Distance Determination Tag Research

(Individual research first attempt)
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Table of contents

Glossary [Derived from “BLE RSSI Distance Determination Research Report”]

BLE	Its full name is “Bluetooth Low Energy”. This technology uses less energy than Bluetooth, which can last longer with the tracking tags' limited battery capacity.
BLE module	A module (part) within a device that is used to send and receive BLE signals.
Buddy Bot app	An application developed by Social Buddy to aid the elderly in their life. The app features a Buddy Bot avatar to make the application more user-friendly.
Companion app	An application developed by Social Buddy to aid caregivers in caring for the elderly. Caregivers can notify and check on the patient when needed.
Tablet	A tablet is a mobile device that is bigger than a smartphone but without a built-in hardware keyboard. In this context, this device hosts the Buddy Bot app and the BLE module.
Tag	A BLE tracking tag is commonly used to track your items. Some known tracking tags are the Apple Airtag and the Samsung SmartTag. This word will be used in the report with its associated brand.
Tile Pro	A tag (see “Tag”) from the company Tile Inc. It is a pro version with a replaceable battery and increased range compared to the normal version.
UWB	Ultra-Wide Band. It is a wireless communication technology with its main feature that enables high-precision positioning.

Executive Summary

This report examines the optimal tracking technology for the Social Buddy, a virtual bot assisting elderly patients. Three technologies were considered: Ultra-Wide Band (UWB), Bluetooth, and GPS. Bluetooth was selected for its compatibility and affordability. Among tracking devices, the Tile Pro tracker was chosen for its broad Android support, adequate range, and practical battery life, making it the best fit for the Social Buddy's requirements.

Problem Description

The Social buddy is an interactive virtual bot which is used by elderly patients that are not able to function independently. It can be accessed via the Buddy Bot App which is suitable for Android tablets. Patients can benefit from this by receiving reminders for medication, and more. The Social Buddy must also be able to keep track of the distance between the patient and itself.

To do this the patient must carry a small tracking device, which is always connected to the Social Buddy. In case the patient walks too far away from the Social Buddy, it must notify the caregiver about this. The caregiver can monitor the patient's distance using the Companion App.

Tracking Technology

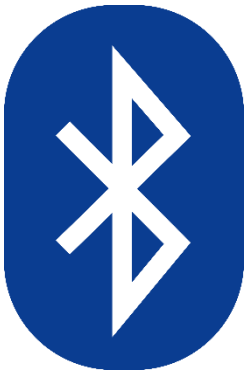
We have three main technologies at our disposal, which can be used to achieve this. Ultra-wide band, Bluetooth and GPS. To determine the best technology suiting our goals, the advantages/disadvantages of each alternative must be weighed against each other.

Bluetooth technology only requires Bluetooth support on the devices that need to be connected. Most tablets these days do support Bluetooth and there are enough tracking tags which run on Bluetooth [3].

Ultra-wide Band (UWB) requires a little more compatibility-equipment to work. To utilise this technology, both devices need to have UWB support in some way. Tablets usually do not have any UWB built into them[4]. So, to make UWB available to a tablet, an external UWB-transceiver is required [5]. As far as tracking devices are concerned, there aren't many tracking-tags which support UWB and Android. Apple AirTag is the only tracker that has UWB support, but it works exclusively in the Apple ecosystem.

GPS technology uses satellite connection to position a device anywhere on the planet. Most tablets have GPS functionality built into them, so it won't have any external factors to rely on [6]. There are trackers that use GPS only, but these are not that common and have a relative higher price tag.

If we forgo the costs that these technologies bring with them, then GPS would be the most suitable option, for its efficiency and reliability regarding global positioning. But in this case the Bluetooth option will do just fine, considering the devices that utilise this technology are much more accessible for purchase and don't rely too much on external accessories, and falls within most low to mid-range budgets.



Tracking Device

Now that we have chosen Bluetooth technology over UWB and GPS, a tracking device must be chosen that has Android Support.

One option is the Samsung SmartTag 2. This however, supports only Samsung Android devices. Considering a device is needed that is compatible with all android devices, this option becomes irrelevant as well [1].

The second option is the Tile Pro tracker. This is a tracking device which runs on Bluetooth and supports all android devices. Additionally, it has a removeable battery and has a battery life of one year. It has a functioning range of well over 100 metres [2].

Product	Pro	Con
Samsung SmartTag 2	Bluetooth, 120 meters range, 700 days battery life [1]	Samsung exclusive [1]
Tile Pro tracker	Bluetooth, Android support, 120 meters range, 1 year battery life [2]	Developer-unfriendly programming interface,

There weren't many Tracking Devices that satisfy the criteria that are set regarding the technology and OS support. Fact of the matter is that the Tile Pro is the only potential candidate for this application, so there weren't any competitors in this case. The main reason why the Tile Pro tracker has been chosen over the Samsung SmartTag is for its range of compatibility with Android devices. To the contrary, the SmartTag is limited to the products of its manufacturer.

Conclusion

Among the available tracking devices, the Tile Pro tracker emerged as the best option due to its broad Android support, decent range, and practical battery life. Although it lacks some developer-friendly features, its compatibility and functionality make it a suitable choice for the Social Buddy application.

References

[1] Samsung SmartTag 2 product review page: https://www.pcmag.com/reviews/samsung-galaxy-smarttag-2

[2] Tile Pro tracker product page: https://nl.tile.com/product/686641/pro-set-van-1white

[3] Overview of tablets with Bluetooth connectivity: https://www.gsmarena.com/results.php3?mode=tablet&sBluetooths=1

[4] Mobile devices with UWB support: https://en.wikipedia.org/wiki/List_of_UWB-enabled_mobile_devices

[5] UWB transceiver applications: https://en.wikipedia.org/wiki/Ultra-wideband#:~:text=Ultra%2Dwideband%20(UWB)%20technology,healthcare%2C%20manufacturing%2C%20and%20transportation.

[6] Overview of tablets with GPS connectivity: https://www.gsmarena.com/results.php3?mode=tablet&chkGPS=selected