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Breath-Controlled Smart Automated Home Assistive System for Disabled Individual

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Abstract: *This research presents a Breath-Controlled Smart Automated Home Assistive System that enhances independence for individuals with physical disabilities using IoT. Unlike conventional solutions, it uniquely utilizes breathing as the primary control mechanism for home automation. This approach empowers users with severe physical limitations to manage daily activities through breath-based inputs, improving their quality of life..*

Keywords: Breath-controlled assistive system, IoT-based, Wireless sensor networks (WSN), Remote monitoring

I. INTRODUCTION

The rapid advancement of assistive technology has significantly improved the quality of life for individuals with physical disabilities, enabling them to perform daily activities with greater ease and independence. Despite these advancements, existing smart home automation solutions often fail to accommodate individuals with severe mobility impairments. Most conventional systems rely on voice commands, touchscreens, mobile applications, or physical switches, which may not be accessible for users with extreme physical limitations. This gap highlights the need for an inclusive, non-intrusive automation system that provides a reliable and effortless method of interaction for individuals with limited or no motor functions.

To address this challenge, this research introduces a breath-controlled assistive system that leverages IoT and embedded technologies to create an intuitive home automation experience. The system utilizes a pressure-based sensing mechanism that enables users to control household appliances through breathing patterns, eliminating the need for manual or voice- based inputs. The integration of ESP8266 microcontrollers, pressure sensors, and Thing-Speak Cloud facilitates seamless communication, real-time data processing, and remote monitoring, enhancing both accessibility and efficiency. By offering a hands-free solution, this system empowers individuals with severe disabilities to interact with their surroundings independently while also providing caregivers with remote supervision capabilities, ultimately fostering a more inclusive and intelligent living environment.

II. OBJECTIVE

- Design an inclusive smart home automation system that allows all types of disabled individuals with severe mobility impairments to control household appliances using breath patterns, removing the need for manual or voice- based inputs.
- Enhance independence and accessibility by utilizing breath as the primary mode of interaction, ensuring seamless operation for users with extreme physical limitations.

III. LITERATURE SURVEY

Recent studies have explored the development of breath-controlled assistive systems for individuals with physical disabilities are as follows:

J. Smith et al. (2018) proposed a breath-controlled wheelchair system for individuals with severe mobility impairments, utilizing a pressure sensor to detect breathing patterns and control wheelchair movement.

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M. Johnson et al. (2020) developed a breath-controlled home automation system using IoT and cloud computing, allowing users to control household appliances with breathing patterns and providing real-time feedback through an LCD display.

A. Lee et al. (2019) presented a breath-controlled assistive system for individuals with physical disabilities, utilizing a pressure-based sensing mechanism to detect breathing patterns and control household appliances.

This literature survey provides an overview of existing research and developments in breath-controlled smart automated home assistive systems. Our system provides a universally adaptable solution for seamless interaction.

IV. SYSTEM ARCHITECTURE

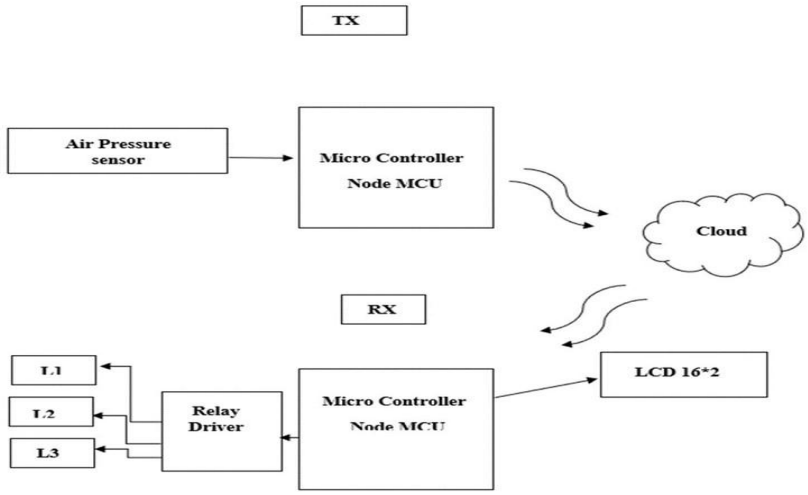

Fig.4.1. Block Diagram of Breath-controlled Smart Automated Home Assistance System for Handicapped People

Methodology for Breath-controlled Smart Automated Home assistive system:

The development of the **Smart Home Assistance System** is cantered around enhancing accessibility and independence for individuals with disabilities. This methodology outlines the integration of key hardware and software components, ensuring seamless communication, automation, and remote monitoring of home appliances.

