



"INDOOR NAVIGATION FOR ALL"

A mobile app that navigates not just regular users, but also assists blinds or visually impaired throughout the indoors.

Proposal submitted by-

KUNAL GEHLOT

1st year, B.tech (Civil) , JIET, Jodhpur.

LOVEJEET GEHLOT

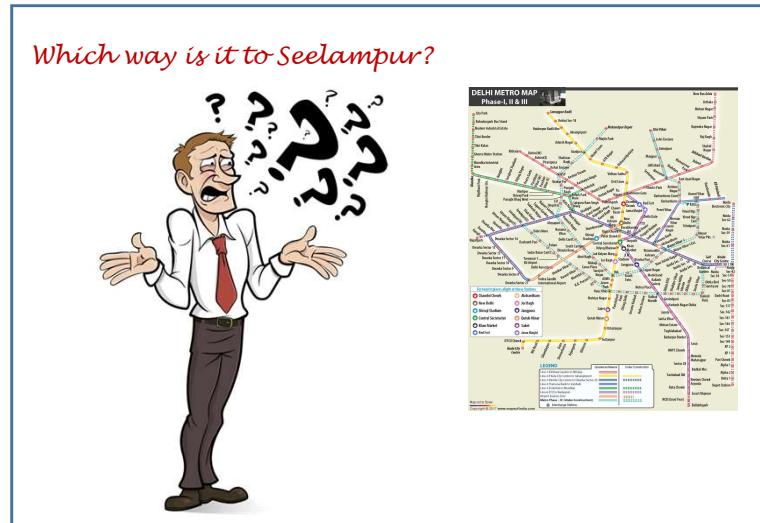
B.Arch 2017, MNIT, Jaipur.

ARGUMENT

Indian government has lately been emphasising on barrier-free public spaces under sustainable development goals. Whether disabled or not, it is targeted that all public spaces can be utilised freely by everyone. But, even after investing a huge amount of public money on following barrier-free guidelines in all public buildings, it fails to fulfil the purpose. For example, tactile paths lets the visually impaired people assist on movement, but provides no hint of orientation or direction.



Furthermore, public transport systems such as Delhi Metro, have become so enormous and complex that even regular users get lost frequently into the chaotic system of mapping. It is not uncommon that travellers have to ask others for routes to their preferred location.



INTENTION

With expeditious advancement in technology and affordability, more than 500 million Indians today have access to internet on their smartphones. With such rapid increment, many apps have tried to provide special features for regular and disabled travellers to support navigation through indoors and outdoors. Yet they have mostly been inefficient and proven to be impractical due to various reasons. We propose adding technological advancements to the environment through developing navigation systems, that can guide people of all kinds who find difficulty in travelling through massive transport systems such as airports and metro stations.

TARGET

According to 2011 census by government of India, Delhi has more than 30k VI/blind people and more than 24k people with multiple disabilities, which can add up to blind or VI people. (<http://www.census2011.co.in/disability.php>).

Delhi Metro, a ₹350 billion project, which claims to have 'barrier-free' design by merely providing tactile paths for blind people, never succeeded in attracting visually-impaired people to use the facility. Even if they choose to use metro for instance, they would always have to rely on others to assist them as it challenges their spatial awareness ability, which also leads up to stress and anxiety. This makes them hesitant in using the service in future.



Even regular visitors get puzzled just by looking at the enormous route map of Delhi Metro, and find it extremely difficult to locate their destination on map and to self navigate themselves on endless stations.

PROPOSAL

We propose the use of Beacon technology, that when connected with Smartphones via app, can solve all the problems of navigations without the need of any human assistance.

The proposed solution makes use of Custom developed app from Google Eddystone, an open-sourced solution for navigation, with a set of Estimote Location and Proximity beacons*.



*Beacon refers to a radio transmitter whose signal helps to fix the position of any smartphone.

