Haptic Navigational System

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***Abstract*- Physical movement is one of the biggest challenges for specially challenged people. Traveling or merely walking down a can be challenging. Because of this, such people will prefer to travel with a sighted friend or family member when navigating unfamiliar places. Our device basically is a navigational shoe which guides the user about the direction by haptic output. We use Arduino as microcontroller to interface with keypad. Two coin vibrating motors are used to provide haptic output and we made a sensor for step counting. RF transmitters and receiver is used to communicate between step counting sensor and Arduino. Firstly, we select the path using keypad. After that person starts walking and step counting sensor starts counting the steps. When there is a turn either motors start vibrating according to the turn. When the person reaches destination, both motors vibrates and after few second it stops. There is also a reverse route available in our model.**

Index terms- Arduino Nano, Step Sensor, Navigation, Radio Frequency

I. INTRODUCTION

In today's world with plenty of advancement in science in technology there are a few group of people who still cannot enjoy the independence of walking on their own for example blind. Upon thinking about this problem we made this device with which these people who are not able to guide themselves can also walk. This project presents a prototype model and a system concept to provide a smart electronic aid for blind people[5].

In this device we have predefined routes fed in Arduino Nano and a step detector is placed in a shoe and upon selecting the path using keypad the the vibrating motor of this device will guide them where to take turn for their destination also we have made three different levels of vibration depending on the distance the frequency of vibration increases hence alerting the user where the exact turn is.

Rest of the paper is organized as follows, Section I contains the introduction of Haptic Navigational System , Section II contain the related work of Haptic Navigational System, Section III contain the Methodology of Haptic Navigational System, Section IV contain the Result and Discussion, section V Conclusion and future scope of this research paper, Section VI Contains the references.

II. RELATED WORK

1. Advanced shoes with embedded positions tacking and path guidance to keep track of Alzheimer's Patient. This research was focused on fixing a GPS on a shoe and tracking person or could be used to inform them if they are going wrong[1].
2. Lechal Footware Technology. This Research was focused on preparing a product for blind or people with Alzheimer it was also fitted with GPS and according to destination address fed in mobile app and GPS co-ordinates the app would send alert to user by vibrating motors to make user aware about the upcoming turn but is limited with an accuracy of 10 Meter [2].

III. METHODOLOGY

This Device has One Transmission unit which is to be installed in a shoe and One Receiving unit which is mobile unit and can be carried anywhere depending on the user.

Transmission Unit:-
It consists of a Dome switch working as step counter and this step counter is connected to 4 pin RF receiver with frequency 433 MHz.

Following is the table descrbing the pin of the Reciever unit.

Pin No	Function	Name
1	Ground (0V)	Ground
2	Serial data input pin	Data
3	Supply voltage; 5V	Vcc
4	Antenna output pin	ANT

Table 1. Pin description of RF Transmitter

Connections:-

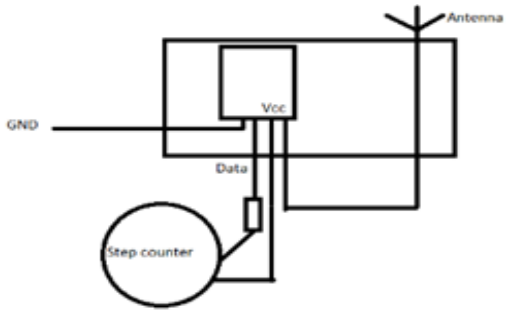

Figure 1. Connection of Transmitting unit

Working of Transmission Unit:-
In this unit the dome switch work as the step counter and whenever a user takes step it goes high and sends this data to RF Transmitter From PIN 2 of the unit. This data received is then transmitted to the receiving unit.

Receiver Unit :-
In this unit we have following components:-

- R.F. Receiver
- Arduino nano
- LM 555
- Resistors(330ohm * 2)
- BC 547 Transistor * 2
- 4*4 Keypad
- Coin Vibrating Motor

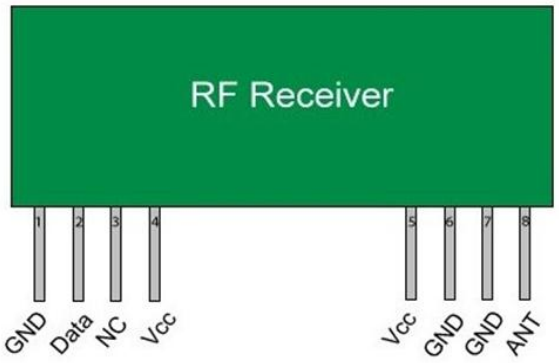

Figure 2. Pin description of R.F Receiver

Connection:-

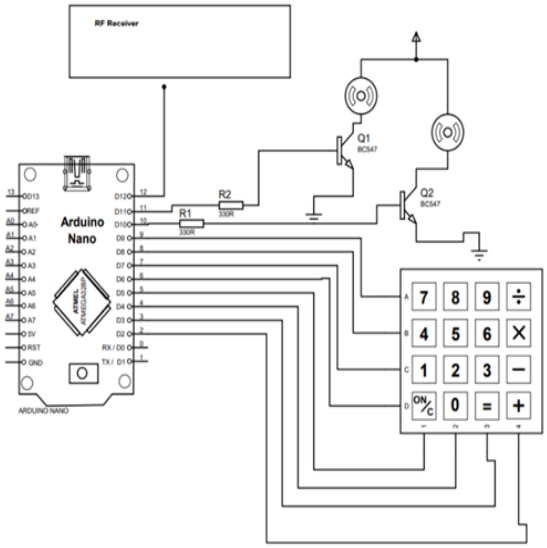

Figure 2. Connection of Reciever Unit

Working of Receiver Unit :-
When a user uses this device there are defined routes in Arduino which can be accessed by the keypad provided after selecting the route no. from keypad, Arduino starts to record the steps. In this unit the RF receiver unit is connected to Arduino PIN no. D12 .When the transmission unit detects a step it sends the data to the receiver unit this received data is in not proper square wave so we use a LM 555 I.C. to covert the incoming data to square wave so as to make it readable by Arduino. Now this data is compared by Arduino with route data feeded in Arduino and after comparison depending upon the direction user needs to take the vibrating motor for left and right vibrates and signals the persons to take a turn.

IV. RESULTS AND DISCUSSION

This device since has less complexity in circuit and is very user friendly since user just needs to select the route and the device will guide it to the destination so user accessibility will also increase. This device can also serve to various group of people like Blinds, People with Alzheimer, people with other memory related issues. Previous Devices using GPS had an accuracy of 10m and above for a turn which for a blind is very large distance so in this device we have increased the accuracy and currently it works with 2m accuracy for a turn.

V. CONCLUSION AND FUTURE SCOPE

This device since can serve a variety of people so the usability of this increases. This device can also be used with different footwear so not limiting it to be used with just one footwear. There are a few limitations like currently it is not water proof but in future waterproofing would also be possible with waterproof cases widely available. Also In future this device could be paired up with ultrasonic and infrared's to detect obstacle and also few electrodes below shoes can prevent the user from slipping if they get an alert of water like conducting liquid is below them.

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