The system employs a **NodeMCU (ESP8266) microcontroller**, which serves as the central control unit, facilitating communication between various sensors, relays, and cloud-based services via **Wi-Fi connectivity**. User input is received through a **mobile application**, enabling hands-free control of essential household appliances such as **Fan, LED, Bulb (L1, L2, L3)**. A disabled individual can control appliances through breathing inputs. Breathing input 1 time exhalation turns the fan ON and OFF as per need. Breathing input 2 times exhalation turns the LED ON and OFF. Similarly, breathing input 3 times exhalation turns the bulb ON and OFF. Thus, the system enables hands-free control for enhanced accessibility. Wireless communication is established using **TX/RX modules**, ensuring reliable data transmission between components.

To enhance environmental adaptability, the system incorporates an **air pressure sensor** that continuously monitors atmospheric conditions. If the sensor detects poor ventilation or uncomfortable temperature levels, the **fan is automatically triggered**, optimizing airflow for user comfort. The status of appliances and sensor data is displayed in real-time on an **screen**, providing immediate feedback to the user.

Furthermore, all sensor readings and appliance statuses are uploaded to the **cloud**, allowing for remote monitoring and management. This functionality enables **caregivers or users** to oversee and control the system from any location, significantly improving convenience and security. The integration of **cloud-based data processing** ensures efficient automation, while **relay modules** act as electronic switches, enabling seamless operation of high-power devices. By leveraging **smart automation, wireless communication, and real-time monitoring**, this system aims to create a more **accessible, intuitive, and independent living environment** for individuals with disabilities. The structured methodology

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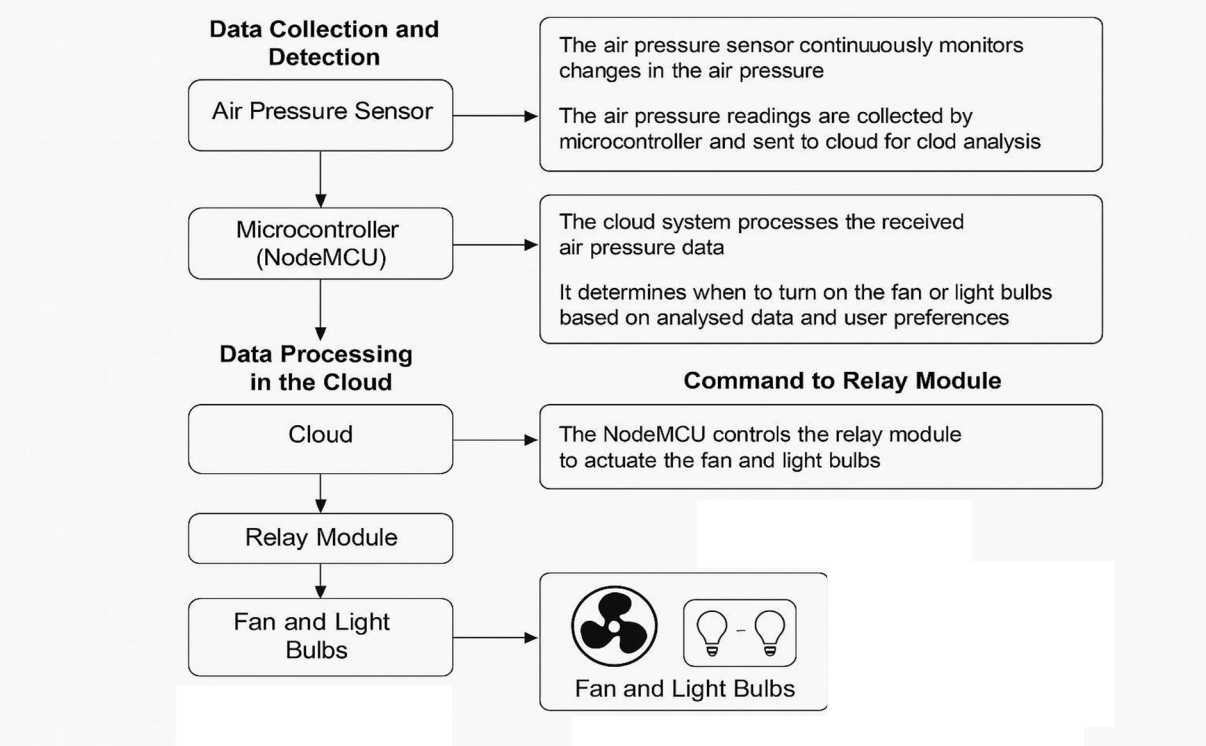
ensures that the system is **reliable, responsive, and scalable**, ultimately enhancing the quality of life for handicapped individuals by providing greater control over their home environment