SOLUTIONS

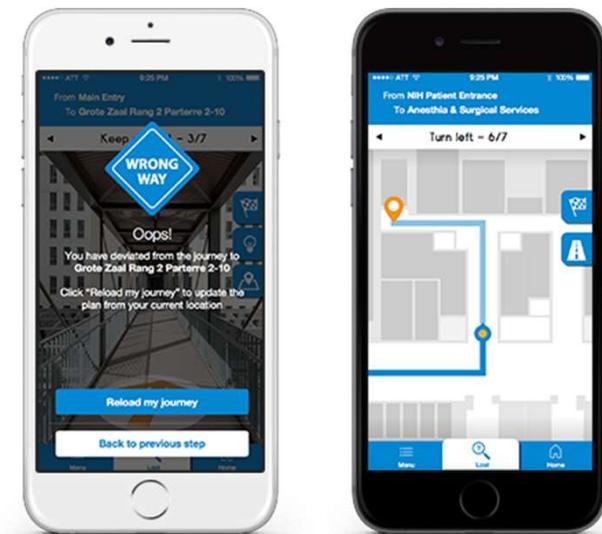
Major solutions provided by 'INFA' are-



1. Precise navigation in outdoors as well as outdoors (depending on the need).



2. Reporting directions that will take the user to its desired station.



3. Instructing shortest route to the desired location within the metro station with and without tactile assistance.



4. Information of nearby regions such as restrooms, drinking water facilities and benches within the metro station.

HOW?

A mesh of beacons is proposed, which will be primarily developed for android phones. In early development stages, we will have to rely on Estimote company, which open-sources the Standard development kit (SDK) and application programming interface and Google developers' open sourced navigation app Eddystone. Eddystone is an open protocol, i.e., its specification is available for everyone.



A short video clip that represents the use of mesh beacons in an indoor floor plan.

The information or analytics of usage, and beacon info would be collected on cloud network. This information will be accessible over the internet or directly linking the app.

This would work on the basis of Bluetooth connectivity with the beacons and measuring their signal time, and will connect to at least three of such devices. Since it would not be enough to pin point the location, we need to utilize powerful software to make the most of what physics allows us. Estimote's platform standard take advantage of thousands of lines of code, written to overcome issues with shaky signal readings. The Estimote SDK is built on top of Core Location, so it includes all noise reduction algorithms developed by Apple to smooth the signal readings. And is always updated with further fixes and increased accuracy by the them. (hub v/s mesh).

EXISTING ALTERNATIVES

There are two major existing companies abroad that are working on similar solutions –

1. **Right-Hear company** (<https://www.right-hear.com/#services>) has provided similar solution in foreign countries but lacks the main portrayed feature that we propose, which is ‘navigation technology’. It makes use of proximity of the person to any specified location and then instructs the user about it.
2. **Indoors** is a an app that lacks navigation features and requires points of interest(POI) to navigate and fails to provide ‘text to voice’ feature. It does not even support android phones. We on the other hand, would have pre-defined voice commands for every situation, which would be suitable to use by android as well as iPhone users.

Both the above applications lacks ideas that we propose, which is ‘navigation technology’, where we pin-point the location of the user and command in relation, rather than commanding in proximity or points of interest. This makes it more easy and reliable to use. ‘INFA’, would also be capable of taking inputs such as terminal number, restrooms and other facilities that can take you directly the location, without having to ask or search around the area.

In India, ‘INFA’ would be the only existing company that would be working on indoor navigation with such wide range of facilities.



A short video clip that represents a similar approach which is under research at IBM.

Cost Calculation and Timeline

There are two major aspects of the proposal on experimental basis for a 300 sqm. area-

- **Hardware** – Cost of Eddystone beacons –
 6 Location beacons costs – ₹12,823
 3 Proximity beacons costs – ₹3,821
- **Software** – The development of android application, capable of voice command and with inbuilt map will also have to be further divided into three sub categories on the basis of data carried.
 Permanent data - The data which is hard – built into the app like voice commands, mapping data, beacon ID, etc.

 Temporary data – The data which will develop with the evolution of the technology and or the preference of the user.

 User defined data – Which will be collected over time to learn the user preference and to further help to develop the technology. It can also contain custom user defined commands or preference which is ever changing.

Cost estimation – (<https://estimote.com/products/>)

- **Hardware costing** – Taking the retail cost in consideration and a small to medium sized metro station, it would require 30 location (for 300 sqm, where three beacons are in every 30m range for maximum efficiency) and 12 proximity beacons (To mark platforms, toilets, counters, stairs),

 location beacons = 5 kits with 6 beacons

 ~ ₹ 66,000

 6 Proximity beacons = 4 kits of 3 proximity beacons
 ~ ₹ 18,000

 Total hardware costing = ₹ 84,000

Software development – Creating the app and setting up the cloud network of beacons.

Software development charges from scratch- ₹ 1,80,000

Cost of installing beacons and calibration- ₹ 20,000

Time calculation –

- Shipping and delivery of the beacons - upto 2 months.
- Software development and distribution - 1.5 months.
- Setting up the beacons - 5-10 days.

Total time required would be 4 months approximately.

The Total expenditure for experimentation project can scale up to ₹ 3,00,000.