A New Indoor Position Estimation Method of RFID Tags for Continuous Moving Navigation Systems

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ABSTRACT

RFID (Radio Frequency IDentification) is considered as one of the most preferable ways for position estimations in indoor environments since GPS does not work well in such situations. In RFID systems, RFID readers enable to estimate the position of RFID tags easily and inexpensively. The problem is how to obtain the accuracy of position estimation of RFID tags as quickly as possible. When we use a mobile robot with a RFID reader in order to search and estimate the position of RFID tags, S-CRR (Swift Communication Range Recognition) has been proposed for the appropriate method. This method is capable of the accurate position estimation in very short time regardless of large number of RFID tags. The disadvantage of S-CRR is that the mobile robot must stop to search RFID tags at each position. Considering indoor navigation systems, mobile entities like robots have to move continuously because they need to navigate smoothly and shortly.

In this paper, we propose a new position estimation method of RFID tags with continuous moving of a mobile robot. This method uses two communication ranges, long and short ranges and switches them appropriately. A RFID reader on a mobile robot searches the following three,

1) the forefront boundary for long range
2) the boundary for short range
3) the rear-end boundary for long range

Combining the information above, the proposed method enables to estimate the positions of RFID tags with high accuracy and low delay. To show the effectiveness of the proposed method, we evaluate the estimated position error by actual experiments and computer simulations. From the results, the proposed method can accurately estimate the position of RFID tags with continuously moving of the mobile robot and apply for indoor navigation systems.

KEYWORDS: RFID system, position estimation, RFID tag, continuous moving, indoor navigation.