



Innovator's project

Done by Seah Jin Juan and Chye Pin Ke



Exploring data



Background information

Being blind is lacking the sense of sight. Visually impaired people depend upon their other senses to navigate in the world. Hearing is the basic sense for blind people, while for the sighted it is our vision. As the visually impaired cannot see, they depend on their other senses, hence they would pay more attention to sounds while sighted people pay less attention to it. It is estimated that around 2% to 8% of blind individuals use their cane to navigate. Others rely on their guide dog, their partial sight or their sighted guide. Apart from navigation, blind individuals can do pretty much everything a sighted person can. The blind would also use Braille to assist them. Due to their lack of sight, they would face problems with navigation, and hence might get lost easily and have a higher risk of dangers.

Envision and its team. 5 Facts about Blindness and The Blind. (26 March 2019). Retrieved from <https://www.letsenvision.com/blog/5-facts-about-blind-people-and-blindness>

Existing solution 1

Using guide dogs. They go through extensive training before they are given a handler. Guide dogs would follow a direct route, always stop at curbs, avoid obstacles(e.g.low overheads), bring the handler to elevator buttons and stop at the bottom and top of stairs. They know what to do because they have what is called selective disobedience. Guide dogs must know to disobey any command that would put the handler in danger. They know how to follow orders and rely on their own judgement of the situation. The handler decides when to go and it is up to the dog to know when it is safe. If there is danger, the dog will not move until it is safe.

Pros:

- with extensive training, guide dogs can be a good companion and can make decisions to help their handlers

Cons:

- the cost of getting a guide dog is high and it might not be an option available to most people

How Guide Dogs Work. (27 December 2006). Retrieved from

<https://www.kidzworld.com/article/1117-how-guide-dogs-work/>

Existing solution 2

A not-for-profit organization called **Wayfindr** used wireless beacons for navigation. The beacons can be placed anywhere – on a ceiling or a wall, along escalators or on platforms, and are fully programmable by the installer. They work by sending out information via a Bluetooth signal to a smartphone that has the accompanying app installed. The app then provides audio descriptions and directions (e.g. turn left and then walk forward until you reach the escalator) to the user, so that they can navigate their way safely around the station.

Pros:

- can help easy navigation as long as the visually impaired has a smartphone
- Visually impaired do not have to ask for their way around

Cons:

- some people might not have a smartphone/ do not know how to use a smartphone
- This software might not be available in extremely rural areas, hence it might not be able to help everyone

Laurie Winkless, Using Technology To Help Visually-Impaired People Navigate Cities. (28 March 2017). Retrieved from <https://www.forbes.com/sites/lauriewinkless/2017/03/28/using-technology-to-help-visually-impaired-people-navigate-cities/#703baf5c71d>

Existing solution 3

Wearable ring tech, FingerReader.

FingerReader is a ring-shaped device that includes a small camera along with haptic actuators that provide the user with feedback. A visually impaired person can use the device to read text by pointing their finger at it, causing the device to read the chosen text aloud. The user can speed up or slow down the reading of the text, as well as repeat chosen words, according to a FAQ document from the MIT Media Lab. In addition, the system offers haptic feedback if the users hand inadvertently moves away from the line of text that was initially selected.

Pros:

- it can save time for visually impaired people to read
- Can read even without the presence of Braille
- With the presence of the FingerReader, people do not have to learn Braille, which requires daily practice

Cons:

- this technology needs to be connected to a computer for it to work, hence it might not be as feasible.

Chris Newmarker, How Wearable Ring Tech Could Help the Blind Read. (8 July 2014). Retrieved from

<https://www.mddionline.com/digital-health/how-wearable-ring-tech-could-help-blind-read>

Existing solution 4

Canes. The white cane is an important tool for independence and mobility among people who are blind or have low vision. Canes can come in various types to support people with different kinds and degrees of vision impairment. Three main types of canes are

Long cane: Long mobility cane which detect all obstacles and hazards within their path of travel by moving the cane in front of them

Identification cane: Designed to be a visible signal to others that the user is blind or has low vision. Use to assist with detecting the height of steps, gutters and down drops)

Support Cane: Has more in common with a walking stick, and can be used to aid balance and as a means of physical support. Can assist with identifying that a person has low vision

White Canes: What You Need to Know. (20 November 2018). Retrieved from

https://en.wikipedia.org/wiki/White_cane

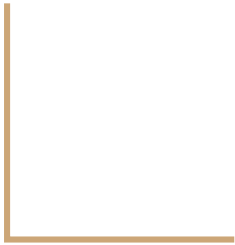
Pro:

