Adoption of an E-Book System Based On Eve Platform Using a Distributed Control Schema of a Virtual Network

Era ADEM
Faculty of Natural Sciences,
University of Tirana,
Tirana, Albania,
era.adem@fshnstudent.info

Areti BOJAXHIU
Faculty of Natural Sciences,
University of Tirana,
Tirana, Albania,
areti.bojaxhiu@fshn.edu.al

Abstract

In recent years, technology is evolving very fast and more and more people are choosing e-books over traditional books. E-books offer many advantages and benefits. Furthermore, multi-agent systems have been the subject of intensive research over the past few years. Multi-agent systems are difficult to implement and adapt in different environments because require abstract modeling and higher level reasoning. Virtual environments, on the other hand, offer the ideal means to produce simulations of the real world for purposes of education, telecommunication, medicine etc. The merging of these two fields seems to have a lot to offer to both research and applications, if progress is made in a coordinated manner and towards standardization. This project aims to create an e-book system with Eve platform which is a multipurpose, web-based agent platform. Eve is an open and dynamic environment where agents can live and act anywhere: in the cloud, on smart phones, on desktops, in browsers, robots, home automation devices, and others. The agents communicate with each other using JSON-RPC protocol.

1. Introduction

Multi agent systems have been one of the most important topics of interest for researchers and one of the most interesting areas in software research. What is a multi-agent system?

There are a variety of definitions that are given for multi-agent systems ranging from the simplest to the longer ones. One of the most precise definitions of multi-agent systems is:

"A multi-agent system (MAS) is a computerized system composed of multiple interacting intelligent agents [Wiki18]. Multi-agent systems consist of agents and their environment. Each agent has incomplete information or capabilities for solving the problem. Multi-agent systems can find answers to problems that are beyond the individual capabilities or knowledge of each agent. The agents in MAS have important characteristics such as: autonomy, local views and decentralization.

The main advantages of multi-agent systems are: robustness, scalability, reduced complexity and flexibility.

Multi-agent systems are developing rapidly in different fields and are applied in the real world to graphical applications such as computer games. Other applications include: education, transportation, medicine, GIS and telecommunication. It is widely advocated for use in networking and mobile technologies, to achieve automatic and dynamic load balancing.

There are a great number of well-known multi agent platforms such as: MadKit (an open source modular and scalable multi-agent platform written in Java) [Madkit], JADE (a software framework to develop agent-based applications) [Jade18], JANUS (a software framework to develop agent-based applications) [Sarl16], EVE (a multipurpose, web based agent platform) [Eve15], etc.

Our aim is to create an e-book system based on Eve platform.

2 Eve platform

Eve Platform is an open source platform and this is one of the most important points for the platform to be successful. Eve offers agents that are very simple to develop and is easy to implement for any developer. Eve is provided for its agents a basic set of capabilities, so the agent can be able to run independently. The features that Eve is provided for its agents are [Eve15]:

- Time independence, scheduling, independent of the represented entity.
- Memory, the possibility to keep a model of the state of the world
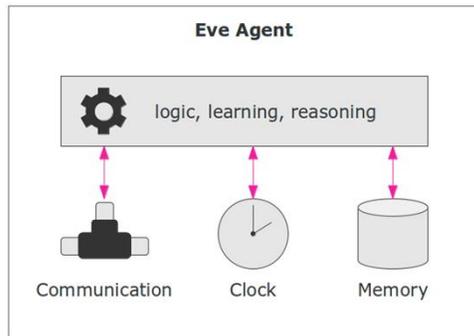- Communication, a common language to communicate between agents

Figure 1: Eve Agent features

Eve platform provides a separate memory capability to the agents and in most implementations, Eve agents has a request based-life cycle. (Figure 1)

3 Adaption of an E-book system based on Eve platform

The first step to setting up a system with eve agents is to create an agent class extending eve. To send and receive messages, each agent has a method sends (to, message) and receive (from, message). A message can be sent to and an agent by specifying either the agents full *url*, or just the agent id. In our project we have created e-book agent. To create a simple agent class, create a file EbookAgent.js with the following code:

```
var eve = require('evejs');
function EbookAgent(id) {
  eve.Agent.call(this, id);
this.connect(eve.system.transports.getAll());
}
```

```
EbookAgent.prototype                =
Object.create(eve.Agent.prototype);
EbookAgent.prototype.constructor    =
EbookAgent;
let              book               =
document.getElementById('search').value;
EbookAgent.prototype.requestBook    =
function(to) {
  this.send(to, book);
};
EbookAgent.prototype.receive        =
function(from, message) {
    this.send(from, response);
};
module.exports = EbookAgent;
```

