NECK PAIN AID USING NI-LabVIEW

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ABSTRACT

The neck is the part of the body that connects the head with the torso and provides the mobility and movements of the head. It supports the weight of the head and protects the nerves that carry sensory and motor information from the brain down to the rest of the body. In addition, the neck is highly flexible and allows the head to turn and flex in all directions. Disorders of the neck are a common source of pain. The neck has a great deal of functionality but is also subject to a lot of stress. The aim of our project is to reduce the neck pain in trigger points by giving the specific temperature. We developed an Automated Temperature controlled Hot and Cold providing system using NI LabVIEW. The purpose of using Ni-LabVIEW is it makes it simple to integrate measurement hardware, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces. Neckpain Aid is developed using Peltier module with the application of Ni LabView. When Peltier module is powered with DC electric current it gets HOT on one side and COLD on the other side. Based on our choice and need Heat or cold can be provided to the individual to Aid pain.

Keywords: *Neck pain, Peltier Module, Arduino-Uno, NI LabVIEW.*

1.INTRODUCTION

The "NECK PAIN AID" is a supportive device which is programmed using Ni- Lab view. Neck pain is a very common problem but does not usually have a serious medical cause. Many people develop a stiff and painful neck for no obvious reason. This is called non-specific neck pain. Heat or Cold therapy can be given to the person based on the need using Peltier Module. This module has been programmed to maintain the temperature without any interruption. Heat or cold is transferred from the Peltier Module to the patient neck based on the need to get relieve from the pain. The purpose of using Ni- LabVIEW is it makes it simple to integrate measurement hardware, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces. Neck pain Aid is developed using Peltier module with the application of Ni LabVIEW. Peltier module is a device which produces heat on one side and cold on the other side when powered by DC current. Pain in the trigger points is given with specific temperature either as thermotherapy or cold therapy. LabVIEW is programmed to maintain the temperature at threshold level. On selecting (either Hot or Cold) in the LabVIEW software it makes the Relay to turn on the respected Peltier module (heat or cold) to deliver it to the individual.

2.EXISTING WORK:

2.1 HEAT OR COLD PACKS

These packs are filled with non-toxic gel in a leak-resistant packaging to let you use the pack for long. Just put the pack in your refrigerator, chiller or freezer as per your needs and you can use it for cold therapy sessions. For heating the pack, immerse it in boiling water for a few minutes and it can be used as heat therapy.

2.2 TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION

Transcutaneous Electrical Nerve Stimulation (TENS) is a therapy that uses low voltage electrical current to provide pain relief. A TENS unit consist of a battery-powered device that delivers electrical impulse through electrodes placed on the surface of your skin. The electrodes are placed at or near nerves where the pain is located or at trigger points

2.3 ULTRASOUND EQUIPMENT

Ultrasound equipment generates high-frequency sound waves that are transferred to a specific body area via a round headed probe. The sound waves travel deep into tissue creating gentle heat. The heat helps relieve pain and inflammation, reduce muscle spasms, and accelerate healing. Depending on the treatment area, range of motion may be increased.

2.4 NECK TRACTION DEVICE

Neck Traction is very comfortable and easy to use for Pain Relief. It elongates neck muscles and separates cervical vertebrae, often resulting in rapid and prolonged relief from the soreness and irritation that accompanies cervical problems. Gentle, intermittent traction exercises the neck muscles increasing circulation. Firm, static traction lowers the pressure between vertebrae, freeing pinched nerves and easing herniated discs. It improves blood supply to neck muscles, tendons, and ligaments. Three layers prevent, control and diminish painful neck and shoulder aches and pains with this comfortable, inflatable neck traction therapy. This Cervical Neck Traction is designed to maintain the natural curve and alignment of the neck for your health. During traction therapy it gently elongates neck muscles and separates cervical vertebrae, often resulting in rapid and prolonged relief from the soreness and irritation that accompanies cervical problems

2.5 THERMO-CARE HEATING GEL PAD ELECTRIC WARM WATERBAG

An electric hot water pouch filled & sealed with a good quality knob, used to provide warmth, typically whilst in bed but also for the application of heat to a specific part of the body. Velvet Type Electric Heat Bag Hot Gel. It is a high quality Reliever From Aches In Cold Climatic Conditions Sealed With Special Gel. The problem with cheaper hot water bags is that it's too hot when just heated to reduce the heat and suddenly its cold. Our high quality hot water bags does not have this issue. It's much more comfortable to use than the cheaper bags with polyester materials. Rechargeable means that the device can be connected to electricity to heat the water inside. There is no battery inside. There is no risk of electric shock. It's perfectly safe to use.

