Lechal Footwear Technology

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***Abstract**-A new interface foreyes-free pedestrian navigation in environments. Itcan be fully integrated into users' own, regular shoes without permanent modifications.Interface use does not distract users from their surroundings. It thereby adds to users' safety and enables them to explore their environments more freely than is possible with prevailing mobile map-based pedestrian navigation systems. It can be evaluated by using different navigation modes. This system provides an affordable, mobile balance abnormality detection system, which is reliable, easily customizable for individual users.In addition, this smart shoe system comprises a platformthat we wish to share for diverse application domains, including urban and participatory sensing, behavior analysis, andnovel applications that incorporate social networking.*

Keywords: navigation, tactile interface, eyes-free interface, wearable, mobile device.

1.INTRODUCTION

Before, people were mainly accustomed to using paper-based maps or to asking other people for directions. Nowadays, mobile map and navigation applications on mobile devices have become a primary class of wayfinding and navigation aids in urban environments. The reliance on automatic navigation systems seems to possess general consequences both for the kind and amounts of spatial knowledge that are acquired during navigation. In contrast to regular, paper-based street-maps, mobile mapbased applications offer a choice of spatial information on different levels of

detail and situated, turn-by-turn instructions to keep users on the right way towards their intended target. Direct efforts associated with acquiring a mobile application(i.e., downloading it) will often be less than those associated with buying a paper-based map at a store. However, such advantages of mobile map-based applications come at the price of high attentional demands as users' visual attention

has to be frequently directed at the display of the mobile device. The interface uses tactile feedback to convey situated turn-by-turn information. Tactile feedback is provided in the user's shoe, using vibration actuators. With Lechal footwear technology, no visual attention on the mobile device is required once the user is on the Way . Users are free to explore their surroundings during the way finding process.Two distinct navigation modes can be used, the Navigator, and the Compass mode. After examining the more obvious placement options for a tactile feedback interface (e.g., in shirt or trouser pockets, near the user's hands, on a belt), we decided to design an interface that is placed in or near the user's shoe in the form of a wearable.

2.SYSTEM ARCHITECTURE

The proposed system is composed of the lechal a personal device such as a cellular phone and a remote networked computing infrastructure. The smart shoecontains a lightweight embedded processing device and pressure sensors. The pressure sensors are placed in the insole, so as to minimize the number of necessary sensing channels while still allowing for feature detection and extraction from walking patterns and necessary gait parameters. As the embedded processing system in the shoe is designed for low-power operations that limit its processing capabilities, a more powerful device such as a cellular phone device is used for real-time, on-site data evaluation. The personal device, i.e. mobile phone, performs real-time fall risk estimation through signal processing, feature extraction,pattern recognition and classification. Upon detecting a set of features that are an indication of high falling risk, the personal device is capable of sending preemptive notification to the user, a physician or a care giver. In addition, it acts as a gateway between the shoe and the backend server. The presence of more powerful devices in collaboration with backend server increases system and data reliability. The collected data is stored temporarily on the device until it is transferred to secure backend server.A remote computing and data repository infrastructure stores parameters extracted from users over time, including balance quality and fall context. This information is considered of high value to both users and more importantly to physicians. In particular, the availability of historic data can be used to improve the fall detection model and lead to enhanced accuracy in fall risk analysis.

3.SHOE LAYOUT

All components of the project are placed inside the right shoe of a pair of large Size Shoes. Several

Fig.1- Lechal hardware prototype, consisting of (1) a microcontroller with Bluetooth LE and compass modules,(2) a9Vbattery,(3) two vibration actuator and(4) an Cellular phone

modifications were made to the shoe to embed all the components inside the shoe's sides and sole.The Battery, Arduino Pro Mini, the HC-06 Bluetooth module will be embedded under the fabric lining the interior sides of the shoe. The fabric lining the sides was sliced up and the components were laid out in space between the down to increase the aesthetic appeal of the shoe.leather sides and fabric. To ensure a robust design, we will tap down all the components and connecting wires and uniformly add padding to reinforce the comfort level for the shoe. The fabric covering will be glued

4.WORKING

Smart shoe is related to the field of navigation systems with tactile feedback. There exists a broad range of previous work, with either a single or with several actuators, that have inspired a number of aspects of and design decisions for our interface. Additionally, a few (e.g., commercial) products exist that include shoe-based interfaces.

