

## **Indoor Navigation System For Visually Impaired**

In Guidance of: Prof. Anil Roy, Prof Rahul Dubey (DA-IICT), Prof. Anil Gupta(IIM-A)

### **Birth of the Idea:**

It was the winter of 2009 and I was undertaking my Rural Internship training at an eye hospital in the rural area of Bareilly and surrounding villages. I found out that the hospital, besides nursing people with eye problems, also offered services to the visually impaired to help them procure certain documents that would enable them to avail of some privileges from the Government. However, this rural hospital had limited resources and the logistics involved in helping these people were becoming unmanageable for the hospital.

I was impressed with the hospital's initiative and did not want the idea to die. It struck me that instead of helping the hospital obtain funds and manpower, it would be best to make the visually impaired, self-sustainable. I thought of helping these people by making a navigation system that would make the Government buildings "Visually-Impaired (VI) friendly" and give the visually impaired a free movement within these offices.

### **The "VI Friendly" Buildings:**

The "VI Friendly" buildings will have Infrared transmitters that would give a sense of all four directions to the visually impaired, transmitting the location and orientation to them. The user has to carry a device that has an Infrared Receiver and an MP3 player with voice clips pre-loaded in its memory card. When the receiver gets signal from one of the transmitters, the user knows his current location within the building and is guided about how to reach his desired destination from where he is standing.

### **Building a Prototype:**

My team, consisting of 3 other members, built a prototype using a television remote as the Infrared transmitter and a TSOP 1538 receiver with an MP3 player and a memory card interface for the end user device. The MP3 player was plugged into the earphones to give audio output to the user. The TSOP and MP3 player were controlled by an Atmega 32 micro-controller. The direction of IR waves was put to good use here. The receiver was coated with a cardboard to allow signals only from one window.

The prototype was funded by the National Innovation Foundation (IGNITE) and was showcased at an event organized by them. The moment of pride came to us when it was presented to Dr. A.P.J. Abdul Kalam, the former President of India, who was the Chief Guest at the event.

### **The Winning Points of the Project:**

- The transmitters are very less complex, as a result of which, the installation cost will be negligible.
- The end user device does not require high-end equipments like Bluetooth transceivers or magnetic compass ICs, bringing down the cost of the device.
- The transmitter and the receiver do not consume lot of power.
- The device will help VI people, especially in developing and under-developed countries, who cannot afford a high-end mobile phone with advanced functionalities to make their task easy.
- Estimated cost of the end user device is Rs. 300

### **My Learning from the Project:**

Never give up. Difficulties, no matter how discouraging they may look, always come with a solution. In our run towards meeting the stipulated deadline for the project, we realized that the voice output handling by a micro-controller and a DAC would take lot of time. When we had almost lost all hopes, our professor made us think hard on the options at hand. The idea of using the circuit of a cheap MP3 player was thus born. Believing in your idea is very important. If you believe in it, you are constantly motivated to take it to the finishing line.

### **Challenges during the Project:**

The biggest challenge we came across was deciding the orientation of Infrared transmitters in the building. It was critical to properly place the transmitters at the right angle to allow smooth working of the system as Infrared needs line-of-sight communication. We faced difficulties in making the micro-controller talk to the MP3 player and also control the MP3 player with the micro-controller.

