Design of a Intelligent Crutch Tool for Elders

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Abstract. In the last few years physiotherapists has been treating the individuals by taking their decisions quickly which results in complexity, non effective and decrease in recovery rate in rehabilitation. Walking aids play a vital role in helping the patients in certain conditions, they lack balance and leads to complex usage of device. These type of aids helps for individuals suffering from spondylitis, disc bulging and postural In this proposed system we design a solution for patient using walkers, this device helps them to maintain the proper balance. As a proof of concept, we develop a sensors-based solution which can be easily embed where the walker helps to get real time information of the subject and helps in recovery rate. This device will automatically warn the users when they apply more pressure on a sensor using haptic feedback. To design a smart crutch tool for Elders and Accident patients which balances the force applied in terms of stress and strain to warn the patients by means of haptic feedback.

Keywords: Posture Correction · Microcontroller · Liquid Crystal Display · Haptic feedback · Force Applied

1 Introduction

According to global reports the number of elders are expected to be more than 850 million in 2040. They help to increase the quality of life by improving their gait patterns. It is a portable, low cost device which helps the diseased individuals for their mobility. The device was designed by adding two Flexi-Force sensors to the hand supports of a walker whenever they apply more pressure on a sensor this device will automatically warn the users using haptic feedback.

2 Literature Survey

In this paper, a prototype was developed to monitor the axial force and the phase of gait cycle and it also helps to measure the real time parameter of the diseased and its operated in wireless mode.[1].

This paper mainly concentrates on the principle of pendulum for handling the crutch in different angles and motions of different weights [2].

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This paper concentrates on Walking aids play a vital role to maintain mobility and its not recommended for long term use [3].

With the usage of crutches size and shape it is useful for long period usage and it is of more aware and it gives a complete experience [4].

This paper mainly highlights the Gait parameters are used to determine the different levels of gait [5].

3 Methodology

We propose a proof-of-concept level sensors-based solution which can be easily embed to the crutch will help to measure the force parameters using flex sensors. They are placed on both the hands and named as F1 and F2.When applying pressure on F1 and F2 there will value variation on LCD.

The drivers (NPN Transistors) is connected with vibration motors which will intimate vibration by using haptic feedback. The output is displayed on LCD Display using power supply. It has analog and digital port. All the digital modules are connected to digital port.

Analog port where varying sensors. LCD display works on 0 and 1 conditions [6]. And it has two operations either it displays the text or it does not display and connected to the digital port of the microcontroller. It is connected to the analog port of the microcontroller. Whenever we press the Flexible force sensor there will an analog value which will vary so we will be setting a threshold value based on the subject. The value will vary only when we connect voltage divider. We are using 10k resistor, Capacitor and voltage regulators are connected to one side and on the other side NPN transistors are connected. It is used to activate or deactivate Haptic feedback motors. Haptic feedback motors. Each motors are connected to each force sensor. Haptic feedback will indicate with vibration when excessive force is applied [7] (Fig. 1).

Analog port is connected to two force sensor which gives the value with variation. Two big flexible force sensor are connected to the analog port of microcontroller. In general purpose board on one side capacitors and voltage regulator is connected and on the other side resistor and NPN transistor are connected.

We need to integrate the power supply and to connect black wire from the power supply board to the battery black terminal and brown wire to the battery red terminal. Once we integrate we will get the power supply, micro controller will turn On and LCD also turn ON. Now LCD display will show the F1 and F2 sensor values. We are using two vibration motors and named as V1 and V2.

We are setting threshold value as greater than 600 Pa. When applying pressure on F1 sensor there will be a analog value variation in LCD display [8]. If the F1 value is $<$600 Pa the vibration motor will not vibrate, if the F1 value is $>$600 Pa it will automatically turn ON the vibration motor and give the haptic feedback to alert the user and similarly for F2 force sensor.