2.6 NECK PROTECTION SELF-HEATING NECK MASSAGER

The neck protection self heating works with dual thermoelectric and piezoelectric effect. The device is Lightweight and Comfortable can effectively improve blood circulation, promote metabolism, and clear the meridians, enhance immunity. The device is Applicable to bone hyperplasia, neck pain, joint pain and other symptoms of hyperthermia therapy Tourmaline Magnetic Therapy Neck Massager Cervical Vertebra Protection Spontaneous Heating Belt Body Massager

3.METHODOLOGY

The Neck pain aid requires a power supply and thus a 12V power supply is connected.

LabVIEW is programmed in such a way to maintain the temperature in threshold level. Peltier module is used to provide Heat or cold to patient on their need. If they select HOT in the software the Neck pain aid is designed in such a way where it turns ON the Peltier 1 which delivers HEAT. Same happens when the patient selects COLD. The 5V 2 channel Relay plays a major role in turning ON the Peltier modules. On selecting HOT in LabVIEW software through the Arduino program the Relay 1 turns ON and thus the DC current passes through Peltier 1 and the Peltier 1 turns ON and delivers HEAT. On selecting COLD the Relay 2 turns ON and the DC current passes through Peltier 2 and it delivers COLD. LM35 plays an important role in maintaining the temperature at threshold level.
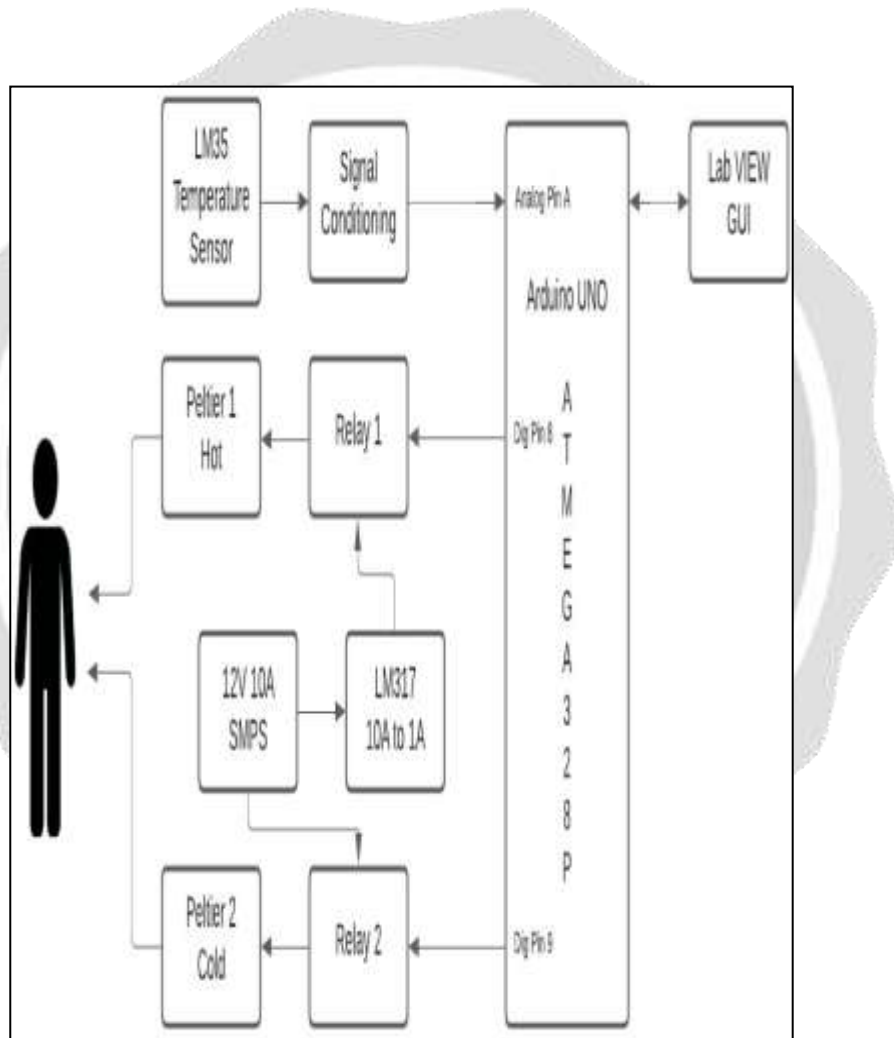

Fig -1: Block Diagram of Neck Pain Aid

4.WORKING

LabVIEW is programmed in such a way where the patient can select HOT or COLD. If the patient opts for HOT through the Arduino the Relay 1 is turned ON and HEAT is delivered from Peltier 1. The power supply for the Relay 1 is given from a 12V 10A Single Mode Power Supply (SMPS) through an LM317.The purpose of LM317 is, it converts 10A to 1A.12V 10A is not directly given to the Peltier 1 because there are chances for skin burning or skin damage as Peltier 1 is Programmed for delivering HEAT. Next, if patient opts for COLD, through the Arduino the Relay 2 turns ON the Peltier 2 which delivers COLD. Peltier module 2 is directly connected with 12V 10A SMPS for power supply. We know that Peltier module gives HOT on one side and COLD on the other side. Peltier module 2 is connected with a HEAT SINK because if 12 V 10A is directly given to the Peltier it over heats the Peltier and the heat would transfer to the COLD side after some time. Then COLD AND HOT is delivered through the Peltier using LabVIEW software.

