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Diabetic Foot Detection Using Pressure Sensor

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Abstract

In this project, as an experiment setup for efficient diabetic foot detection is described. Diabetes also brings neurovascular complications, which results in development of increase in pressure among the regions of the foot. Patients with diabetic polyneuropathy often lose sensations of pain and temperature in their feet, this results in an derisory pressure in their feet, while standing or walking. This may cause injuries in the feet; painless trauma develops and results in ulceration. So taking care of diabetic foot ulcer is required. For that we are introducing the device which will take the reading of the pressure applying on the foot of a diabetic patient , the pressure will be read or sense by the pressure sensor which react on a very low pressures. According to the Normalized Peak Pressure (KPa) values Classification of normal and diabetic neuropathy patients will be done. In this method diagnosis of foot ulceration will be done in an earlier stage thereby the further prevention of ulceration.

Keywords— *Diabetes, Flexiforce sensor, Foot pressure, Neuropathy, Foot detection.*

I. INTRODUCTION

Foot gives stability support while walking , standing and running. The foot has five major functions, it's the inspiration for the entire body, it can adapt to uneven ground, it acts as a shock , it provides leverage for propulsion, and it absorbs transverse leg rotation. Loss of anyone of those functions are often detrimental to the patient, and is usually noticed in patients with diabetes. quite 50 million people within the world have diabetes the prevalence of diabetes among those over 45-65 years aged group. In India diabetic is that the second commonest explanation for lower limb amputation. Foot ulceration affects 25% of patients with diabetes during lifetime and 85% proceeds to lower limb amputation. Elevated levels of blood sugar (hyperglycaemia) origin of spillage of glucose into the urine. Normally, blood sugar levels are highly controlled by insulin.

II. LITERATUARE SURVEY

The authors of this recent paper [1] tells us that the Assessment of sudomotor function by SUDOSCAN™appears to be a sensitive new method to identify subjectsat high risk for developing diabetes when compared withthe conventional methods (FPG, OGTT, and). Themethod is without fasting

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requirement, non invasive, robust andreproducible. [2] Patients with diabetes mellitus are prone to have multiple complications.One of the major complications is foot ulcer.It is a common complication which has shown an increasing trend over previous decades.Fifteen percent of diabetic patients will suffer from foot ulcer during their lifetime.Although the accurate figures are difficult to obtain, the prevalence of this complication ranges from 4% to 27%.Diabetic foot ulcer is a major source of morbidity and a leading cause of hospitalization.Approximately 20% of hospital admissions among diabetic patients are due to foot ulcers.Once diabetic foot ulcer has developed, there is an increased risk of ulcer progression, leading to infection, gangrene, amputation [3] The processing of signals is carried out in the digital domain because digital processing is accurate, fast and reliable. Digital signals are often an approximation of the analog data (like video or voice) that is obtained through a process called quantization. Representation of the digital signal is never exact, but its most closely approximated digital form. So its accuracy depends on the degree of approximation taken inquantization process. The advantage of digital communication over analog one is its noise immunity. In any transmission path some unwanted noise or voltages are always exist which cannot be fully eliminated. When a signal is transmitted, this noise gets added to the original signal causing some distortion of the signal. [4] The LabVIEW instrument driver library contains instrument drivers for a variety of programmable instrumentation, including GPIB, VXI, and serial. If a driver for your instrument is in the library, you can use it as is to control your instrument. Instrument drivers are distributed with their block diagram source code, so you can customize them for your specific application [5] This technology described educational model of computer controlled fan, with special developed software. This model is designated mainly for teaching of control systems basics. Students can test the OFF control, PID control, identification with use of the transient response. All this tasks are highly configurable with possibility to save measured data from experiment.

III. METHODOLOGY

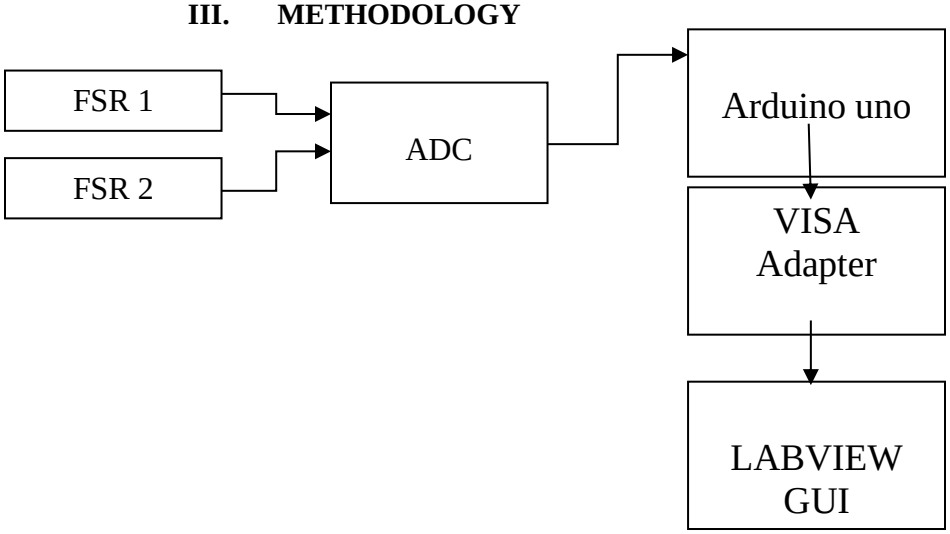

Fig. 1 Block diagram of system

In this block diagram we have tried to describe you the whole working of our project. so basically we are getting the pressure readings from the flexi force sensor, which are given to the 10 bit ADC of the arduino uno which will convert it to the digital form for the smooth process. That data then passed through the arduino uno for the process of serial communication. Afterward that serial will be acquiesced

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by the VISA which will act as data acquisition system (DAQ). And then it will access from the labview for the detection purpose.

