

Chapter XII

An Agent-Based Library Management System Using RFID Technology

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ABSTRACT

The objective of this research is to describe a mechanism to provide an improved library management system using RFID and agent technologies. One of the major issues in large libraries is to track misplaced items. By moving from conventional technologies such as barcode-based systems to RFID-based systems and using software agents that continuously monitor and track the items in the library, we believe an effective library system can be designed. Due to constant monitoring, the up-to-date location information of the library items can be easily obtained.

INTRODUCTION

One of the primary objectives of a library is to provide a collection of information artefacts and enable easy and fast access to those artefacts. Most modern libraries provide open stack access

for browsing and retrieving of the items available. This open access may lead to misplacement of items in various sections of large libraries. When an item is misplaced it cannot be reached by its potential users. It is tedious for the library staff to find and track a misplaced book that is needed

by another user. In addition, it can be costly to locate the item, and possibly replace the item (when it is not possible to locate the item at the time that is needed). In this chapter, we describe an approach that can reduce the effort associated with finding such items.

RFID is an upcoming technology that facilitates easy object identification, in particular, when voluminous entities have to be tracked and monitored (such as products in the supply chain context, library items in a library). An item that is marked with an RFID tag can be read by a RFID reader. This information can be used in tracking and managing the tagged items. The cost of RFID tags (in particular, the passive ones) are low enough to make it feasible to be used for the identification of large quantities of items. Currently, more than 20 million books worldwide are embedded with RFID tags (Research Information, 2007) in more than 300 libraries (RFID Gazette, 2007).

Software agent systems are one of the well studied areas of artificial intelligence, as agents can be embedded with intelligent decision-making capabilities. Robots are physical embodiments of software agents. Software agents when embedded in a robot can be used for a variety of purposes such as planet exploration, handling nuclear wastes, and fire rescue. The study of collaboration using agents is important because they are indispensable for carrying out tasks in unmanned zones and industrial automation.

In our approach, the agents interact with each other in order to ensure up-to-date information in the central library database. They read the tag in the environment using a RFID reader, undertake appropriate processing and communicate the information to another agent. To provide inter-agent communication they can use languages such as FIPA (The Foundation for Intelligent Physical Agents (FIPA), 2007) ACL over WI-FI network. In this project, an agent is used to identify and obtain the location of a misplaced book.

BACKGROUND

Some researchers have worked in integrating agent-based systems with RFID technology for tracking and monitoring purposes (Mamei & Zambonelli, 2005). Our work is inspired by their approach in adopting the RFID technology with agent-based systems.

Related Work in the Context of Library Environment

In the previous works (Choi, et al., 2006; Molnar & Wagner, 2004) that have used RFIDs for library management system, most of the focus has been on automating the process of check-in and check-outs carried out at the circulation desks, automation of inventory management process and sorting returned items (RFID Sorting, 2007). The RFID technology has also been used in enabling antitheft functionality by requiring the gate sensors to check whether an item has been issued or not.

The authors of R-LIM system (Choi et al., 2006) describe how the position of tagged items in the library can be identified within a shelf, based on the shelf locator tags that indicate the relative position of the books in a particular rack of the bookshelf. In their approach, manual scanning (using a hand-held scanner) was employed to read the tags of the library items in a shelf. It was assumed that the library items are placed in their correct location. This may not be easily assumed in an open library stack where numerous patrons interact with the library artefacts. To ensure consistency, the library staffs need to periodically check the shelves for possible misplaced items. This is a tedious and time consuming operation. To our knowledge, not much work has been done that identifies the location of misplaced items in an automated manner.

In our system we have incorporated the idea of continuous monitoring of the library items which

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