NEUROMIST REVIVE: MOIST HEAT THERAPY FOR SPINAL RECOVERY AND BACKACHE RELIEF

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Introduction

Back pain is a common and severe health issue affecting millions worldwide, significantly impacting quality of life, productivity, and overall well-being. This complex condition arises from various causes, including poor posture, muscle strain, and severe spinal disorders. Studies show that approximately 80% of people will experience back pain at some point, highlighting the urgent need for effective solutions. The human spine provides support, facilitates movement, and protects the spinal cord. Disruptions in the spinal structure can cause pain, discomfort, and mobility issues, emphasizing the importance of prompt and effective treatment. Traditional back pain management approaches, such as medication, physical therapy, and surgery, may not always offer long-term relief or address underlying causes. This limitation has spurred interest in alternative therapeutic strategies that target both symptoms and root causes holistically. Non-pharmacological and non-invasive therapies like vibration therapy, heat therapy, and electric stimulation have gained recognition for their effectiveness in pain relief, improving spinal mobility, and promoting tissue healing. These therapies offer a comprehensive approach to spinal health, catering to individuals with varying degrees of back pain and spinal issues. Recognizing the potential of integrating these modalities into a cohesive system, this project aims to innovate back pain management and spinal recovery. By combining vibration therapy, heat therapy, and electric stimulation into a user-friendly product, the project seeks to enhance quality of life, improve spinal health, and promote overall well-being for those suffering from back pain. This integrative approach represents a significant advancement in providing personalized and effective therapeutic solutions.

Objectives

The project aims to create a product that synergizes moist heat therapy with electronic stimulation, delivering a holistic solution for spinal recovery and lower back pain relief. By integrating these therapies, the product will provide effective, targeted moist heat treatment to aid in spinal recovery. Utilizing innovative technology, the device will offer significant relief from backaches, addressing the root causes of discomfort. The focus is on improving overall well-being by alleviating spinal pain and enhancing user comfort. This project aspires to set new standards in pain management convenience, ensuring ease of use and maximizing therapeutic benefits for users. Through this advanced approach, the product will support

comprehensive spinal health and promote a better quality of life for individuals suffering from back pain

Methodology

Materials: The smart therapeutic belt consists of three main components: hardware, software, and connectivity. The hardware component encompasses the electronic elements integrated into the belt, such as the battery bank, temperature sensor, microcontroller, IoT module (ESP8266), actuators (relays, vibration motor, heating element), and user interface (mode switches, LCD display). The software component includes the embedded firmware programmed onto the microcontroller and IoT module to control the therapeutic modalities, process data, and facilitate user interaction. The connectivity component enables remote monitoring and data transmission via the Thing Speak IoT platform, allowing users to monitor and adjust therapy parameters from anywhere using a mobile device.

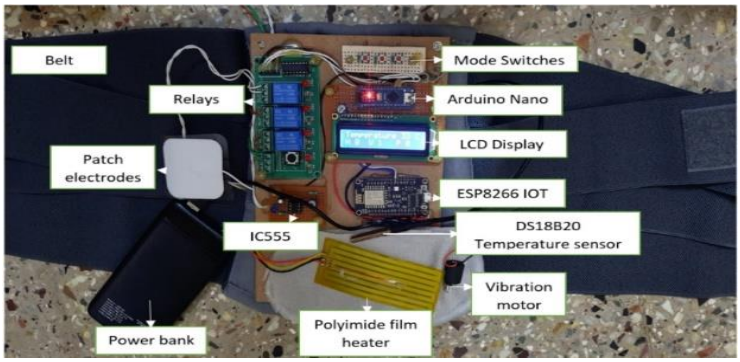


Fig. 1: Hardware setup of the project

Methods: The block diagram showcases a sophisticated system governed by an Arduino Nano microcontroller, serving as the central processing unit orchestrating various functions. The DS18B20 Temperature Sensor interfaces with the Arduino to provide real-time temperature data, enabling precise control over the system's thermal aspects. A Mode Switch is incorporated to facilitate seamless transitions between different operational modes, enhancing user flexibility and customization.

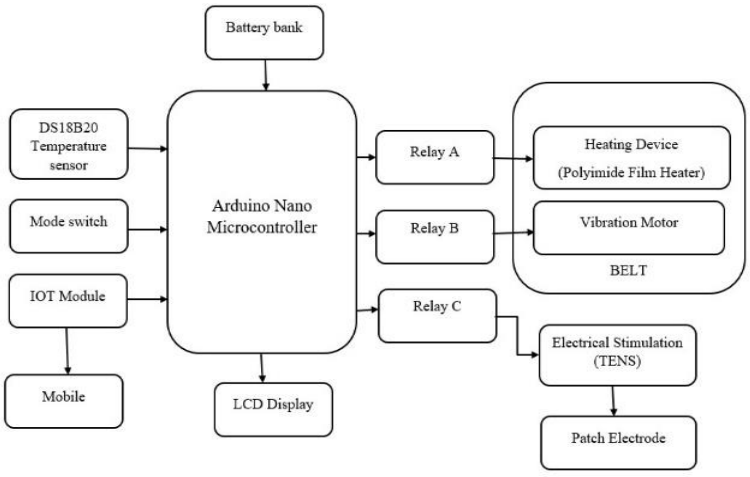


Fig. 2: Block diagram of the proposed model

The inclusion of an IoT Module signifies the system's capability for internet connectivity, potentially allowing for remote monitoring and control, expanding its utility beyond local interactions. The representation of a Mobile device hints at the

