Demo: Notification Control and Reminders with UWB Indoor Localization

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Abstract

Localization based context awareness in mobile phones can enable several conveniences for users. This demonstration explores a way to smartly control notification and "Do not disturb" settings for the mobile phones based on the user's indoor location. Furthermore, users can setup location-based reminders which pop-up on the mobile phone when the user visits a specific indoor location. While enabling full-scale indoor localization might be challenging, we use just a few UWB beacons placed strategically, say embedded inside home-assistant devices, Wi-Fi routers, etc. and a UWB enabled phone to provide the required context awareness.
Video: https://www.youtube.com/shorts/MbBwPw0BIJU

CCS Concepts: • **Human-centered computing → Smartphones**; • **Networks → Location based services**.

Keywords: uwb localization, smartphone notifications

1 Introduction

A mobile phone can utilize its indoor location for controlling its behavior. Users may want to automatically silence their phones in the study or bedroom, or to be reminded to take their keys when leaving the house. GPS, while good for outdoor localization struggles to accurately calculate location indoors. Ultra-Wideband (UWB) radios work well for these uses, since they can measure distances with 10cm accuracy. Given a few UWB anchors placed in the corners of a living space, the x,y coordinates of a UWB tag within that space can be calculated. While such functionality might one-day become a standard feature on all mobile phones, to demonstrate the effectiveness of such location-aware behavior, we have designed a mobile app that sets the "Do not disturb" and sends location based reminders. The equipment used is shown in Figure 1.

2 Design

The core idea in this demo is to utilize periodic distance measurements from known UWB beacons to determine the approximate location of the mobile phone. We use our custom-made fleet.ft UWB shields [2] running on Cortex M0, both as anchors as well as the mobile tag. We employ simple two-way-ranging to measure distance from anchors. Once a cycle of ranging completes, the given anchor device id and distance are written to the phone via USB host mode. The app has a handler that uses the law of cosines to compute the x,y coordinates based on the two distances to the anchors, and the distance between the anchors. Before starting, the user should follow the steps on the instructions page and then walk around to their desired location and add a zone. The app will ask for a radius (in cm) from the current location and what notification settings to apply as seen in Figure 2.
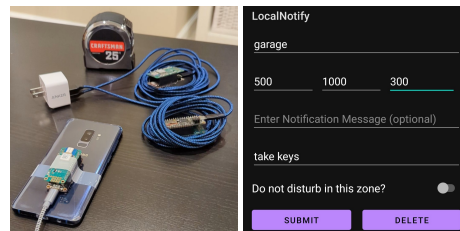

Figure 1: Equipment used for demo (left)
Figure 2: Screen to add location based rule (right)

3 Related Work

Previously, UWB location was used to deliver custom messages to a phone containing exhibit information in a museum [1]. This is similar to our demo in that it uses UWB to compute x,y position, however, the use-case is completely different.

4 Demo

We plan to show a live demo with minimal infrastructure. We will deploy two or three UWB anchors and define a few zones in the demo area. Users can walk around to different zones and receive notifications and have do not disturb enabled.

Acknowledgments

References

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