INTELLIGENT ORTHOSIS WITH PAIN RELIEVERHEAT BELT

AN INTELLIGENT DEVICE FOR VARIOUS ORTHOPEDIC SUPPORTS

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***Abstract*— Nowadays there are many different types of orthopedic supports available in the market. These include supports like heat belts, knee caps, collar belts, wrist and arm support, back supports etc., which are used as supports for various body pains, swells, sprains. Many of these orthopedic supports are available in electrically or battery-operated form with regulators installed in them in order to control the temperature passed by those supports. But all these supports are available in manually-controlled form. Theuser always has to regulate the temperature. This does not provide an actual amount of temperature to thatspecific body part that will help in faster relief of pain. Other than this problem, there are users that face with wrong usage of their orthopedic supports. This mainly includes older peoples who have to use such supports on a daily basis but lack with caretakers around them. Due to this problem, they do not get enoughguidance for the usage of their supports properly. With the help of our INTELLIGENT ORTHOSIS, wehave come up with a solution that will fix all these problems in one go. This device can be installed in many types of orthopedic devices that are usually used in a daily basis by people with issues in their muscles and joints. With this solution, the absence of caretakers can be easily compensated in order to help older peopleget proper treatment of their muscular or joint problems.**

Keywords*— *Orthopedic support, Intelligent Orthosis, FSR Module, Locomotor.

I. INTRODUCTION

In this paper, we have introduced an intelligent device for the orthopedic supports available in the market. This device enables automatic temperature transfer in orthopedic supports based on the pain occurring in the portion where the support is worn. This allows proper and accurate passage of temperature in order to obtain faster pain relief. For this intelligent cure of pain, we have implemented the use of several sensors, microcontroller, temperature passing devices and control systems that will lead to an instant relief from pain at that moment. The temperature passing all over the support will be completely harmless and effective for the user.

II. COMPONENTS LIST

1. Any orthopedic support
2. Power Supply
3. Arduino UNO microcontroller
4. Electrodes
5. FSR (Force Sensing Resistor) Module
6. Peltier Module
7. Switch
8. Buzzer
9. Connecting Wires
10. LED light

III. METHODOLOGY

Working principle of Intelligent Orthosis:

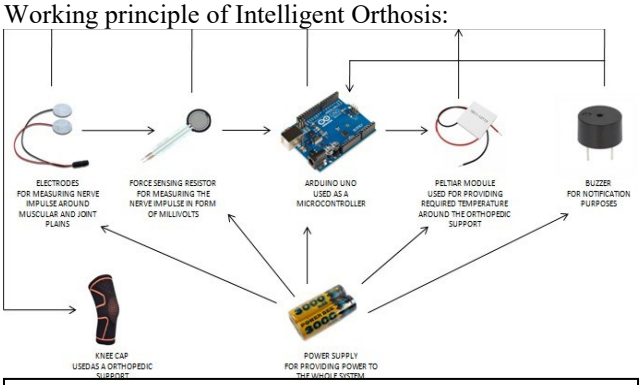

Figure: 01 WORKING PRINCIPLE OF INTELLIGENT ORTHOSIS

This is the working principle of our prototype where it will be automatically detect the amount of pain and pass temperature based on it for pain relief. In order to measure the pain, we have used electrodes that will measure the nerve impulse from the muscular or joint plains and provide it to FSR module. Since the nerve impulse is measured in millivolts so, the FSR will measure the nerve impulse in form of millivolts and provide the data to Arduino UNO for further processing. The Arduino UNO will control the Peltier module based the inputs of electrode and FSR module. The Peltier module will pass the required temperature uniformly all over the orthopedic support that will provide enough warmth to the orthopedic device which would be harmless and effective for the user. In additional, there is a buzzer attached to it in order to provide various notifications to the user regarding the proper usage of the support. This way, it will work as a guidance system for older people as well.

IV. CIRCUIT ANALYSIS

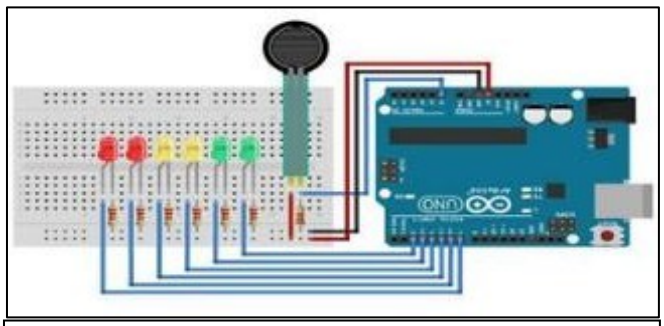

Figure: 02 CIRCUIT DIAGRAM FOR TESTING THE MEASUREMENT PROCESS

This is the image of the circuit representing the way we connected the FSR module with Arduino uno. Thiscircuit is used for testing and calibration purposes. Here, the LED lights represent the amount of the input of pain in the device. The LEDs will glow brighter as the nerve impulse received starts increasing. This system will be connected to the orthopedic device in order to measure pain from our body. In that case, thePeltier module starts functioning based on the input received from electrodes and FSR module.

V. PROTOTYPE DESIGN

By the help of the above given circuit and block diagram, we came up with a prototype of our Intelligent Orthosis that can function the mentioned operations. In this given image, all components are not attached yet. This is a basic assembling of the device to an orthopedic support.

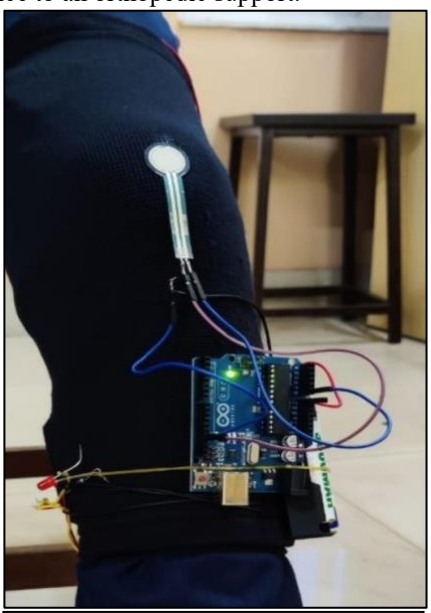

Figure: 03 Prototype Design

VI. RESULTS

The paper has been finished with success with the utmost satisfaction. The paper gives a clever plan for growing an automated health support for various people. Provisions are created to improve the code. It has been examined with live records and has supplied a prosperous result. Then the code has been tested to determine expeditiously. The device created met its objectives, with the aid of using being truthful to apply. This code is advanced with measurability in mind. Further modules can't be really different as soon as necessary. The code is advanced with a popular approach. However, there is nonetheless plenty of scope for future development and accessories in practicality. This device is able to measure the pain out of a joint or muscular plain and provide enough heat that can relieve pain and won't be harmful for the user.

VII. APPLICATION AND FUTURE SCOPE

1. Other than orthopedic patients, this device can also be used by athletes with locomotor issues.
2. This can provide safety from external injuries like the other safety guards.
3. A memory function will be installed to keep a daily based record of use of the device providing theconsultant help for better treatment.
4. Useful for older people to get proper treatment in absence of others or without taking others help.

VIII. CONCLUSION

To develop this paper, we have learned Arduino IDE Programming. With the success of this paper, we would like to develop much more advanced devices to provide help to our society. In the end, we would like to thank our mentor Ms. Susmita Das Madam for her great contribution in our paper. Without her guidance and support, this paper wouldn't become a success.

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