A. ACTUATORS

Although an obvious approach would be to indicate turns to the left by vibrations in the left shoe and turns to the right by those in the right shoe. Distributing the two actuators across both shoes would necessarily require a second communications channel and a second power source, thereby doubling the system's complexity. The human foot is very sensitive to tactile stimuli (vibration), especially at the ankle in the medial region where we place Way's actuators. We hypothesised at design time of the interface that users would be able to reliably differentiate between two different vibration sources in the same shoe if both would be placed sufficiently apart. For encoding directional instructions (left, right, behind, or in front of a user), we devised 4 simple vibration patterns. When the target is within a 90° area to the left or right, on the corresponding side of the shoe.. When the target is within a 90° area directly behind the user, both actuators vibrate. When the target is within a 90° area just in front of the user, there is no vibration at all. The user does not need to be bothered with additional instructions when no change of direction is required at the moment.

B.NAVIGATION MODE

It works just like regular navigation systems that are, for instance, used in cars and only provides feedback when users are approaching intermediate targets.

C.COMPASS MODE

In contrast to the Navigator, this approach is more exploratory and playful, and invites users to interact more with their navigation task. Basically, in this mode, tactile feedback is provided until users are pointing into the correct direction.For the shoe component, an Arduino Pro Micro has used,since it has a very small size, but still provides enough pins and sufficient computing power for our prototype. Bluetooth Low Energy (LE), the most recent version of the Bluetooth protocol, which has a low energy footprint and allows our prototype to run off a standard 9V battery for days. Bluetooth communication is currently one-way only: instructions are sent from the Mobile to the microcontroller, but not vice versa. The shoe component also includes a 9-The shoe component also includes a 9- DOF inertial measurement unit (IMU) with an accelerometer, magnetometer, and gyroscope. With these 3 sensors, we can compute the stabilised heading of the shoe component. The mobile has a compass, however, a second compass needs to be located within the shoe component because the phone compass will often not be aligned with the user's viewing direction. The shoe component also holds two vibration motors, which are placed on each side of the user's foot to communicate the navigation instructions. The-shelf vibration motors are used over other actuators(e.g., pneumatic actuators, heating elements, electrical stimulation) because they are easy to replace, low-cost, and work with a broad voltage range for different power sources. The phone component uses smartphone's GPS facilities to provide situated, turn-by-turn routing information. The route is constantly updated to allow our prototype to dynamically adapt to wrong turns or to any deviations from a planned route. Once the appropriate signal has been determined, a corresponding command message is sent via Bluetooth to the microcontroller in the shoe component, along with other model dependant data. Such a signal is sent every two seconds. The microcontroller computes whether the

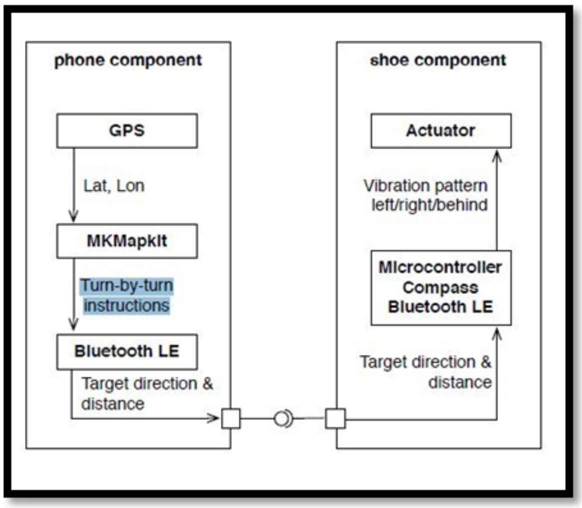

Fig.2-Smart Shoe component diagram

target(i.e., the next turn) is close enough to start the tactile feedback. Application first determines the angle between a vector from theuser's position to magnetic North and a second vector from the user's position to the target. In order to determine the actual orientation of the user relative to the target, the compass angle of the user is also required. The mobile compass angle is not used instead as it will often not correspond to the user's orientation. The microcontroller consequently retrieves the current compass angle of the compass module in the shoe component, and offsets it with target.