- The lightness and greater length of the straight canes allows greater mobility and safety
- Collapsible canes can be stored easily

Cons:

- May not be safe for both parties if people do not pay attention to where they are walking
- The Blind cannot use stairs easily
- They won't know whether they've arrived at their destinations

Framing problem



Finding root cause

Why do the blind need an extra support when they travel

They cannot see and they won't notice any obstacles ahead of them, thus prone to higher risk of injury



Why are existing products like white cane not sufficient

Many people are now on their phones when walking so they aren't aware of their surroundings, thus still a high risk of injury

<https://www.bbc.com/news/disability-34855311>



How can we help people to be safe

How can we help improve communication between the blind and others

How can we help the blind to be more self reliant

How can we help to improve travel duration of the blind without the help of others



Why can't the blind find someone to accompany and bring them around

Everyone has their own schedule and they will want to be independent



Problem Statement

The blind have difficulties going around on their own as they cannot see. People who are new to a place or are lost also have difficulties finding their way back to their desired location. We hope to solve this problem by designing a product that can help bring people to their desired locations without difficulty and to be more self-reliant.

How might we help the blind navigate around better and reducing the risk of injury

Generating ideas



Idea 1: Robot

Description:

Our product is a robot that can bring people to their desired location. It will be able to save time for the blind as they can hold and follow the robot to the location upon requesting the place they wish to go to. The robot will then stop when it reaches the location and will notify the "passenger". These robots can be placed in shopping malls to guide the blind. They can be stationed at specific venues of the mall(entrance,outside lifts) for easy access. Our robot will be using a line-following sensor to bring the people around. We will feature Braille codes on the robot for the blind to type the location they wish to head to and a touch screen above to show the words. If the user doesn't know Braille codes, there's an alternative way for the user to communicate with the robot, via the sound sensor. There will also be a handle made at the side for the user to hold on it while it leads the way

Idea 1: Robot

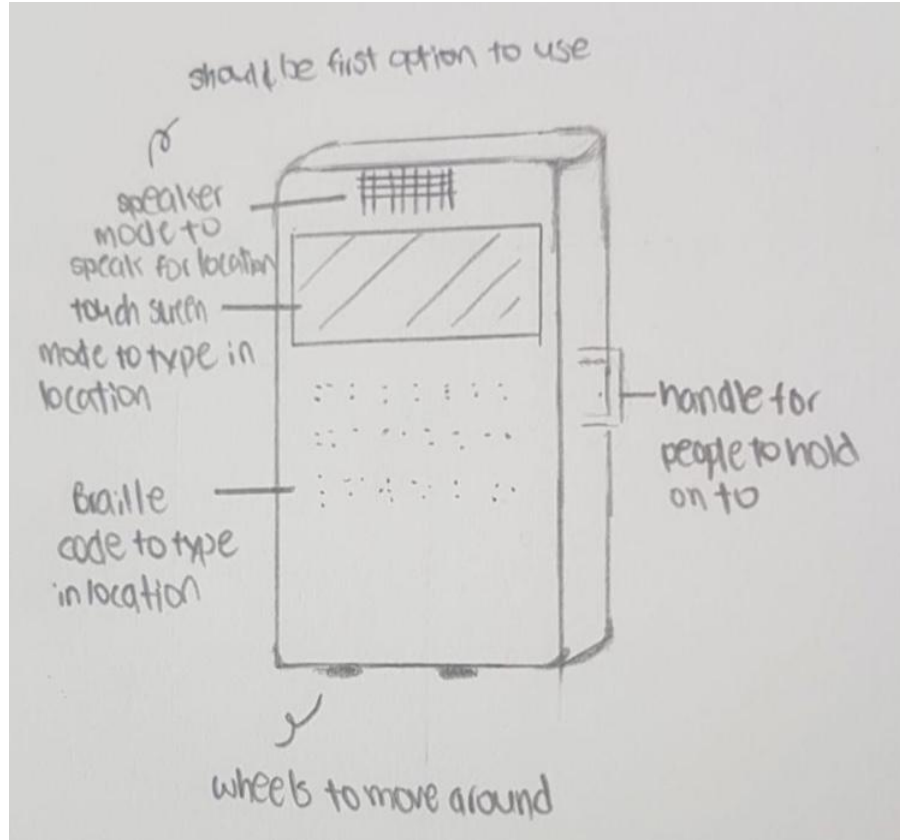
Pros:

- can help users move around more easily around a certain area (e.g. a shopping mall) with lesser time spent
- It can help both the visually impaired, and also those who are lost
- The robot is large enough such that people would be able to spot it easily and would be able to give way

