Design of Continuous Location Tracking and Analysis System in Hospital

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In this paper, we describe a system that tracks and analyzes continuous locations of indoor workers, such as hospital staffs. The system is used for a field experiment tracking continuous locations of the staffs (doctors, nurses, care workers, etc.) in a Japanese hospital so as to improve the ways of work coordination of them based on their location data, such as physical proximity of them. In the experiment, each staff brings a small data logger device [1] for tracking and recording his/her locations and movements. It has a sensor unit sensing 3-axis acceleration of body movements of the staff and a wireless communication module (IEEE 802.15.4) receiving beacon signals from other network devices installed in the hospital floor. Based on the integration analysis of the data, the system can estimate continuous locations of the staffs and visualize them as multiple staffs' trajectories in synchronized manner.

First, we describe design and implementation of the tracking and analysis system. In such location tracking system, reducing energy consumptions is an important issue. By optimizing embedded software of the device, the sensor device continuously works for about 7.5 hours and the correctness of the estimated locations of the system is about 3 meter. Then, we describe the field experiment and analysis results of the obtained data. Comparing between the staffs' trajectories visualized by using the system, we can understand the difference of working styles inherent in each occupational category, such as doctor and care worker. In addition, we can know the frequencies of co-work (working around a patient) of the staffs by the proximity of their trajectories.
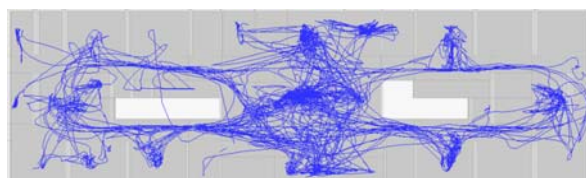

Fig. 1 Trajectory of Hospital Staff (Care Worker)

[1] A. Sashima, et.al. Developing Mobile Physiological Sensor that Works with Indoor Positioning System, IPIN 2011.

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