Post-doc position

Laboratory: IRISA – GRANIT Team (Lannion)

Title: Indoor Localization via UWB radio for crowded indoor environment

Key Words: Radio Localization, Digital Communications, Testbed & measurements.

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Description

Knowing the position of a device in its environment becomes an important issue for applications providing services based on the position. Many solutions have been proposed going from satellite based techniques (i.e. GPS…), video tracking or radio-electrical waves combining…. However, these techniques reach their limit when very high accuracy is required (lower than 10 cm), especially in indoor environment.
In such a stringent requirements, Ultra Wide Band based techniques have emerged as an accurate solution. UWB are radios having relative bandwidths larger than 20% or absolute bandwidths of more than 500 MHz. Such radios combine low to medium rate communications with positioning capabilities using ranging techniques [1].

Emerging applications of UWB are foreseen for sensor networks and we proposed to study in this Master Thesis its application to a leisure case which aims at localizing visitors (wearing a sensor) in a museum. This application obviously has many constraints among we can cite the number of persons to be localized, the speed of the persons to localize, the accuracy of the localization we want to obtain, and the need of energy efficient solutions since some visitors could need the whole day to go through the museum. A hot topic of this application is then the extremely low power consumption the embedded algorithm running on the sensors should have. This post-doc position takes part in a cooperative project with two SMEs, and a real deployment is targeted in a museum, where accurate positioning can enable augmented reality applications.

General objectives and expected results

The first phase of this work will be dedicated to the bibliography study on UWB communications and localization techniques [3]. It exists many localization techniques among we can cite the trilateration but some others have already been developed in the GRANIT team [1,4]. The researcher should then be able to propose/improve these techniques considering the aspects listed previously (number of persons/sensors, accuracy required, speed of the persons…). Thanks to the support of our engineers, they will be implemented in the Zyggie [5] platform developed in the team which embeds decaWave UWB transceivers [6].

The post-doc candidate should have skills in signal processing and digital communications. An experience in digital electronics (microcontroller programming) would be a plus. He should be autonomous while having capacities for team work and easy integration.

Links

[1] IEEE802.15.4a/D7, Wireless MAC and PHY Specifications for Low-Rate Wireless Personal Area Networks
[2] S. Monica and G. Ferrari, UWB-based localization in large indoor scenarios: optimized placement of anchor nodes, in *IEEE Transactions on Aerospace and Electronic Systems*, vol.51, no.2, pp.987-999, April 2015
[3] G.M. Hoang, M. Gautier, A. Courtay, Cooperative-cum-Constrained Maximum Likelihood Algorithm for UWB-based Localization in Wireless BANs, *IEEE International Conference on Communications (ICC)*, 2015
[4] GRANIT Team: https://www-granit.irisa.fr/
[5] ZYGGIE Platform: https://www-granit.irisa.fr/wireless-body-area-networks/
[6] decaWave transceivers: http://www.decawave.com/