safety and awareness in managing IBS symptoms.

6. Buck Converter(LM2596S)

The buck converter is responsible for providing a stable and regulated power supply to the entire system. It steps down the input voltage to a suitable level required by the NodeMCU and sensors. This ensures reliable operation and protects components from power fluctuations.

7. ADC Converter(MCP 3008)

The ADC (Analog-to-Digital Converter) converts analog signals from the sensors into digital data that the NodeMCU can process. This component ensures accuracy and precision in data measurement. By improving signal quality, the ADC enhances the overall performance of the monitoring system.