Design and Implementation of a RFID Based Real-Time Location-aware System in Clean Room

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Abstract

The application of Automated Material Handling System (AMHS) to the semiconductor manufacturing factories is one of the most important steps in the automation process of semiconductor business. All cassettes in the vehicle of the transportation equipment will be able to send their positioning information through this system. Nevertheless, some positioning information will be interfered or get lost if there is any relocation of the cassettes from the effective ranges of AMHS by operators. In order to retrieve these lost cassettes only manpower is possible, and the search process is time wasting and inefficient. In this paper, we have implemented a Clean Room Real-Time Location-aware System (CRRLS) that is based on the technology of RFID in accordance with special placement arrangement. The proposed system can reveal the positioning information of the cassette in the clean room by analyzing the received radio frequency energy information. Moreover, we establish a transmitting model of radio signal, and used this model to estimate distance between RFID (Radio Frequency Identification) tag and readers. A triangular positioning algorithm is developed to define the location and its 2-dimensional absolute coordinate of the cassette, and the lost cassette can be retrieved easily. Furthermore, reusable RFID tags can store additional information sent by the transceivers and data of parameter of the production process to reduce the possibility of severe damage because of wrong parameters setting, as a result, competitive advantage of the semiconductor business can herewith greatly increase.

Keyword：Automated material handling system, Clean Room Real-Time Location-aware System (CRRLS), RFID, radio signal frequency energy, SpotON, triangular positioning system, Infrared, Ultrasonic, Active Badge,

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