1. INTRODUCTION

A number of systems, technological and otherwise, exist for helping blind and visually impaired users navigate from place to place. However, in focusing only on the destination, these systems often neglect the journey. We propose to rectify this, with a device to improve a user’s peripheral awareness of their surroundings. This is the motivation and the primary goal of this project.

The Talking Points project aims to create a system for attaching information to places and objects, in a format that can be easily converted to speech. It allows blind and visually impaired users to get information about the places and objects they are walking by, and can also be used to provide digital information to other passersby.

We have created a proof-of-concept of this system. The system reads passive RFID tags from a mobile reader. It looks up a tag’s ID number to find associated text, then uses text-to-speech software to read that speech to the user. This system has a low deployment cost, works reliably both indoors and out, and is straightforward to extend to more advanced features.

We have a working demonstration of a Talking Points system. We use a desktop RFID reader, a laptop, and a portable power supply along with several passive RFID tags. Smaller and low-power versions of these components are available but expensive; we believe the cost of all components will continue falling, making systems based on this technology affordable in the near future.

2. VISION AND GOALS

The primary goal of the Talking Points system is to associate digital information with places and objects in an accessible way, creating a type of augmented reality. The simplest piece of information is a description of the place or object; in a format that can be read aloud to a user. However, the system is designed to be easy to extend, so a point could also contain a longitude, latitude, and altitude; information about nearby points; and dynamic information, such as the current exhibits at a museum, a room’s meeting schedule, or upcoming events at a theater.

By associating rich information with a point in space, it is possible to build powerful applications on top of a simple infrastructure. By making the set of information easily extensible, new applications can be constructed without making changes to the physical deployment.

The system was designed with the Universal Design Principles in mind. We believe that if our system is useful to both sighted and non-sighted individuals, we can expect higher acceptance and better understanding of the system.

In order to be successful, this system must work both indoors and outdoors. It must have good enough resolution to find individual businesses along a street, and individual doors within an office building. It must be inexpensive to deploy and easy to use.

3. IMPLEMENTATION

Our current proof-of-concept implementation attempts to meet all of these goals in a straightforward way, showing that the basic ideas are sound and creating a base upon which future work can be built.

We use a 900MHz RFID reader and passive tags. The tags are mounted on foam backing with the Talking Points logo; this backing serves to keep the tag a short distance away from the wall, improving read range, and to provide information about the project and the purpose of the tags. The reader is a desktop model with two antennas, one on the left and one on the right, which we use to distinguish the direction of the tags. Both reader and tags adhere to the EPC standards.

The reader is connected to a laptop, running software we developed. The software communicates with the reader and scans for tags which are within the antenna’s range. When a tag is found, its ID number is looked up in a database to find a textual description of the place the tag is associated with. This description is passed to text-to-speech software, and is read aloud via the laptop’s sound card.
The desktop RFID reader is powered by a portable UPS. The whole system is situated on top of a rolling cart, which allows it to be moved around easily. As it moves, it announces the tags in its proximity.

Clearly this is not an ideal form factor. However, it provides a good demonstration using widely available and inexpensive equipment. Small, portable RFID readers attached to a handheld computer are already available, and we expect the price of these readers to become reasonable in the near future. We address this and other usability issues in the Future Work section.

4. DEMONSTRATION
To demonstrate the Talking Points system, we attach tags to points of interest throughout a demonstration area, such as a large room or a hallway. We then connect the laptop to a small set of speakers, and move it through the building to “browse” the points. As we walk by a point, the laptop announces whether the tag is on the left or right, and reads the description of the tagged location.

5. FUTURE WORK
This system is designed as a proof-of-concept. As such, there is a great deal of interesting work remaining. We plan to continue refining the system, in consultation with the blind and visually impaired community at the University of Michigan.

This system introduces some unique challenges in human-computer interaction. Using techniques from HCI in conjunction with the universal design principles will allow us to create a system which is both usable and useful, and we expect to learn important lessons about the needs of the blind and visually impaired community during this process.

One such issue we anticipate is the form factor of the system, which could clearly use improvement. It is too large to be easily used, especially by a blind user who may already have a cane or dog. We believe it can be reduced to the size of a handheld computer using today’s technology, and hope that even smaller equipment will be available in the near future.

Another issue is the amount of information presented by the system. By announcing every tag, too much information is presented, which would probably be both overwhelming and annoying for prolonged use. Filtering is necessary to reduce this information to a subset that is likely to be of interest to the user.

Finally, the system for authoring, storing, and accessing the information is currently very simplistic; we are designing a Web-based system with support for a richer and more flexible set of information, and systems to index this information.

We believe that all of these areas present fruitful avenues for future research.

6. CONCLUSION
We have demonstrated that it’s possible, by using off-the-shelf equipment in a novel way, to determine nearby objects by reading tags from objects and places in the physical world. Once we have that information, we can associate it with a description of a place, and combine available software components to read the description aloud.

These elements combined create a useful proof-of-concept of a system for determining which objects are nearby and communicating that information to a blind or visually impaired user.

By extending on this basic model, we can create powerful applications providing information about the physical world to both sighted and non-sighted users.

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9. REFERENCES