5.HARDWARE USED

Peltier module, Relay, Temperature sensor LM35, Voltage regulator LM317, ATMEGA 328p Microcontroller, Arduino UNO, Heat sink, Resistor, capacitor, SMPS

6.SOFTWARE USED

Ni-LabVIEW

7.RESULTS

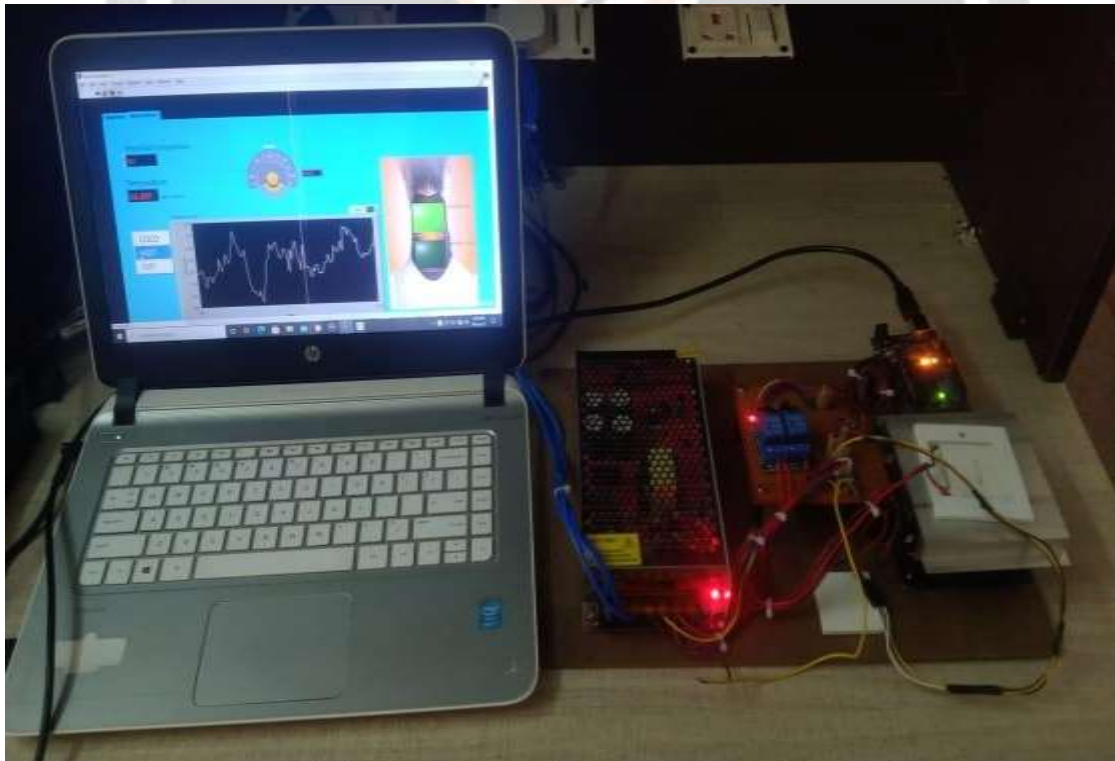- When Relay 1 turns ON the LED glows and the Peltier module 1 delivers HEAT

