NAVIGATION ASSISTANCE USING AN UMBRELLA

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Abstract. Internet of Things (IOT) is one of the fastest growing technologies which allows versatile creation of worldly applications with devices that communicate via computer based systems. It has made way for exceptional innovations which has made our lives assisted and easy. One such example is smart umbrella, which not only acts a shield from rain but also consists of various other features such as alerts of weather and virtual assistance for the elderly. This paper proposes an umbrella which acts as a navigation assistant to pedestrians to reach their respective destinations.

1. INTRODUCTION

The primary usage of an umbrella is to protect its users from rain and sun. And as days change, smart umbrellas now redefine its traditional purpose. The new smart umbrella is now a navigation assistant for pedestrians. Other significant features include theft prevention using SMS alerts, speech assistance, and weather forecasting. The expansion of usage of electronic devices while driving and walking on the roads have had an increased effect on the road accidents that occur annually. This proposed system reduces this risk of accidents by eliminating the need to look at mobile phones and assists in navigation. The umbrella is made of 8 LED bulbs. These are attached to tip of umbrella ribs. These LED bulbs assist the users by pointing to the direction they are supposed to take based on the destination. Raspberry Pi interacts with the LED bulbs by providing direction information which is obtained by the Google Maps Direction API. A developed Android application is used that sends real time co-ordinates to Raspberry pi through Bluetooth. This helps track the location pinned. The module helps pedestrians travel with ease and safety that doesn’t require them to look at smart phone screens.
2. LITERATURE SURVEY

Pradnya Battin, Dr. S. D. Marakandehave effectuated an android application that alerts and reminds the users to perform a particular task based on location instead of time. The application is run by Google map services API. This decreases the possibility of forgetting the task to be performed in a particular location which is independent of time. But unfortunately this cannot be implemented for indoor locations [1].

Shigeru HAGA et al have researched about the ramifications of using smart phone devices while walking on the road. They conducted various experiments such as sending messages, watching videos, playing video games on undergraduates while walking, which proved that pedestrians using cell phones on road are prone to accidents [2].

The indoor light system was proposed to be controlled using web technology and raspberry pi. Cesar Cheuque et al proposed this system. The interoperability between mobile and system did not fail. A more durable platform should be created that is user friendly. The two problems that weren’t considered were safety and serving larger purpose.

Sathya Narayanan E et al invented a cane that is used by the visually challenged. Which provides services like detecting obstacles, guidance for level crossing, indicates current location by using sensors and GPS. The user is provided instructions using text and speech converter. This is transmitted through headphone. This module is relatively inexpensive and weighs only about 2 kilograms. But again unfortunately this module can’t detect obstacles with heights of 1.5 m and above (from the ground).

Yohei Iwaki, Nobuo Kawaguchi, Yasuyoshi Inagaki proposed a system that uses both location and direction. Its biggest advantage is that it provides an extensive range of application services.

3. PROPOSED SYSTEM

The model is a smart umbrella paired with mobile applications that act as a navigation assistant by using the Bluetooth technology and provide additional features to improve the already existing system. Main concept that we use is the LED intimation for navigating the direction and mobile application for the select the root map of the destination. The proposed umbrella should continue to point in the same direction sent from smart phone navigator overcoming a variety of disturbing behavior such as rotating the umbrella. If it does not point in the correct direction, the customer would not be able to arrive at the correct location. To solve this problem, we continue to update the direction using 9DOF sensor calculation module. It updates the direction periodically using a three-axis electronic compass sensor (Sparkfun 9DOF).
The additional features are stated below: When the umbrella goes out of range, an SMS will be sent to the user's mobile number stating the same. When the user reaches the destination, the listed contacts will receive an SMS stating that he/she has reached the destination. The weather forecast updates are sent as an SMS alert to the user, intimating them about the weather. Voice instructions of the directions will be provided using a speaker; the user can enable or disable this feature and also the one which controls the LED bulbs.

The aim of our model is to reduce accidents caused by excessive usage of smart phones while walking on roads. The primary purpose is to eliminate the need for using smart phones by replacing them with this model for navigation. This smart umbrella will guide us our way using the LEDs attached on the ribs of the umbrella. This helps in minimizing the risk of accidents considerably. The weather forecasting in our model helps the users to decide and take precautionary measures based on it. Loss prevention is also provided for the users by notifying them via SMS alerts when the umbrella goes out of range. Speech assistance is present so that the users can navigate easily in case they go in wrong direction.

![Workflow of Model](image)

The below sub contents provide the whole system architecture which provides the information about the inter connections of the LEDs and the Raspberry Pi. It also provides us the information about the connections between the HC-05, 9DoF and Raspberry Pi. The architecture diagram in Figure 3.3 shows 8 LED bulbs which are connected in series with resistors each of 330 ohms resistance and their connections to the microcontroller i.e. raspberry pi 3 B+. The LED bulbs used are of 3 different colors, namely red, green and yellow. The cathodes of LED bulbs are all connected to the ground pin of raspberry pi 3. The anodes obtain power supply from GPIO pins of the raspberry pi 3 which passes through resistors and powers the LED on or off. The GPIO pins used for the 8 LED bulbs are GPIO 25,12,16,05,21,18,23,24 representing the bulbs in clockwise order.

