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Application Of Artificial Neural Network In Healthcare With Binary Robust Independent Elementary Feature

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Abstract - *The failure of diabetic patients to detect the precursors of leg ulcer growth in the extremities leads to ulcer formation and proliferation. Peripheral neuropathy, a complication of diabetes, is the cause of this loss of sensation. This project details the development and testing of a device that will serve as an early warning system for the development of foot ulcers. The system looks for signs of ulceration in high-risk areas on the soles of the feet. Capacitive Pressure sensors are used in combination with a data acquisition device to read the necessary data from the soles of patients' feet. While the subject was standing and walking, pressure and temperature measurements were taken from the big toe, the ball of the plantar, and the heel. The information gathered identifies areas of the plantar that are subjected to the most localised pressure and, as a result, are the most vulnerable to ulceration. In addition, after the hardware has detected the possibility of a leg ulcer, the camera takes an image of the foot and uses image processing to search for the possibility of a leg ulcer. If an ulcer is found, it may recommend medication. As a result, our device aids in the early detection of the disease and hence the reduction of its symptoms.*

Key Words: peripheral neuropathy, ulceration, image processing.

1.INTRODUCTION.

In order to provide the best diabetic wound treatment, an accurate and comprehensive diabetic wound assessment is needed. A wound evaluation performs two essential functions: determining wound severity in order to forecast anticipated wound healing rates and establish a detailed plan of care, and serving as a reliable outcome indicator for evaluating the efficacy of a given wound treatment programme.

The calculation of wound extent is an important parameter to include in a diabetic wound assessment. Several methods for assessing wound size have been developed and validated, including wound depth and surface area rather than wound depth or volume. While stereo photographic determinations may be the most precise, wound tracing onto transparent acetate or calculations based on length/width measurements are both considered reliable and simple. The measurement of wound bioburden and wound severity are two other determinants of wound healing that should be included in a wound assessment. This entails examining wound exudates and necrotic tissue type, as well as the amount and characteristics of necrotic tissue, granulation tissue, and reepithelialization, as well as determining the wound edge and peri ulcer skin's viability. The pressure sore status tool (PSST), the pressure ulcer scale for healing (PUSH Tool), the Sussman wound healing tool (SWHT), the Sassing Scale, and the wound healing scale have all been created to measure these aspects of wound healing (WHS). According to recent reviews of these wound status assessment instruments, at least two of them (the PSST and the Sassing Scale) have enough published data to be considered accurate and effective wound healing indicators in chronic pressure ulcers. Both of these wound status instruments or scales include a bedside examination of the wound bed, wound lip, and peri ulcer skin by a qualified healthcare professional, who then assigns a number to the wound that best represents the observations received. Except for the WHS, all of the existing instruments for assessing wound status were created primarily for use on pressure ulcers. None have been shown to reliably measure the appearance of diabetic, venous, or arterial ulcers in chronic vascular leg ulcers.

2. RELATED WORK

2.1. R. E. Morley, E. 1. Richter, 1. W. Klaesner, K. S. Maluf, M. 1. Mueller In-Shoe Multisensory Data Acquisition System" The aim of this project is to create a system that can predict when a patient is at an increased risk of developing an ulcer. Since the patient is likely to have a degree of peripheral neuropathy, the system must be able to detect what the patient can't. There are a few subtle warning signs that occur before an ulcer forms. Inflammation and dryness are the two most prominent of these warning signs.

2.2. R. G. Frykberg, L. A. Lavery, H. Pham, C. Harvey, L. Harkless, A. Veves, "Role of Neuropathy and High Foot Pressures in Diabetic Foot Ulceration," Inflammation

means that tissue has been damaged in the region. This has a measurable symptom: a rise in temperature. Days before the skin splits, a difference of 2.2°C between "hot spots" on the soles of the feet will occur. Components in the Diabetic insole will monitor this increase and alert the patient to the increased risk.

2.3. Dr. Gheorghe Serbu, "Infrared Imaging of the Diabetic Foot" Diabetes is a major public health issue that is rapidly spreading. According to the WHO, 135 million people were affected by diabetes in 2009, and this figure is expected to rise to 600 million by 2030.

2.4. H. Wannous, S. Treuillet, and Y. Lucas, "Robust tissue classification for reproducible wound assessment in telemedicine environment" Image acquisition, wound image storage in database, wound image pre-processing, wound edge determination, wound colour segmentation, and wound pattern identification are all part of the wound image assessment method. A Smartphone is used to capture the wound image, which is then saved in an image archive. After image capture, the first task is image pre-processing. The image pre-processing phase reduces the size of a high-resolution image to improve speed and remove unnecessary data. The horizontal and vertical pixel dimensions of the original image are divided by four to yield 816*612. It achieves a good balance of wound closure and performance.

2.5. Y. Z. Cheng, "Mean shift, mode seeking, and clustering". To detect foot outline, the pre-processed image is converted to grayscale and then Otsu Binary thresholding is applied. If the foot outline detection result is viewed as a binary picture, the infected area is marked as "White" and the rest of the foot is marked as "Black," which aids in locating the wound boundary within the foot zone. When the foot boundary is not closed, the problem becomes more difficult to solve.

2.6. V. Falanga, "The chronic wound: Impaired healing and solutions in the context of wound bed preparation,"Clinicians and nurses face a difficult challenge in monitoring the wound healing process since they must evaluate the wound. Not only routine wounds, but also ulcers, burns, traumatic, and surgical wounds, all need evaluation. Foot ulcers are a serious health problem for people with type 2 diabetes, affecting 5–6 million people in the United States. Foot ulcers are painful, infected, and take a long time to heal.