Fig -2: Neck Pain Aid delivering Heat

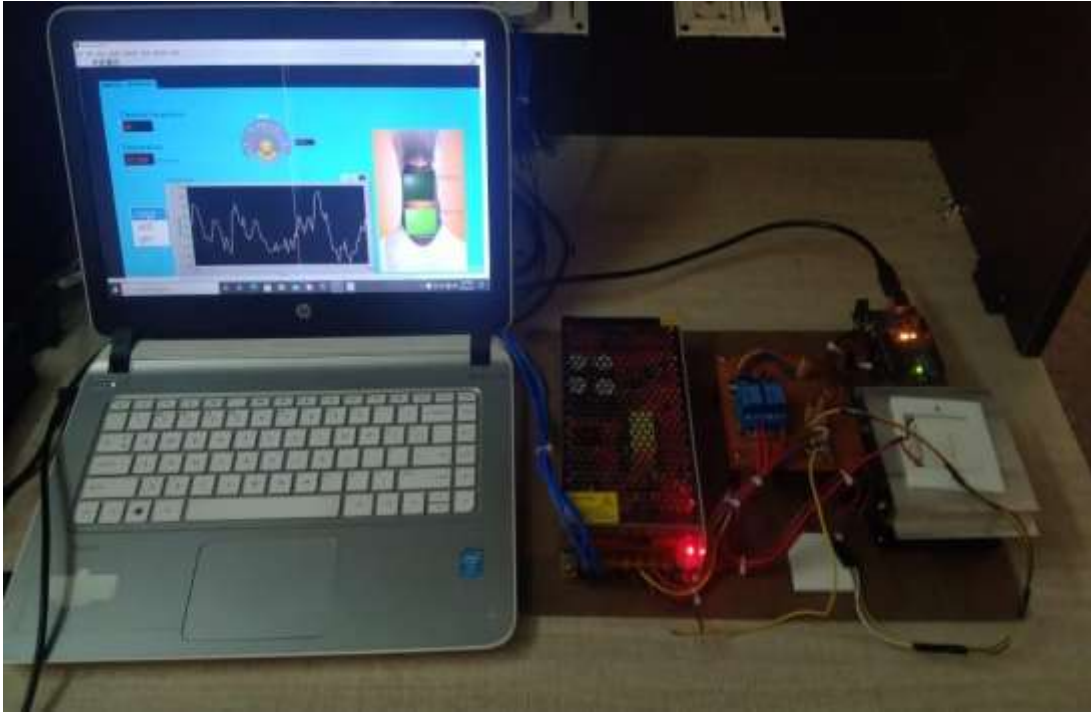- When Relay 2 turns ON the LED glows and the Peltier module 2 delivers COLD

Fig -3: Neck Pain Aid delivering Cold

8.CONCLUSION

By using NI-LabVIEW we developed a neck pain aid using Peltier Effect. The Methodology that we discussed above helps in delivering HEAT or COLD to patient as per the patient requirement. There are many systems that are serving the same purpose. But these systems are time consuming, non-mobile, and produce allergic reaction. Our proposed system overcomes all of the above problems and it is simply affordable and easy to use. Our system can be further developed as a mobile application where people can opt for HOT or COLD from their mobile phones.

9.REFERENCES

[1] Gerard A. Malanga, MD, Ning Yan, PhD, Jill Stark, DPM, *"Mechanisms And Efficacy Of Heat And Cold Therapies For Musculoskeletal Injury"*, Postgraduate Medicine, 2015, early online: 1-9, ISSN:0032-5481

[2] Giannoula Tsakitzidis, PT Roy Remmen, MD, PhD, Wim Dankaerts, PT,MT, PhD, Paul Van Royen, MD, PhD, *"Non-Specific Neck Pain And Evidence- Based Practice"*, European Scientific Journal January 2013 edition vol.9, No.3 ISSN: 1857 – 7881 (Print) e - ISSN 1857- 7431

[3] Gregory Garra, DO, Adam J. Singer, MD, Richard Leno, MD, Breena R. Taira, MD, Neeraj Gupta, MD, Beena Mathaikutty, MD, and Henry J. Thode, PhD, *"Heat or Cold Packs for Neck and Back Strain: A Randomized Controlled Trial of Efficacy",* ACADEMIC EMERGENCY MEDICINE 2010; 17:484–489 ª 2010 by the Society for Academic EmergencyMedicine

[4] Holger Cramer, Christian Baumgarten, Kyung-Eun Choi, Romy Lauche , Felix Joyonto Saha , Frauke Musial , Gustav Dobos , *"Thermotherapy self- treatment for neck pain relief—A randomized controlled trail",* European Journal of Integrative Medicine Volume 4, Issue 4, December 2012, Pages e371-e378

[5] Muhammad Atif Khan, Assistant Professor, Isra Institute of Rehabilitation Sciences, Isra University, Karachi Campus, Pakistan, *"Effects of Acupressure & TENS along with Hot Pack in Neck Pain",* Journal of Physical Fitness, Medicine & Treatment in Sports, Volume 1 Issue 1 - March 2017

[6] Olawale O.E. Ajibola, Kehinde O. Fagbolagun , and Olayide P. Folorunso, "*Design and Fabrication of a Moist Heat Therapy Device for Treating Non- specific Low Back Pain",* ISSN 0511-5728 The West Indian Journal of Engineering Vol.41, No.1, July 2018, pp.55-64

[7] Samy S. Abu Naser, Suheir H. Almursheid, "*A Knowledge Based System for Neck Pain Diagnosis",* World Wide Journal of Multidisciplinary Research and Development 2016; 2(4): 12-18 www.wwjmrd.com e-ISSN: 2454-6615