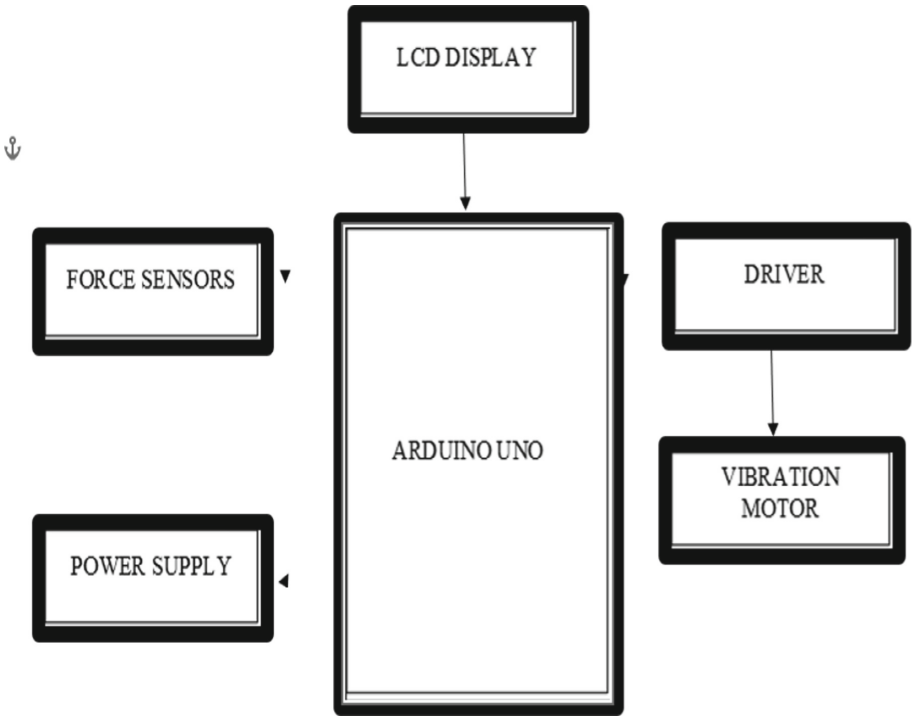

Fig. 1. Block diagram of intelligent crutch tool

4 Result and Discussion

We have connected both force sensor to the LCD display and we can see that F1 and F2 are at initial state. Now we are applying pressure on F1 sensor and there is an analog value variation in LCD display F1. We are giving threshold value as 600 Pa. If F21 value is <600 Pa vibration motor will not vibrate, if the value is >600 Pa the vibration motor vibrates and alert the user and we are applying pressure on F2 sensor and there is an analog value variation in LCD display F2 [9]. We are giving threshold value as 600 Pa. If F2 value is <600 Pa vibration motor will not vibrate, if the value is >600 Pa the vibration motor vibrates and alert the user [10] (Fig. 2).

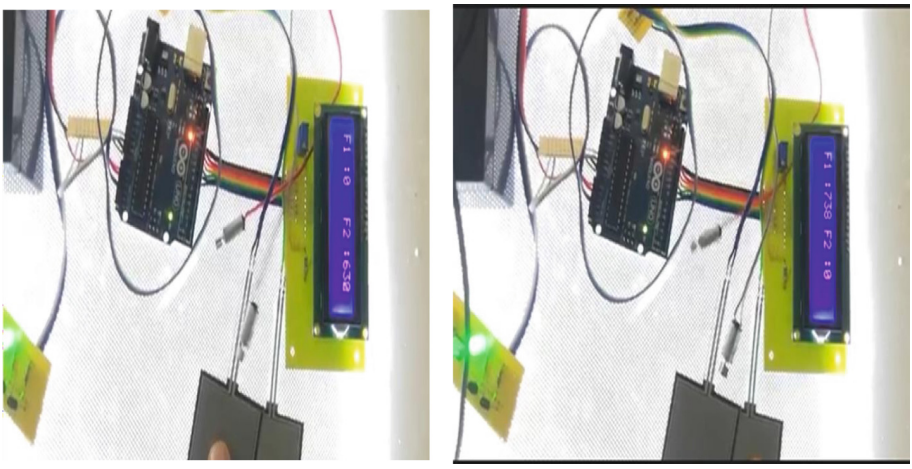

Fig. 2. Results obtained when excess force is given in F1 and F2 sensors

5 Conclusion

We propose a proof-of-concept level sensors-based solution which can be easily embed to the real walker were used to measure the information like applied pressure on each side using force Sensors. We have designed a crutch tool using haptic feedback which helps to monitor body posture changes and will develop this equipment as a crutch device which helps to monitor body posture changes like gait pattern, sports injury, cerebral palsy etc. to avoid injuries.

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