possibility of managing the system through a mobile application, offering convenience and accessibility to users on the go. An LCD Display serves as a visual output interface, presenting vital information and system status in a user-friendly manner. The presence of multiple relays (Relay A, Relay B, Relay C) highlights the system's ability to control various external devices autonomously. Relay A governs the Heating Device, likely a Polyvinyl Film Heater, enabling precise temperature regulation for specific applications. Relay B controls the Vibration Motor, suggesting the system's capability to deliver vibration-based functionalities for tactile feedback or sensory stimulation. Relay C manages the Electrical Stimulation, potentially utilizing Transcutaneous Electrical Nerve Stimulation (TENS) technology in conjunction with a Patch Electrode for therapeutic or wellness purposes.

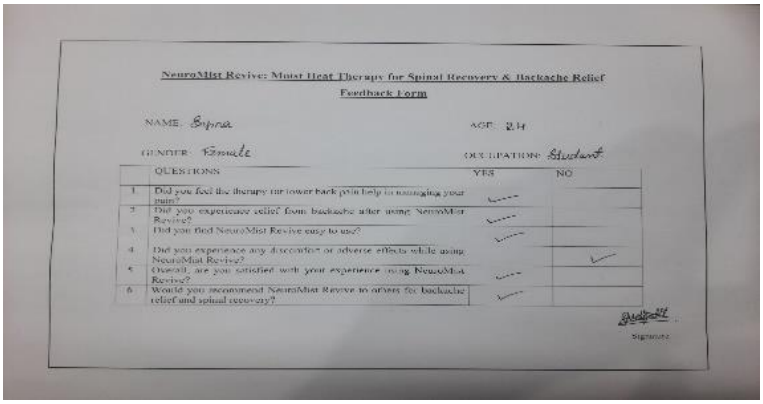
The integration of a Battery Bank as the power source underscores the system's portability and independence from conventional power outlets, enhancing its versatility for diverse use cases. Overall, the block diagram portrays a comprehensive and intricate system design that combines sensor input, control logic, connectivity features, and output mechanisms to deliver a multifunctional and user-centric experience.

Results and conclusion

The prototype demonstrated effective pain relief for individuals suffering from lower back pain through its innovative design, integrating an Arduino Nano microcontroller and an LCD display. It features three distinct modes: heating, vibration, and electric stimulation, each adjustable to suit individual needs. Users can select from three intensity levels for heating, four levels for vibration, and targeted electrical stimulation using patch electrodes. The inclusion of relays ensures precise control and seamless transitions between modes.

The integration with the ThingSpeak IoT platform, enabled by the ESP8266 module, allows for real-time monitoring and remote adjustment of therapy parameters, enhancing user convenience and informed decision-making. The customizable therapy sessions, with a minimum duration of 10 minutes, provide tailored pain relief, leading to optimal outcomes and user satisfaction.

Following the therapy session, the participant was asked to fill out a feedback form, as shown in above feedback form. The subject gave a positive reaction, indicating that they were happy with the therapy. This input suggests a positive response from the patient to the therapy, which may result in the intended effects, such as reduced pain, increased blood flow, or increased comfort levels.


NeuroMist Revive: Moist Heat Therapy for Spinal Recovery & Backache Relief
Feedback Form

NAME: Bipra AGE: 21

GENDER: Female OCCUPATION: Student

	QUESTIONS	YES	NO
1.	Did you feel the therapy (in lower back pain) help in managing your pain?	✓	
2.	Did you experience relief from backache after using NeuroMist Revive?	✓	
3.	Did you find NeuroMist Revive easy to use?	✓	
4.	Did you experience any discomfort or adverse effects while using NeuroMist Revive?		✓
5.	Overall, are you satisfied with your experience using NeuroMist Revive?	✓	
6.	Would you recommend NeuroMist Revive to others for backache relief and spinal recovery?	✓	

Signature

Fig.3. Sample Feedback from the Subject.

The IoT connectivity and user-friendly design of the prototype facilitated effective pain management, making it a promising solution for personalized back pain therapy. The comprehensive approach of combining hardware and IoT capabilities represents a substantial advancement in customized pain management treatments.

Scope for future work

The prototype will be improved in the future to better suit changing user needs and take use of new technology. To provide patients with more options for treatment, such improvements could include incorporating complementary therapies like massage or acupuncture. More thorough data gathering and analysis could be made possible by improved IoT connectivity, opening the door to highly customized treatment regimens based on unique health profiles. Advanced materials and wearable technology research could lead to designs that are more user-friendly and ergonomic. With the goal of improving back pain sufferers' quality of life and providing more effective pain relief, these advancements seek to advance customized pain treatment techniques.

References:

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