A Dynamic Channel Assignment Method for Indoor Positioning Systems in WLAN Based on Location Information of Mobile Terminals

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Abstract

We propose a dynamic channel assignment method to achieve an optimal wireless network capacity based on location information of mobile terminals in indoor positioning systems. In our method, a trade-off between wireless network capacity and positioning accuracy is achieved through channel assignment.

Two premises are made in our research: (1) We use Wireless LAN (WLAN) as the platform for indoor positioning. (2) To fulfill the positioning requirement, Access Points (APs) are set beforehand and every mobile terminal in the service area can observe at least three APs, since multilteration positioning method is used in our system.

Generally, to mitigate interference as well as improve network capacity, neighboring APs of WLAN are always assigned to different channels. On the other hand, in the area of indoor positioning, APs are always assigned to single channel or random channels. In other words, the issue of channel assignment has not gained enough attention so far in this area. To the best of our knowledge, we are the first to propose a dynamic channel assignment method that gives a balanced consideration to both communication and positioning simultaneously.

The foremost character of our research is that: the requirement of positioning could be met, and furthermore, an optimal wireless network capacity could be achieved by dynamically re-assign channels through utilizing collected terminal-assisted information (especially, location information). Compared to traditional channel assignment methods, two major contributions are made in our research: (1) The wireless network situation can be fully acquainted in a timely manner through periodical observation. And thus, the method is believed to be suitable for dynamic network environment such as shopping malls or airports. (2) The mobile terminals can obtain precise location information as well as have smooth and timely Internet access.

To evaluate the effectiveness of our method, we conduct experiments with simulation to compare it with static channel assignment methods with respect to positioning accuracy of terminals and network capacity such as throughput.