Cons:

- it might be too expensive to have multiple robots in one area, what more if it needs to be available in many places
- It is very big and bulky in size and may block other people's way especially when there is a narrower path
- Each robot is only limited to move around a certain area (e.g. one level of the shopping centre) so it might not be able to help the user if the other robot from another area cannot come to the user on time to bring him/ her to the desired location

Idea 1: Robot



Idea 2: Smart watch

Description:

This watch can track the location of the blind and can also tell them where to go. It can be connected via Bluetooth to track the location. The user will have an earpiece connected to the watch, and will be able to listen to the directions of how to walk from one place to another (e.g. telling the user to "Turn Left after 5 steps). As it can be connected via Bluetooth, this device can also tell when there is a traffic light, hence it will tell the user when to stop and go. It will help facilitate access for the users such that he/she could go to whatever place that he/she wants to go to with minimal help. Since most people have their phones, the watch can also detect crowds of people through their phone and bring the user through another route.

Idea 2: Smart watch

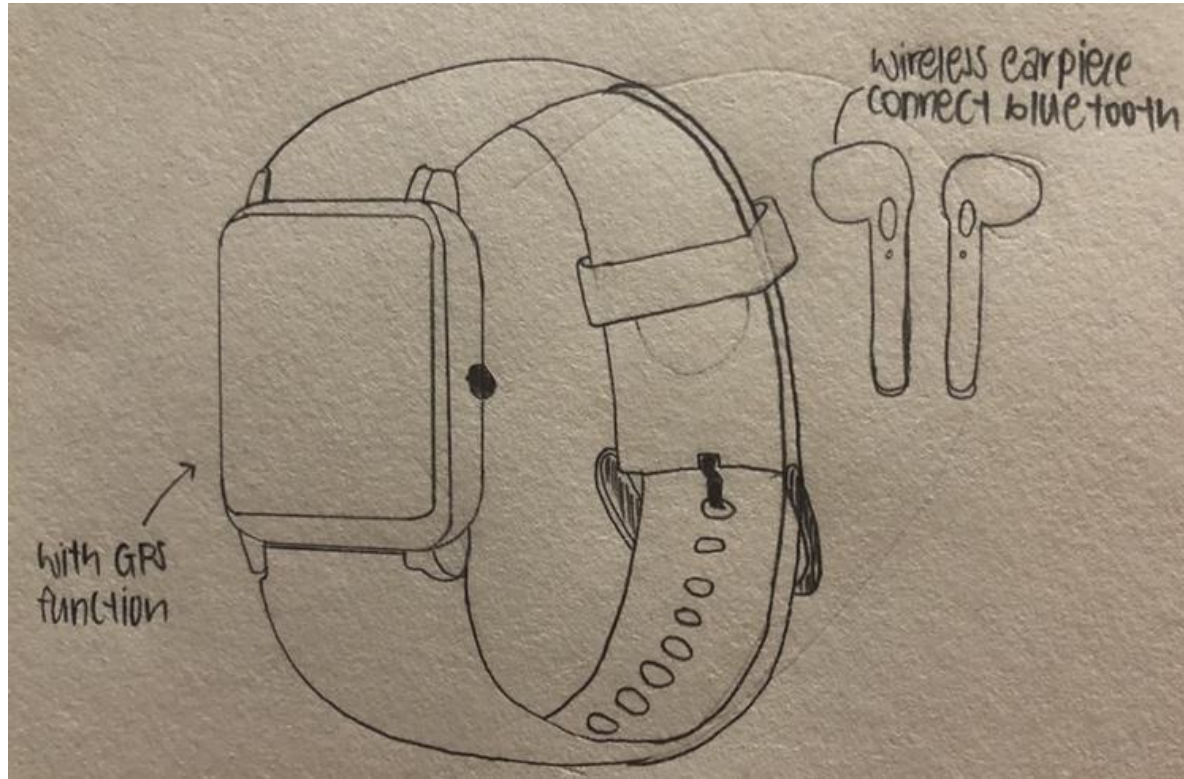
Pros:

- Can help help users move around with minimal help from others
- Can be accessed through almost all locations to help the user
- Can detect other people and crowds to help the user move around easily

Cons:

- It is pricey, hence people might not be able to afford getting a smart watch
- If any of the facilities is spoilt (e.g. traffic light), it would not be able to help the user (cross the road)

Idea 2: Smart watch



Idea 3: Improvisation of blind stick

Description:

Instead of having the common sticks the blind use, we plan to connect the stick to a MBot. Users will no longer need to go by their senses when walking. By using Ultrasonic and line-following sensors, the MBot can detect if there's any obstacles blocking its way and then change its direction, thus it will be safe for everyone. Travelling time will also be lessened because the MBot can lead the person up the stairs. They can also connect the movement of the MBot using their phone through Bluetooth.

