Applications of Bluetooth Radio Technology and Indoor Positioning in the Hospital

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Applications of Bluetooth Radio Technology and Indoor Positioning in the Hospital
Division of Education
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BACKGROUND

• Keeping track of the locations of objects, patients, and doctors is vital for the smooth operation of a hospital.2
• Radio technologies, including Bluetooth Low Energy (BLE), Wifi, & GPS, can assist.
  – BLE is preferred due to simple deployment of proximity and distance beacons.
• Deployment of multiple beacons in an array, combined with appropriate software, can inexpensively and easily be utilized for Indoor Positioning (IP).

OBJECTIVES

• To explore the potential of Bluetooth Low Energy beacons in various functions within the hospital.
• Develop a proof of concept app that utilizes four beacons to provide detailed location reporting, and to successfully execute proximity and location notifications.
• Compare Estimote and Beaconstac, two competing beacon technologies.

METHODS

• Wrote a literature review to provide background on potential uses of Indoor Positioning in health care, i.e. route finding in an emergency evacuation of the hospital.3
• Compared the advantages/disadvantages of BLE, Wifi, and GPS.
• Used Swift for coding; Estimote and Beaconstac provide code samples for ease of use.
• Modeled Hospital entrance to identify specific regions that triggered specific actions when device was near.
  – Had to adjust output interval for the beacons to maintain accuracy

METHODS (Cont.)

• Tested Estimote, exploring actions when activated by proximity.
  – Displayed PNG map of hospital using image display and changing object statuses.
  – Delivered sample gift store coupon using distinct storyboards.
  – Required intricate, obscure methods.
  – Redirected use to specific webpage using UIKit library.
• Tested Beaconstac, an alternative solution requiring minimal coding, but incapable of coordinate finding.
  – Actions only trigger via proximity, rather than coordinate finding.
• Analytics: Capable of tracking device location for data analysis on traffic flow, time spent at specific location, etc.

DEMO

• Custom Estimote sample app, displaying sample “gift coupon,” trigger through Indoor Positioning

• Standard Beaconstac sample app, listing three beacons at different states.

RESULTS

• Proof of concept app was functional; successfully displayed a map image, “coupon” link, and webpage.
  – Demonstrates that beacons can trigger a wide variety of actions, with significant potential.
• Initial concerns addressed by altering settings; accuracy improved from reducing beacon intervals.
  – However, it seems to work better when in motion.
• Estimote proved more flexible; Beaconstac proved incredibly simple to deploy complete solution.
• Lack of current literature/research on Bluetooth in health care, despite Bluetooth’s advantages, i.e. less energy usage, higher accuracy, ease of deployment.1

CONCLUSIONS

• BLE offers potential for a wide variety of applications in health care, from information delivery to sanitary notifications. Use in way-finding seems to have potential.
• Estimate offers more potential functionality, whereas Beaconstac is simpler to deploy and includes better analytics.
• Bluetooth coding and app development could serve as an entry-level topic in programming using outside technology.
• Literature review supported belief that additional research should be explored in this area.

REFERENCES