IV. IMPLEMENTATION

Arduino Programming :

Algorithm :

Step 1 Start the system
Step 2 Serial communication will begin
Step 3 Loop will take place
Step 4 Analog 0 will show rfsrReading and analog 1 will show lfsrReading.
Step 5 To begin with rfsrReading print “R”.
Step 6 If rfsrReading is <10 then print rfsrRead Or else processed to next.
Step 7 If rfsrReading is <100 then print rfsrReading..
Step 8 If rfsrReading is>999 then print 999.Print the final rfsrReading.
Step9 To begin with lfsrReading print ”L”.
Step10 further output will be same as rfsr for lfsr.
Step11 Print the final lfsrReading.
Step12 Delay of sometime
Step13 END the program

When we will Start the system Serial communication will begin then Loop will take place then for right leg Analog 0 will show rfsrReading and for left leg analog 1 will show lfsrReading. To begin with rfsrReading it will print “R”.If rfsrReading is <10 then it will print rfsrRead Or else processed to next.If rfsrReading is <100 then print rfsrReading.
If rfsrReading is>999then print 999.Print the final rfsrReading.To begin with lfsrReading print ”L”.further output will be same as rfsr for lfsr.Print the final lfsrReading.Delay of sometime END the program

Proteus Simulation :

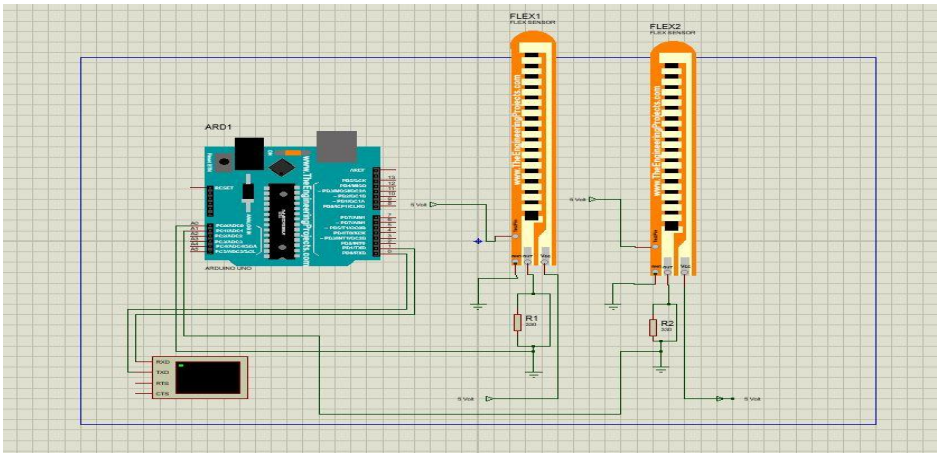

Fig. 2 Hardware Simulation

The above result is proteus simulation, our project is hardware based so first we need to do

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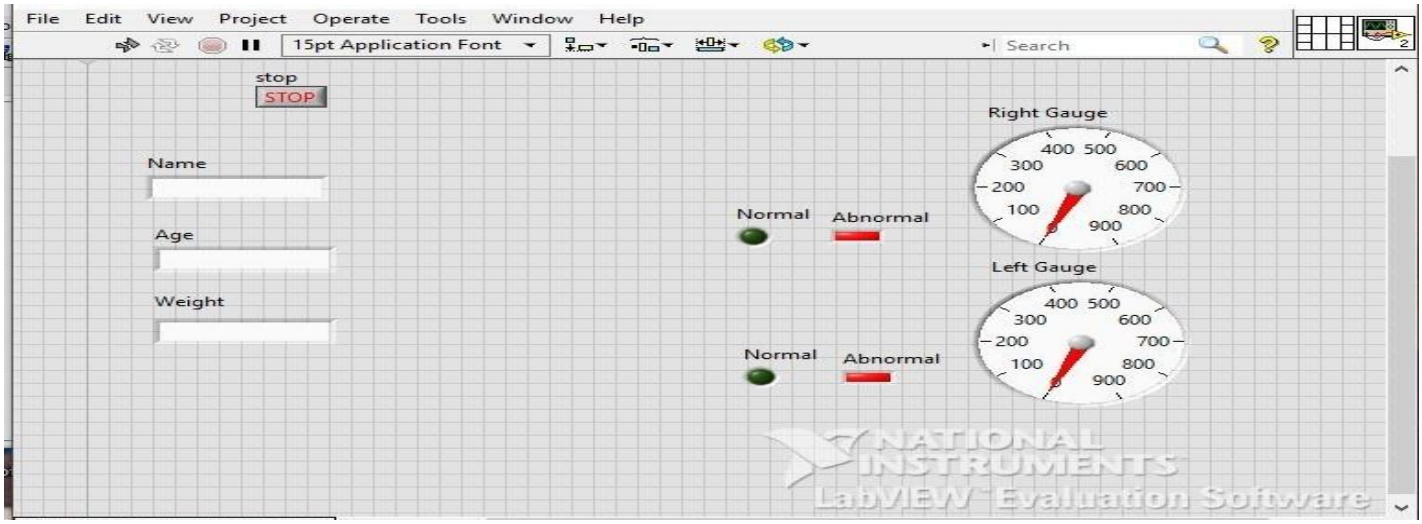
simulation .We will use Arduino for tool kit for software purpose. Flexi force sensor is used for measure force or pressure. And the support component for the same. Basically we are changing the input voltage of the FSR in the simulation for respective output.

