# Using smartphones to avoid spatial disorientation of elderly

April 22 2015


xample of geographic areas of security. Credit: UPM

Researchers from UPM have used new technologies of mobile network operators to locate and send alerts when an elderly person with mild cognitive impairment (MCI) suffers from episodes of spatial disorientation.

Biomedical Engineering and Telemedicine group of Universidad Politécnica de Madrid (UPM) has developed a location-awareness

service using smartphones in order to detect episodes of spatial disorientation that are frequently suffered by elderly people with mild cognitive impairment. The detection of disorientation and loss analyzes information such as proximity to home or place of interest, if the user is with a relative or riding public transportation and accounts for certain time intervals. When disorientation occurs, the service puts the elderly person in touch with his nearest contact (family, a health worker or a friend) to verify if he requires help.

Due to population aging, a big societal challenge is maintaining the quality of life and autonomy of the elderly, as certain cognitive aspects can deteriorate, such as executive functions, verbal attention, visual memory and spatial navigation. This deterioration is known as mild cognitive impairment-MCI, and up to the 60% of cases include episodes of spatial disorientation that appear even in zones where the elderly person carries out daily tasks such as doing the shopping, going to the health centre or visiting someone. The person goes missing and starts to wander, causing not only stress or anxiety, but also dangerous situations (falls, accidents, etc.). Disorientation of elderly also means a source of concern for their caregivers (family, friends).

This study, conducted by GBT group at UPM, establishes safety areas for each user around a series of geographical locations called hotspots. These locations can be their home or other familiar places. These zones distinguish potentially unfamiliar areas where a situation of spatial disorientation could occur. By using the location information service, a lost person is put in contact with his relatives via smartphone.

The location service uses a new technology of intelligent communication networks called IP Multimedia Subsystem (IMS). IMS networks provide basic services that can be reused by any installed application on a smartphone. The basic presence service sends dynamic user information such as location to other users or systems subscribed to the service. The

presence service can store static information through the profile of each registered user.

This study is another example of how information and communications technology (ICT) are becoming essential tools for supporting elderly people. Smartphones and their integrated sensors are a rich source of user data and its context.

The location information is an essential part of the user context in order to provide applications based on geographical location. The location service will allow people with MCI to live with more independence, preserving their autonomy and self-esteem. The service will also allow caregivers to manage situations of spatial disorientation and reducing stress and anxiety.

**More information:** "Design and Technical Evaluation of an Enhanced Location-Awareness Service Enabler for Spatial Disorientation Management of Elderly With Mild Cognitive Impairment". *IEEE Journal of Biomedical and Health Informatics* 19 (1): 37-43. DOI: 10.1109/JBHI.2014.2327638