Idea 3: Improvisation of blind stick

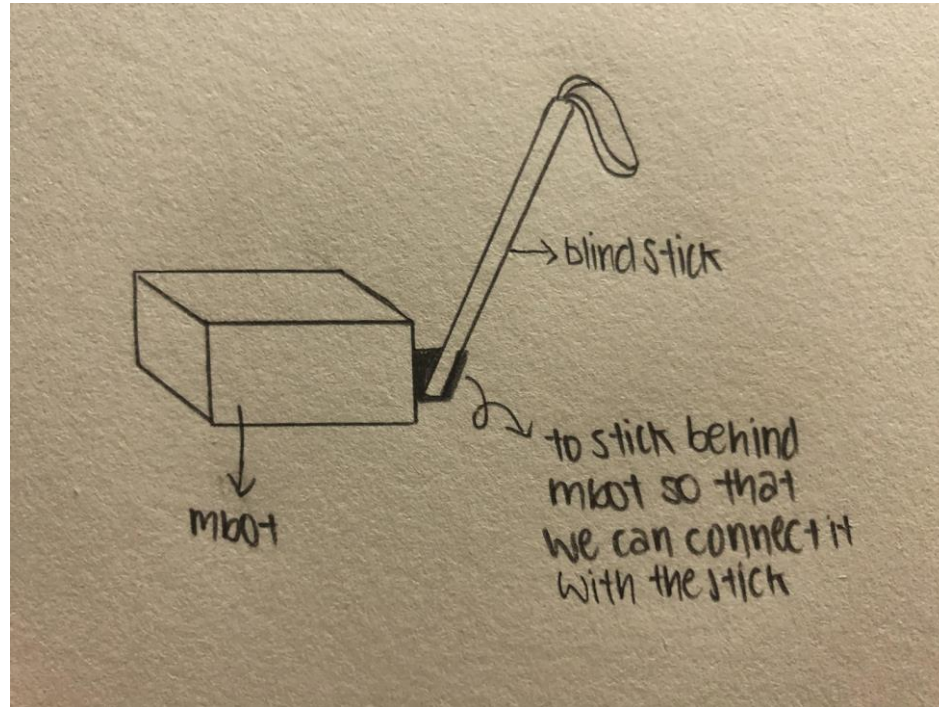
Pros

- Easy to use because all functions can be controlled with phone
- MBot can be easily purchased
- The stick and MBot are already existing products so only work is to code the MBot

Cons

- MBot cannot sense the pedestrian crossing so it won't stop when the red light is shown

Idea 3: Improvisation of blind stick



Criteria descriptions

1	Ease of use	It is the most important criteria as users use the product often, so it has to be convenient for the user such that it requires little to no difficulties in operating the device.
2	Safety	Safety is the next most important criteria as the product made must not cause harm to users, or bring users to any sort of harm. It should be user friendly.
3	Durability	Durability and portability is ranked equally as it needs to be able to be brought about easily and has to last as long as possible for the users to help them the most.
	Portability	
4	Affordability	Affordability is not as in important as those above because as long as the product can help the user, it would be worth its price.
5	Ease of manufacture	Manufacturing process is placed at the bottom of the list as it has the least to do with the user.

Evaluation matrix

Criteria	Importance	Robot		Smart watch		Improvisation of blind stick	
		Rating	Weighted total	Rating	Weighted total	Rating	Weighted total
Ease of use	10	3	30	4	40	3	30
Safety	9	4	36	4	36	3	27
Durability	8	4	32	4	32	3	16
Portability	8	3	24	4	32	4	32
Affordability	7	2	14	2	14	4	28
Ease of manufacture	6	2	12	3	18	4	24
Total		18	148	21	172	21	157
Relative total (Divide by 224)			0.66		0.76		0.70
Rank			3		1		2

FINAL

After evaluating our ideas, we've come to a conclusion that a Smart Watch will be the most suitable idea which can fulfill our main objectives: to allow the Blind to be able to move more reliably and to travel without much difficulty. If we were to carry on and produce a prototype, we would try to make use of coding to make a tracker that will track the user's location, and at the same time the maps can locate nearby barriers, such as traffic lights, staircases, crowds and will be able to tell the user how far away he or she is from it, and will be able to help him or her move around better.

THANK YOU