3.METHODOLOGY

The production of ulcers in the extremities causes ulcer formation and proliferation in diabetic patients. Peripheral neuropathy causes the loss of feeling. This project serves as an early warning system for the development of foot ulcers. The pressure and temperature of a person's big toe, ball of plantar, and heel are measured. Following the hardware identification, the software camera captures a picture of the foot and determines the stage of the ulcer, as well as recommending medicine for that stage if necessary.

3.1 BLOCK DIAGRAM

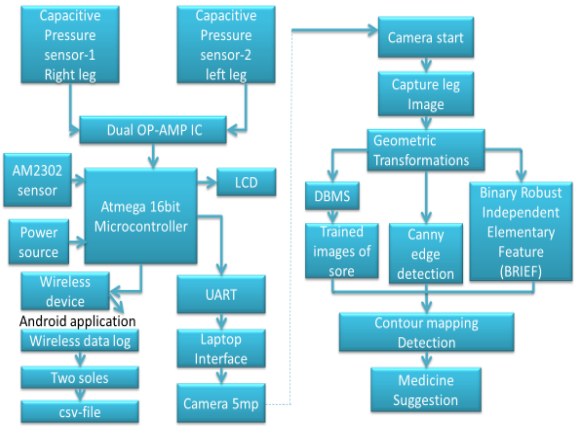
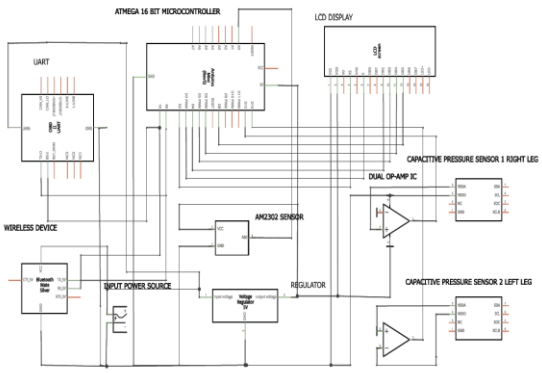


Fig -1: Block diagram

3.2 CIRCUIT DIAGRAM



Fig–2 Circuit Diagram

4. COMPONENT REQUIREMENT

HARDWARE SPECIFICATION

- Processor : INTEL I5
- RAM : 4 GB RAM
- Hard disk : 1TB
- Monitor : 20 color monitor

SOFTWARE SPECIFICATION

- Front end : GUI
- Back end : python
- Software tool used : python IDLE
- Platform : Windows 8 or 10

5. EXPERIMENTAL RESULTS

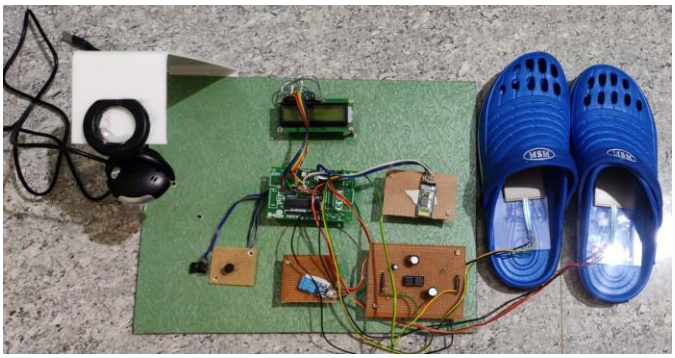


Fig-3: Experimental Setup

```
Humidity: 23.00% Temperature: 42.00°C
107.60°F Heat index: 43.64°C 110.56°F
TEMPERATURE RANGE HIGH, IT WILL FORM
FOOT ULCER , CHECK WITH
CAMERAplantar_left_leg881
plantar_right_leg0
plantar_left_leg_pressure_rate -high
Humidity: 23.00% Temperature: 41.00°C
105.80°F Heat index: 41.96°C 107.54°F
TEMPERATURE RANGE HIGH, IT WILL FORM
FOOT ULCER , CHECK WITH
CAMERAplantar_left_leg0
plantar_right_leg0
Humidity: 23.00% Temperature: 41.00°C
105.80°F Heat index: 41.96°C 107.54°F
TEMPERATURE RANGE HIGH, IT WILL FORM
FOOT ULCER , CHECK WITH
CAMERAplantar_left_leg0
plantar_right_leg3
Humidity: 23.00% Temperature: 41.00°C
105.80°F Heat index: 41.96°C 107.54°F
TEMPERATURE RANGE HIGH, IT WILL FORM
FOOT ULCER , CHECK WITH
CAMERAplantar_left_leg6
plantar_right_leg1
Humidity: 22.00% Temperature: 40.00°C
104.00°F Heat index: 40.02°C 104.03°F
plantar_left_leg737
```

Fig-4: Hardware Result

6.CONCLUSION

The project ends with the creation of a system for monitoring the healing status of diabetic foot ulcers using the BRIEF algorithm. Development of an effective classifier for quantitative analysis of wound healing status. Foot photos are classified using classifiers based on the intensity level of the wounds as labels. Using colour image processing and segmentation techniques, filtering, denoising, and transparent overlay techniques, an effective tool for analyzing wound healing has been developed. Effective cell identification and evaluation of their level of health in the wound picture, assisting in the non-contact diagnosis of the status of a foot ulcer to a doctor. This method makes it simple to assess wound deterioration. The images analysed with this method must be compared to a real-world wound image database before the efficacy of the treatment can be determined.

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