Virtual Marketplace: Software Agent Design (Data Analysis)

Zaharije Radivojevic, Ivan Toskov

Abstract— **The purpose of this paper is to present the results of monitoring the life of autonomous software agents in the continuously changing environment. Issue is not their independence or their source code, we have focused on results of gathering and processing data. These agents have been made specifically for the Virtual Marketplace. Since the term Virtual Marketplace is still the new one, we will also explain it. The last part of the paper is the summary of all gathered data, and some conclusions that would help us in future work.**

***Index Terms*—Datamining, Internet, Software Agents, Virtual Marketplace**

I. Introduction

The phenomenon of the Internet has strongly influenced the way people think and act in the last decade of previous century. It has integrated itself into all aspects of life, evolving from the computer science to economic issue. The pros and contras have been noticed very soon. From the beginning, the problem was to extract the relevant data from the multitude of information. Right information is always one click of the mouse button away, but which is the right address? The software agents, who search the Internet instead of the humans, can provide help. They reside on the servers, multiply themselves, gather information, and send it to their owners. Software agents are the important part of the Virtual Marketplace. This is the new term often referred to as electronic marketplace or e-marketplace, and it's based on the experience gathered from computer and economic sciences [I-faber00, Chung01, and Chin01].

For starting every business transaction, two sides are needed: the buyer and the seller. This can be done in the small amount of cases, but in most of them we need the third side: marketplace. In case of the Internet, virtual marketplace should do the following: help buyers to find the goods at the best price, assist sellers in presenting their merchandise, assist in payment support,… Programs that provide this support are often independent (agent), but there are also static programms that constitute the core of the Virtual Marketplace.

The structure of the Virtual Marketplace is the following:

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- Transaction support
- Content management
- Supply chain management
- Value added service

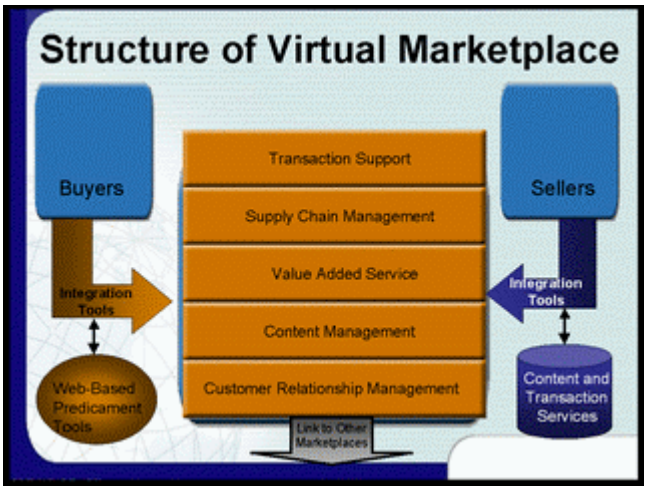


Fig. 1: Structure of the Virtual Marketplace

II. Experiment structure

Out work has been performed in period of three months, using resources on the Faculty of Electrical Engineering in Blegrade. Three software agents were active under Windows NT 4.0 operating system, one under Linux 2.2.19, and for trying communication with remote agents, one agent was started in italian educational facility at the server with Linux. This model was created only for educational purposes, and all these agents managed to survive in changing environment for a period of three month. The parameter set to these agents were:

goal: collect cotact parameter for persons who are science related (published articles, books etc.)

period of execution: three months

strategy: frugal

level of reliability: middle

number of acknowledgements: one

Under contact parameters we took name of the person, title, and e-mail address. Level of reliability is the number of times the person has been mentioned in some document, and it had the same contact parameters. The strategy was to spend more time at the beginning choosing people, that is, spend more time

processing data and less gathering new, and later, do the opposite: gather more new data and spend less time processing them. The results of our experiment were controled by comparing them with the results of previous experiment performed by another group of students, but with different methodology and different purpose. The use of our conclusion is in the area of data gathering and filtering, and designing dedicated software agents.

III. DATA PROCESSING

The processing of data is time consuming and it cannot be done efficiently without the help of computer. Software agents, as stated before, proved themselves superior for filtering and data processing compared to conventional programming. On figure 2 is the filtering model that is often used during filtering information from non-structured data types.

