Energizing Local Discovery and Communication by Incorporating Visual Indication as Wearable Technology and Tapping Into Crowd-sourced Data-sharing Networks

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ABSTRACT

The goal is to improve data flow amidst increasing urbanization by designing a solution that increases frequency of in-person intercommunication. In a period of political turmoil and challenging values that have defined western society and peacekeeping for decades, a growing distrust in established social hierarchies is taking root.
IDEO's "Guide to Human Centered Design", as well as a collection of other references, such as the Delft Design Guide, inspired the team's design process.
The resulting prototype enables users to utilize any smart device to synchronize interests to a personal wearable, which then scans for surrounding tags and activates color changing pigments if he or she has come across an area relevant to his or her interests. Tags can be placed by individuals and businesses alike as part of a collective effort to support guerrilla information networks.
While this itself is not the solution, it dictates that technology should exist for the benefit of the common good. Giving people control over communication throughout their cities is vital as increasing urbanization takes root.

ACM Classification Keywords

Wireless communication (C.2.1); Microprocessor/microcomputer applications (C.3); Portable devices (C.5.3); Object-oriented Programming (D.1.5); User interfaces (D.2.2); Information networks (H.3.4); Interaction styles (H.5.2); Prototyping (H.5.2); Electronics (J.2); Engineering (J.2); Hardware (K.8.2)

Author Keywords

Welfare technology; Guerrilla marketing; Bluetooth low-energy; Interactive architecture; Mobile development; Information distribution; Ubiquitous technology; Wearable technology.

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INTRODUCTION

Programming the MCUs had to be done in two parts: one C program for the MCU in the jacket and the other for a tag. A version of the official BLE_API was used in order to utilize the Bluetooth functionality of the RedBearLab BLE Nanos. A Bluetooth Low-Energy beacon works by periodically advertising a package of bytes. Certain bytes are standard and mean different things according to the offcial Bluetooth documentation, such as the company code of the vendor. One can adjust specific settings such as the power level of the transmission (TX power level), advertising and scanning period, as well as whether the device should be recognized as a heartrate monitor or, in this case, a generic tag.

The MCU in the jacket must be able to be simultaneously open to connect with users' smart devices in order to receive arrays of interests and then to periodically scan for surrounding tags advertising those same interests. If those tags indeed match the user's interests, the program will send a signal to the heating elements, thereby activating the color change. In order to determine the distance from a tag, one can use the following formula, where TX is the TX power level of the advertising peripheral, RSSI is the detected signal strength, and where n is a constant equal to 2 in free space:

$$d = 10\frac{TX - RSSI}{10 \cdot n}$$

The MCU in the tag must only be periodically advertising, waiting to be discovered by the user. The interests are thus collected in an array and transmitted with most of the heavy lifting being done by the BLE_API.

JACKET MCU

RedBearLab's BLE Nano MCU sits in a pocket within the wearable, scanning and processing advertisement packets transmitted by tags. This BLE Nano checks to see if the interests of the user match the interests send out by a tag. If there is no match, nothing will be executed. If there is a match, the program will start detecting the user's proximity to the tag. Because the MCU is connected to the heating elements in the sleeve of the jacket, the number of activated heating elements are able to increase according to the distance from the jacket to a tag.
Additionally, the MCU must be able to send and receive information to and from a mobile companion app in order to

synchronise users' interests, so that the jacket could be fully functional without an internet connection. While the BLE Nano within the prototype tag acts as a peripheral, the same chip within the jacket must act as a central device, able to connect with other devices.

TAG MCU

The prototype tag includes a RedBear Lab BLE Nano, which, in this case, functions as a one-way package advertiser, sealed into an adhesive sticker. The transmitter, encoded with a predetermined array of tags, is powered by a small coin cell battery. In the future, TDK's SESUB-PAN-T2541 BLE transmitter, the world's smallest at 4.6 mm x 5.6 mm x 1.0 mm as of 2014 could replace the BLE Nano in the tag, as there is no need for the full range of capabilities that the MCU supplies. [1] In the foreseeable future, it is plausible that lithium ion batteries, ambient energy harvesters, or BLE transmitters themselves could be 3D-printed using "functional inks" [3] and implemented, potentially leading to an even thinner footprint and thereby more flexibility in the placement of each tag.

Mobile Application

The role of the mobile application, is to provide a platform that allows users to easily let the wearable know what topics they are interested in. The interaction with the mobile application is therefore kept simple.
When it comes to the user interface, the application starts out by having you either sign in, or create an account. This allows for the interests the user sets, to be synchronised to a database, having the data persist over multiple devices, just by logging in.

After the user has signed in or created an account, a screen with a text-input field and an "add" button is shown. The text input allows you to write one subject that you are interested in, say "User Experience". When clicking the button, the interest is added to the database.
When the user has added the subjects that he or she is interested in, a "sync" button is shown on the navigation bar. Tapping this button, the interests that the user entered will be synchronised to the MCU in the jacket, letting the wearable know what interests the user has.

The mobile application is programmed using a framework called React Native [2], which lets one build multi-platform, native mobile applications using the JavaScript Core. It lets one develop native applications for both Android and iOS, using the same codebase, making it available to as many users as possible.

CONCLUSION

In the end, this project stands for something bigger than just a jacket. It is a way to listen, to use technology to bring people together - not pull people apart. It is one of many answers to a yearning that so many people have to expand their bubble, whether that bubble is social, physical, or metaphysical. Perhaps a glimpse of the egalitarian future to come. While the project itself is not the solution, it dictates that technology should exist for the benefit of humanity. Giving people control over communication throughout their cities is vital as increasing urbanization takes root.

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DEMO VIDEO

Link: https://vimeo.com/200242031
Password: tokeninc

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