V. WORKFLOW



This system monitors air pressure using a sensor, with data sent to a NodeMCU microcontroller and then uploaded to the cloud for analysis. Based on the processed data and user settings, the system decides whether to activate connected devices like fans or lights. The NodeMCU then triggers a relay module to control these devices accordingly, ensuring automatic operation based on environmental changes.

The system operates through several key stages that enable the automation and control of devices:

Data Collection and Detection:

The air pressure sensor continuously monitors changes in the air pressure.

The air pressure readings are collected by the microcontroller (Node MCU) and sent to the cloud for analysis.

Data Processing in the Cloud:

The cloud system processes the received air pressure data. If the data meets certain predefined the cloud will determine that the fan should be turned on. Similarly, if there is a need for lighting the cloud system may decide to turn on the light bulbs.

The cloud also analyses user preferences, which could be predefined or dynamically learned over time. Based on these preferences, the cloud system optimizes when and how devices are turned on or off.

Command to Relay Module:

Once the cloud system processes the data and makes a decision, it sends a signal to the

Node MCU. The Node MCU then controls the relay module, either closing or opening the circuit to the fan and light bulbs, depending on the cloud's decision.

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The relay acts as a switch to control the on/off state of the fan and light bulbs, ensuring the appliances operate according to the system's analysis.

Real-Time Monitoring with LCD Display:
The LCD display provides users with live feedback. It shows the status of the fan and lights (on/off).

VI. RESULT

Breathing Input1: Fan ON/OFF (Exhalation)

Breathing Input2: LED ON/OFF (Exhalation)

Breathing Input3: Bulb ON/OFF (Exhalation)

Breathing Input1: Fan ON/OFF(Exhalation):- A single exhalation from the user is used to toggle the fan's state. If the fan is OFF, it turns ON, and if it's ON, it turns OFF. This simple method allows easy and accessible control, especially for users with physical limitations and mobility is stricy restricted.
Breathing Input2: LED ON/OFF: - Two consecutive exhalations are used to toggle the LED light.
The system checks the LED's current state and switches it ON or OFF accordingly. This simple method allows easy and accessible control, especially for users with physical limitations and mobility is stricy restricted.
Breathing Input3: Bulb ON/OFF: - Three consecutive exhalations are used to toggle the main bulbs (L1, L2, L3) ON or OFF. The system either switches them all at once or in sequence, based on the setup. This simple method allows easy and accessible control, especially for users with physical limitations and mobility is stricy restricted.

VII. CONCLUSION

The Smart Home Assistance System for handicapped individuals revolutionizes independent living by integrating IoT, cloud computing, and automation to create a safe, efficient, and user-friendly environment. By enabling hands-free control of appliances through sensors, actuators, and remote monitoring, the system enhances convenience and accessibility for users with physical disabilities. Real-time feedback and cloud-based connectivity allow for seamless operation while providing caregivers with remote supervision, ensuring safety and peace of mind. Additionally, its automation capabilities contribute to energy efficiency and cost savings, making it a sustainable and practical solution. This innovative approach not only improves daily living but also fosters greater independence, security, and comfort for individuals with mobility challenges.

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