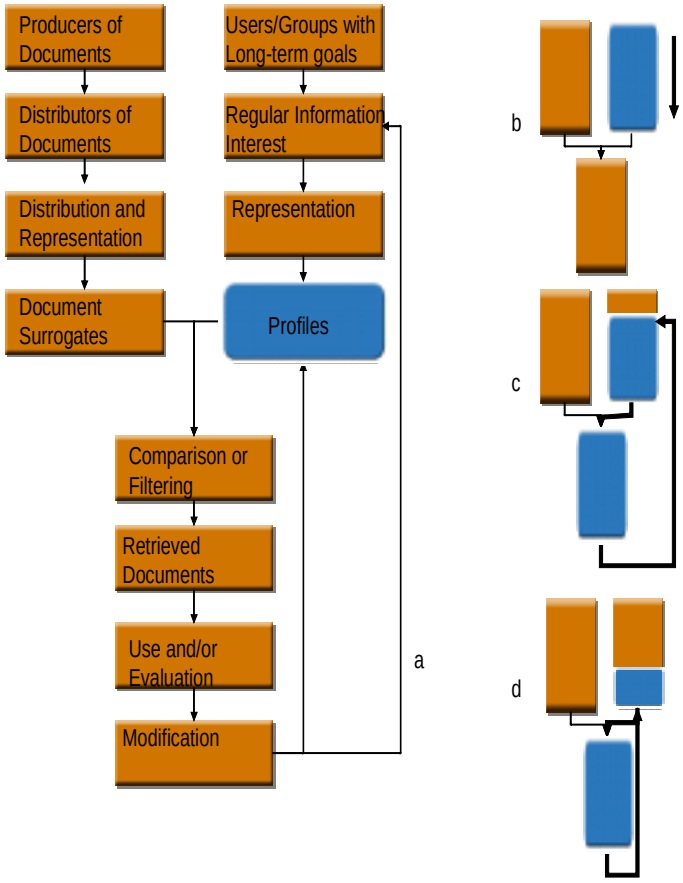


Fig.2: Information filtering model by Belkin and Croft [BC92]

During the realisation we used the vector field model. The words in the document were taken as fields in multi-dimensional space, and then we tried to find minimal distance between out vector and previously given set of vectors. We presumed that all documents used similar finite set of words. During result ranking, several comparison and ranking tecniques can be used (figure 3.).

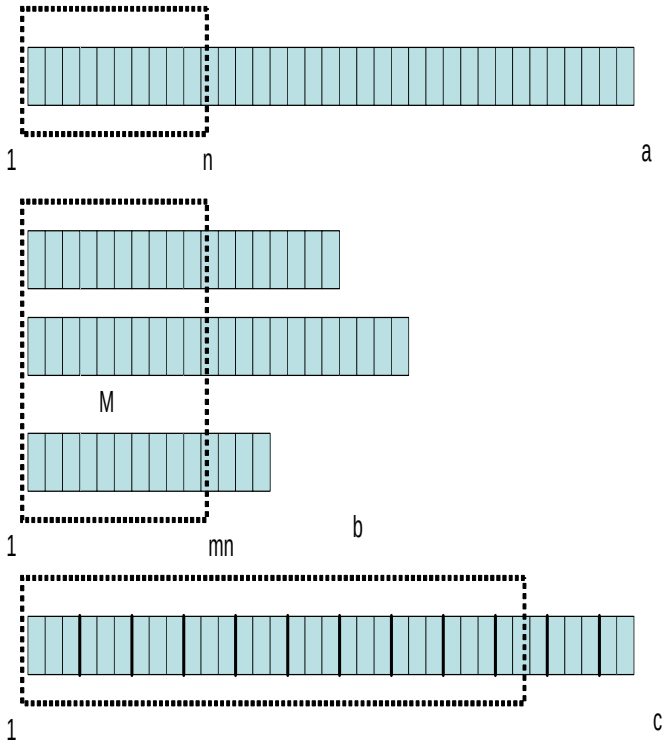
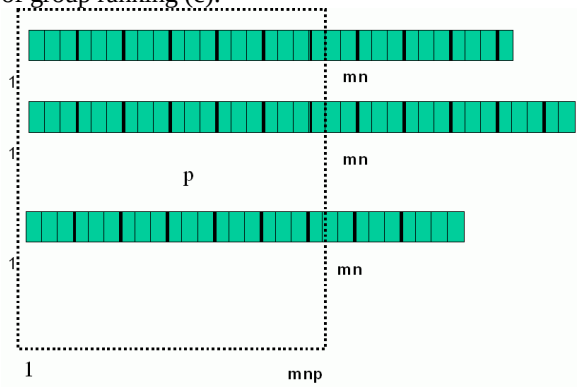


Fig.3: document ranking techniques

One simple technique (Fig. 3a) is to pick all relevant words in the document, sort them usig weight marking techniques i one dimensional vector space. Take top n words (objects, vectors) and for that n dimensional vector deternine his weight in n dimensional space using given vector matrix with weights. This is the simplest model and it is mostly used in our experiment, with addition that coeficient calculation was done dynamically. At the end of the work, final filtering was performed with parameters that were adjusted during the processing. Two more sophisticated model can be seen also at figure 3. One is technique of multiple comparison (b) and tecnique of group ranking (c).



Our modification of the simplest technique was that we assumed that every document can belong to number of related types. We look at n-dimensional space, but using m different categories. We take each document and form an identical list like in basic model, but we do it m times. This way, we get matrix of possible belonging to similar categories. Eech categoty is based on same rules, and at the end results are compared with basic characteristics of types. Method has

shown better results in practice, than the basic method, but the execution time was prolonged m times, and it requiered substantial memmory resources.

During the work, following known links has not given good results, so we used the help of public search engines to provide us with links. We have chosen Google, AltaVista, HotBot and Lycos. We also used Citeseer, because it had a great number of cached scientific papers.

