

Indoor positioning system

S-Y. TSAI, C-Y. TAI, W-T. CHEN, P-K. CHEN, L. BAI, Y-L. HSU. **Development of an IoT (Internet of Things) indoor positioning system based on Mi-Band.** *Gerontechnology* 2016; 15(suppl):99s; doi:10.4017/gt.2016.15.s.917.00 **Purpose** Wearable devices are becoming increasingly popular. In particular, Mi-Band¹ at less than 20 USD, has rapidly increased its market share². Mi-Band uses Bluetooth chip (Dialog DA14580) to sync with the Mi-Band App in real-time via BLE (Bluetooth Low Energy) to view fitness and sleep records of the users. IoT (Internet of Things) is a computing concept that describes a future where every physical object is connected to the Internet and is able to identify themselves to other devices. Many older adults are requested to wear GPS based wearable devices or RFID tags, mainly for positioning or localization purposes, to prevent them from being lost. The purpose of this study is to develop an IoT indoor positioning system based on Mi-Band, which is low cost, flexible, and easy to implement. With receivers deployed in the indoor area, caregivers can check the position of the older adult wearing a Mi-Band from their mobile devices. When an urgent situation is detected (such as the older adult is leaving the building), the system will send a notification to caregiver's mobile device. **Method** The indoor positioning system consists of tags, receivers, and a cloud server. As mentioned earlier, Mi-Band is used as the tag in the system. The receiver includes a BLE module (HM-11) and a TI CC3200 Wi-Fi Wireless MCU. When the older adult wearing a tag enters a specific area, BLE module can immediately collect the data of Mac Address and RSSI (Received Signal Strength Indicator) of the tag. As shown in the IoT structure (Figure 1), the receiver 'publishes' the data to the IoT 'broker' at the cloud server using receiver ID as 'topic'. Mobile devices which 'subscribe' to the topic will receive the data, which is then interpreted into the position of the older adult, and display a pop-up message if an urgent situation is determined. **Results & Discussion** The indoor positioning system has been developed and installed in several nursing homes. Caregivers can immediately receive notification from mobile device when an older adult is approaching dangerous areas such as balcony and to prevent the older adult from leaving the nursing home unexpectedly. Receivers can be easily installed at necessary locations and connected to the cloud server through Wi-Fi. The searching range of the receiver can be adjusted to 5 meters in maximum according to the size of the applied area. This system is also designed to provide personalized reminiscence therapy. When the older adult wearing a Mi Band enters a specific area, reminiscence photos and videos belonging to him/her will be displayed automatically on a TV screen (Figure 1).

References

1. <http://xiaomi-mi.com/xiaomi-mi-band/>; retrieved May 30, 2016
2. IDC Worldwide Wearables Market Soars in the Third Quarter as Chinese Vendors Challenge the Market Leaders. IDC, December 3, 2015

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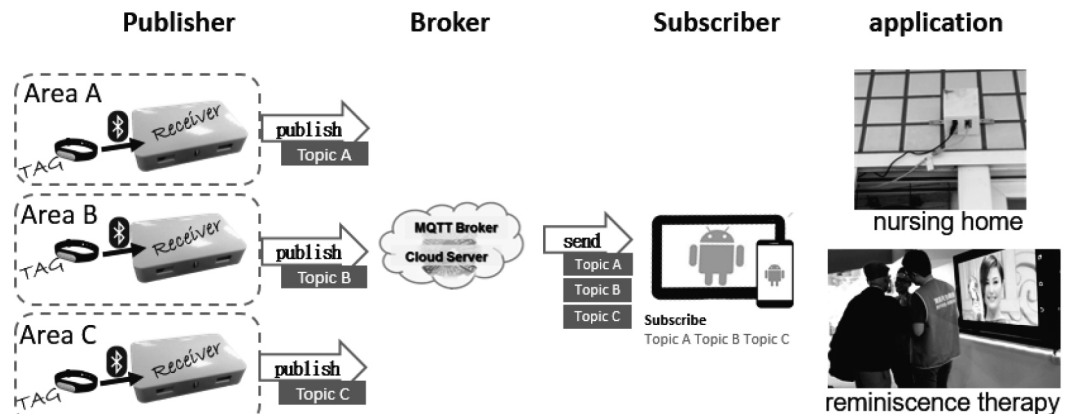


Figure 1. System structure and user scenario