802.11 Network Planning based on ESBEA Evolutionary Algorithm to Improve Location Accuracy

Soumaya Zirari
CEA-Leti Minatec Campus
17 rue des Martyrs 38054 Grenoble cedex 9
France
soumaya.zirari@univ-fcomte.fr

Wahabou Abdou, Philippe Canalda and François Spies
Institut Femto-st UMR CNRS 6174 - 1, Cours Louis Leprince-Ringuet 25200 Montbéliard – France
Département d'Informatique des Systèmes Complexes / Optimization Mobility NetworkIng Team
firstname.lastname@femto-st.fr

ABSTRACT

The main problem of radio planning is motivated by the overall goal of improving the performance of current communications services. Whatever the base station nature, these tools will need to transmit data as quickly as possible while ensuring reception, minimizing information loss and offering a guarantee of the continuity of service. If planning has covered different domains such as minimizing the cost or improving the signal reception, the upgrade of the positioning quality is rarely discussed.
In this paper we propose a planning algorithm aiming to help place the APs in such a way as to give the user accuracy under a threshold no matter where his location.
The principle is based on the idea that, to improve the accuracy, we must have at least four transmitters well distributed in space in order to estimate the user's position. To appreciate the geometric distribution of the transmitters, we basically use the Geometric Dilution Of Precision criteria. Indeed, we try to place the APs in such a way that the user will have at least four well-distributed APs for each (x,y,z).
The idea of our planning algorithm is based on placing the APs so that we have a GDOP of 1 to 3 for each (x,y, z). Indeed, instead of talking about improving the accuracy of the user positioning, we aim to minimize the GDOP's value by using an evolutionary algorithm. In this case we use ESBEA
ESBEA is a multi-objective evolutionary algorithm using a simulated binary encoding. The multi-objective aspect can handle problems for which several evaluation criteria, though often conflicting, are needed.
The simulation tests establish good prospects for our scheduling algorithm. Indeed, they have proved effective when it comes to placing the transmitters so that the user can obtain an estimate of its position with the least possible error.

KEYWORDS: Planning, GDOP, GPS, Wi-Fi, positioning, evolutionary algorithm.