V. RESULT

Front panel :



Fig, 3 User interface of labview

Lab VIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphically based programming language developed by national instruments .As we can see in above fig we have taken two gauge by named right gauge and left gauge to see force applied on flexi force sensor also we have placed two LED's across the gauges and as we can see we can save patients name, age and weight for future reference for better operation we have placed stop button we can operate this system so flexibly.

Back Panel :

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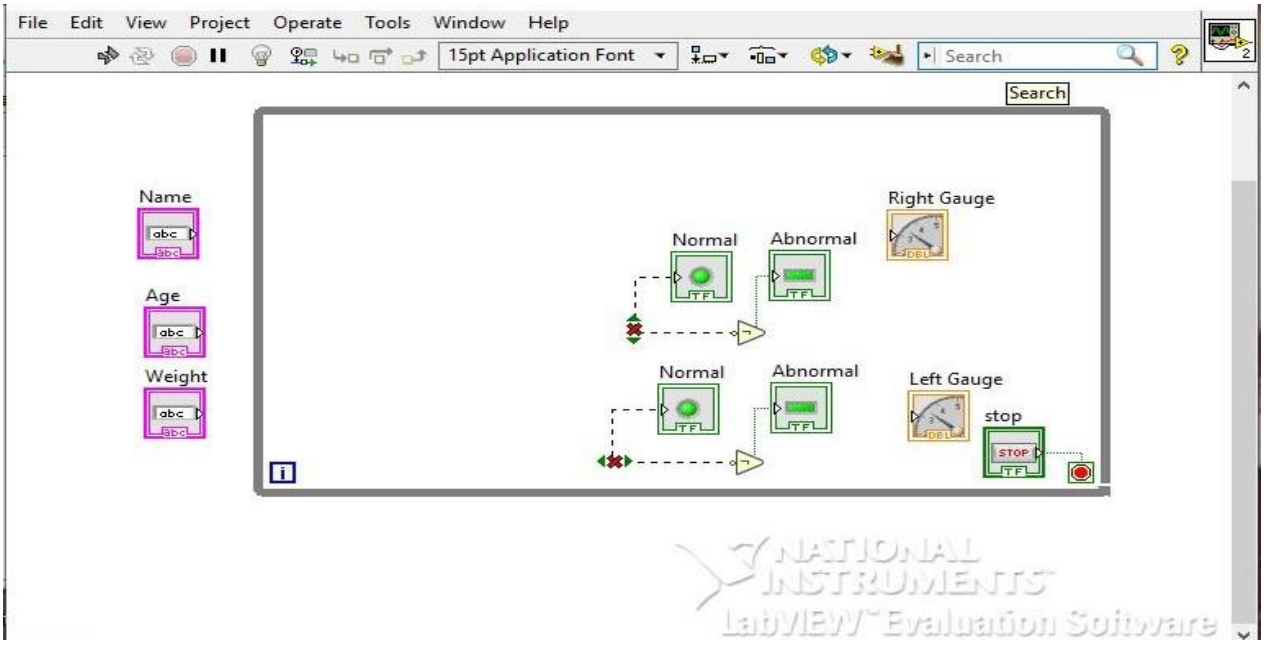

Fig. 4 Block diagram panel of labview

Above window is nothing but back panel of lab view software back panel works as a simulation, above diagram shows the defined variables we can see right gauge for right foot and left gauge for left foot those are defined for two flexi force sensors. This is what we have declared and reception for flexi force sensor. After that the main function leaded towards loop function here we have used while loop which verify input and collect data according to the condition.

VI. CONCLUSION

The experimental study of foot pressure parameter for various class of diabetic patients and the mean value for both normal and abnormal foot pressure values are compared without any physical trauma , there will be an Increase in pressure if there is possibility for getting foot ulcer in a particular area So any variation in Foot pressure which indicates of early detection of foot ulcer This is very helpful to the Physician for The detection of foot ulcer in earlier stage and also reduces foot neuropathy possibilities and cure a particular.

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