This agent class can be used as follows. Note that the agents talk to each other via a *LocalTransport* which is instantiated in *eve.system* by default.

```
var EbookAgent =
require('./EbookAgent');
// create two agents
var agent1 = new
EbookAgent('agent1');
var agent2 = new
EbookAgent('agent2');
// send a message to agent1
agent2.send('agent1',book);
```

We have created a search button where we can search for a specific book and we will get a response from the agent

with details of the book such as, the name, the author and a description.

We have created two agents where the first agent makes a request and the second agent sends a response in this format:

```
{

        'name': 'Title,

        'author': 'Author',

        'description': 'Description',

        'image': 'Path of the book'

}
```

In the figure below (Figure 2) are shown e-books data that the agent sends us. In addition, you could choose a book to read, based on your preference.
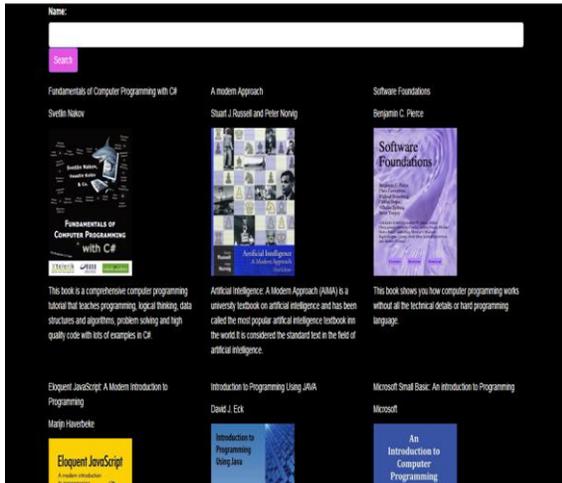

Figure 2: Multi-agent interface that shows e-book data

After we search for a specific e-book with a key word based on title for example **"java"** then we have the result below:
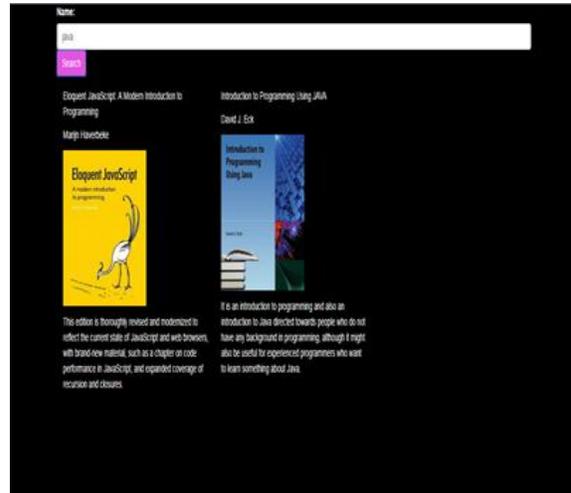

Figure 3: Multi-agent interface that search with key word

Agents communicate using JSON RPC protocol, using JSON to format requests and responses.

4 Results

In recent years, the advances of technology has led to an everyday growing use of e-books instead of paperback books. This is the core reason that brings the need to improve the use of e-book which we have done by introducing the e-book system adapted in the Eve platform. In this paper, we have achieved results that multi-agent platforms provide relevant content and make it simpler to create an adaptation for web systems. The main benefit of Eve platform was that it was helpful to adapt the e-book system using a distributed control schema of a virtual network. Furthermore, Eve platform has simplified the use of the concept of web agents and the achievement of various goals such as robustness, flexibility, reduced complexity, and scalability. Multi-agent platforms are very promising for the future and are expected to be used far more because of the benefits they bring in developing new applications. The use of such platforms for our e-book system is one example of that.

References

[Ste14] Ludo Stellingwerff. Eve: a Novel Open-source Web-based Agent Platform, 2014

[Jon14] Ludo Stellingwerff, Jos de Jong. Practical Applications of the Web-Based Agent Platform 'Eve', 2014

[Wiki18] https://en.wikipedia.org/wiki/Multi-agent_system

[Madkit] http://www.madkit.net/madkit/madkit.php

[Jade18] http://jade.tilab.com/

[Sarl16] http://www.sarl.io/index.html

[Eve15] https://eve.almende.com/index.html