**HC-05 AND 9DOF WITH RASPBERRY PI**
The above figure consists of raspberry pi 3, Sparkfun 9DoF Inertial Measurement Unit(IMU), HC-05(Bluetooth module). The transmitter of HC-05 is connected to the serial port, UART receiver GPIO pin number 15 of the raspberry pi by a yellow wire as shown in the figure. HC-05’s Ground pin is connected to the ground pin number 6 of raspberry pi represented by a black wire in the figure. HC-05 is provided with power of 5 Volts by connecting to the 5V pin of raspberry pi which is numbered 4 shown by a blue coloured wire in the figure. Once, the HC-05 is paired with the mobile phone’s Bluetooth, values can be sent from the Android application to the pi via HC-05. The baud rate in the program should be set to 9600 bits per second (bps). To get the current orientation of the device, Sparkfun 9DoF sensor is used. An FTDI basic breakout board is attached to the 9DoF sensor. This is used to connect to the USB port of raspberry pi using a USB connector. The values can be read by writing python code to open the USB port of the raspberry pi.

Table 1. Magnetometer Readings

| DIRECTION       | START RANGE | END RANGE |
|-----------------|-------------|-----------|
| North           | 337.6       | 22.5      |
| North-East      | 22.6        | 67.5      |
| North-West      | 202.6       | 337.5     |
| East            | 67.6        | 112.5     |
| West            | 247.6       | 292.5     |
| South           | 157.6       | 202.5     |
| South-East      | 112.6       | 157.5     |
| South-West      | 202.6       | 247.5     |

Google Maps Direction API is used to receive the turn by turn guide from the starting point to destination mentioned by the user as inputs. The current orientation of the umbrella is obtained by using a Magnetometer sensor (9DoF). Magnetic declination is also considered to get the accurate heading value. Based on this obtained information the respective LED bulb pointing to that direction glows. The pedestrian needs to follow the direction shown by bulbs to reach the destination. The range of boundary is set for the umbrella. Once it goes out of that range, an SMS alert is sent to the registered users which include the information about the current location of the
umbrella. This proposed model also gives weather forecasting updates of the destination which can also be sent as SMS alerts based on which the user decides whether to carry the umbrella or not. The directions are provided as text as well as speech which now can be transmitted to the user via headphones or speakers by connecting to Raspberry Pi. In table 1 the magnetometer reading is shown.

4. CONCLUSION

This paper proposed the navigation assistance using an umbrella module that exists on the top of the umbrella. Use of smart phones while walking on the roads can cause safety problems to pedestrians due to the dispersion of the field of view. Therefore, we made the smart navigation module such that the user can give the source and destination and the umbrella helps in the navigation to their particular destination using attached LEDs on the ribs of the umbrella instead of smart phone. Due to this the number of accidents decreases. It can provide safety and convenience. The weather forecast updates are sent as an SMS alert to the user, intimating them about the weather. Voice instructions of the directions will be provided using a speaker; the user can enable or disable this feature and also the one which controls the LED bulbs.

REFERENCES:

[1]. Battin, Pradnya, and S. D. Markande. "Location based reminder Android application using Google Maps API." In Automatic Control and Dynamic Optimization Techniques (ICACDOT), International Conference on, pp. 649-652. IEEE, 2016.

[2]. Cheuque, C., Baeza, F., Marquez, G. and Calderon, J., 2015, November. Towards to responsive web services for smart home LED control with Raspberry Pi. A first approach. In Chilean Computer Science Society (SCCC), 2015 34th International Conference of the (pp. 1-4). IEEE.

[3]. SathyaNarayanan, E., Nithin, B.P. and Vidhyasagar, P., 2016, November. IoT based smart walking cane for typhlotic with voice assistance. In Green Engineering and Technologies (IC-GET), 2016 Online International Conference on (pp. 1-6). IEEE.

[4]. Fernandes, Ana Isabel, Miguel Goulao, and Armanda Rodrigues. "A Comparison of Maps Application Programming Interfaces." arXiv preprint arXiv:1305.3485 (2013).

[5]. Finkelstein, Stanley M., Stuart M. Speedie, Xinyu Zhou, Edward Ratner, and Sandra Potthoff. "VALUE: virtual assisted living umbrella for the elderly-user patterns." In Engineering in Medicine and Biology Society, 2006. EMBS'06. 28th Annual International Conference of the IEEE, pp. 3294-3296. IEEE, 2006.

[6]. Asha P, Albert Mayan J, Canessane A (2018),"Efficient Mining of Positive and Negative Itemsets Using K-Means Clustering to Access the Risk of Cancer Patients", Communications in Computer and Information Science ,ICSCS 2018, Kollam, 2018,pp.373-382.

[7]. Sri Harsha S.L.S, Chakrapani Reddy S, Prince Mary S(2017),"Enhanced home automation system using Internet of Things ",Proceedings of the International Conference on IoT in Social, Mobile, Analytics and Cloud, I-SMAC 2017 ,pp.89-93.