5. ADVANTAGES

1) It would really help mainly for visually challenged people.
2) The comparably higher accuracy and better comprehensibility , simplicity and low weight of a actuator System.
3) does not require users to hold or carry their smartphones in specific ways in order to be able to navigate properly.
4) It counts your steps and tracks your calories burnt.

5) Navigation Assistance while travelling.

6)Distraction-free travel.

7) Automatic rerouting and alerts.

8)Various User-controlled Vibration pattern.

9)Precisely Calculates pressure distribution on different areas of your feet.

6. LIMITATIONS

1)Battery failure or loss of Bluetooth connection.

2)User might miss a turn because of environmental condition.

7. COMPARATIVE ANALYSIS

There are also other smart shoe technology such as:

No Place Like Home: which is an art project that features a pair of men's leather shoes which were specifically built for the project. The shoes are augmented with a micro controller, a GPSmodule,andasetofLED switcharearranged inthetoe-capoftheshoe. It is guided by different light patterns as they walk around.

Paradiso:This prototype was used for expressive, interactive dance performances, in which the dancer generated a stream of music based on shoe-embedded sensors.As a bridge between interest in Wearable Computer systems and new performance interfaces for digital music, a highly instrumented pair of sneakers have been built for interactive dance. These shoes each measure 16 different, continuous parameters expressed by each foot and are able to transmit them wirelessly to a base station placed well over 30 meters away, updating all values up to 60 times per second. It is use for some musical mapping & demonstration in dance.

How Lechal Footwear is better

1)The above technologies are used for specific application or specific purpose.

2)The above technologies need to continuously glance down at your phone rather than paying attention to your surrounding but the lechal smart shoe is also useful for blind people as it does not require to continuously glance down.

3)Lechal has increase accuracy,operating flexibility than paradiso& no place like home.

4) This shoe has interactive haptic technology, which allows your shoe to become pedometer, calorie counter and GPS.

5)The No place like home technology uses different LED patterns to guide,but in Lechal footwear there is no need for light patterns so the blind person can also use these technology.

Due to these advantages we should analyse that Lechal Footwear Technology is better than any other Smart shoe Technology.

8.FUTURE SCOPE

The shoes sync up with a smartphone app that uses Google maps and vibrate to tell users when and where to turn to reach their destinations. These shoes were developed for blind people since the cane can detect objects but cannot tell them where and when to turn. Now theses shoes could be used by the joggers, mountain bikers or even tourists will be able to plug in their destionations and not have to stop to check their phones as they move. Also these shoes will be able to use for recording distance travelled and calories burnt.The biggest challenge will be to make the design more modular so that it can be placed inside any shoe. The designs should be more compact and light weight, so that it causes minimal distraction to the user. Wireless Induction Charging could be added to provide a convenient way of charging the device without having to hook up any wires to it.

9.CONCLUSION

It is a haptic footwear, innovated in India for every sone mainly help for visually challenged people. Its help for navigation system and medical fitness as it counts steps and tracks calories burnt. It works as a natural extension of the human body. Earlier cane was used in detecting obstacle Now the cane has been replace by this shoe. The biggest achievement for this project was how to get everything assembled inside a shoe. A lot of time was spend trying to add user comfort and how to make the product look nice. A charging socket was added on the side so that the product looked more complete and finished. Also a special USB Charging Cable was added to add to the ease of charging for the finished product.

10. REFERENCE

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