Interferometric Geocasting for mm-wave Off-body Communications

Mots clés :
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- Domaine scientifique principal: Divers

Résumé du projet de recherche (Langue 1)

1. Goals of the research
In the next few years, the widespread deployment of high-speed wireless local area networks and personal area networks will enable multi-gigabit communications to multiple users in indoor environments. It is expected that future users will be immersed in so-called Smart Environments (SE): body-mounted wireless devices will provide a totally new experience to the users with exciting services as augmented reality, video streaming, wireless gaming, Gigabit Ethernet … A key issue of such SE’s will be the capability to spatially confine the electromagnetic signals emitted by the indoor wireless access points, on one hand to manage interference between different users and/or different body-mounted devices, and on the other hand to contextualize the transmission according to the 2D or 3D spatial position (i.e. making the environment “smart” by itself, independently of the users). In other words, SE’s will need some geocasting techniques at the physical level. Millimeter-wave communications appears as a viable candidate to support these future SE’s: • The unlicensed spectrum in the 60 GHz band offers very large bandwidths • The high path loss facilitates signal confinement. • The small wavelength offers the possibility for compact body-mounted devices. But no technique currently exists in order to achieve geocasting. In this project, we argue that geocasting at 60 GHz can be implemented by an interferometric approach. Interferometry has already been applied with success at 60 GHz for localization: by spectral analysis, a couple of receive antennas can derive the Time-Difference of Arrival (TDOA) of the signal, and hence a hyperboloid where the source has to lie on. Two couples of antennas hence permit localization in 2D, and three in 3D. The main idea behind this project is to use the reciprocal of this interferometric localization technique: by appropriately selecting the time-difference of departure of the signal on a couple of transmitting antennas, it is possible to shape the spectral signature of the signal, when received on a specific hyperboloid. A receiver located on this hyperboloid will decode the information, while receivers located elsewhere will only see spectral noise. With two or three such couples of antennas, it is thus possible to achieve 2D or 3D geocasting.

Résumé du projet de recherche (Langue 2)

Propagation modelling for body-mounted device, channel modelling for off-body communication, geocasting derived from models. Algorithms for geocasting in 2D and 3D

Informations complémentaires (Langue 1)

Co tutelle avec l'Université Libre de Bruxelles (Prof. Philippe De Doncker)