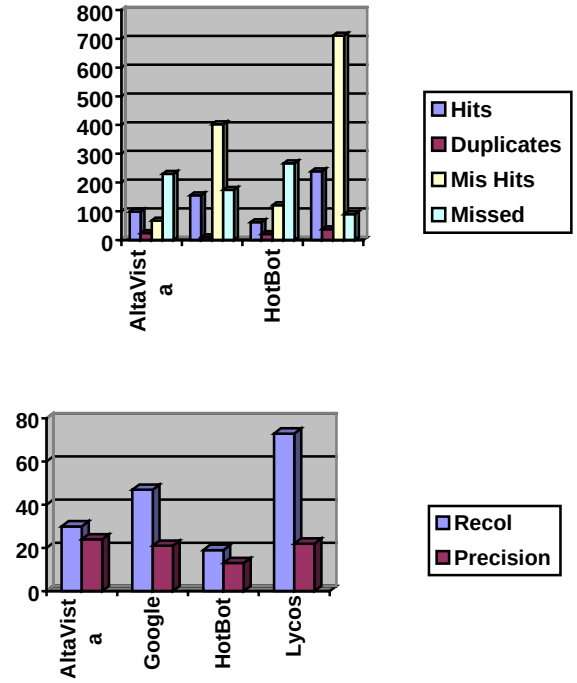
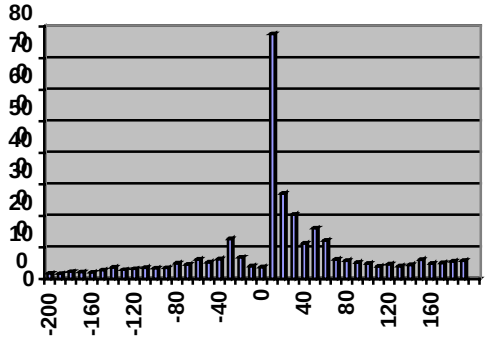


Fig. 4: Comparison of the most used search engines [Desai 02]

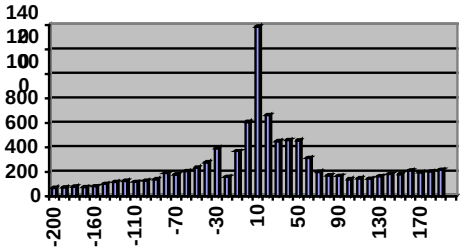
For our experimtn we have chosen Google. Beside good comparison results, it provides us with advanced search options, and it has cached a lot of non-textual files (like pdf, ps, ppt …)

IV. RESULTS

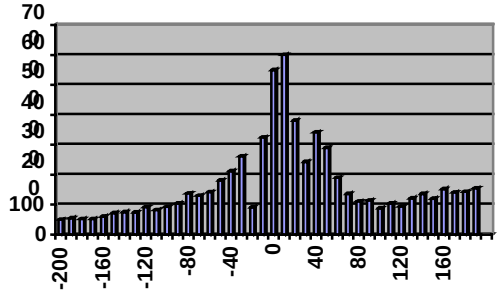
We now present the results of our experiment:



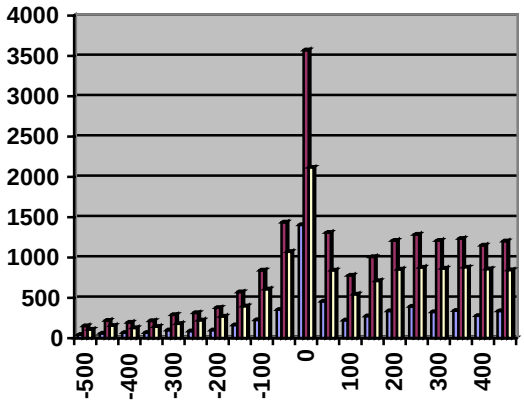
Distance in characters between name and the e-mail in processed files



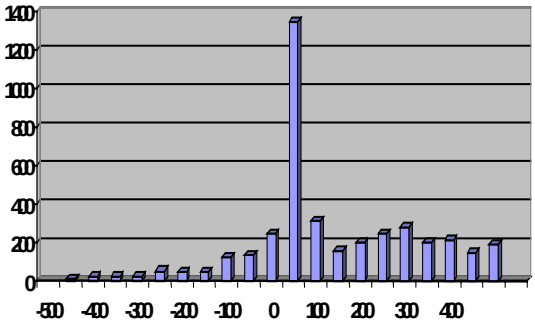
Distance between name or surname and e-mail adderss in characters



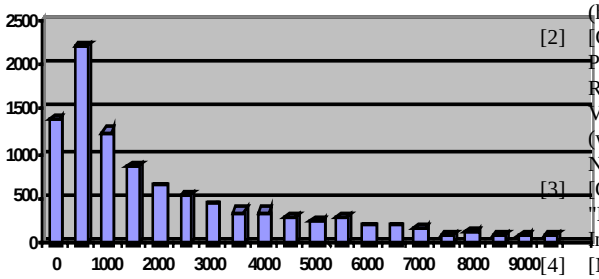
Distance between surname and e-mail address in characters



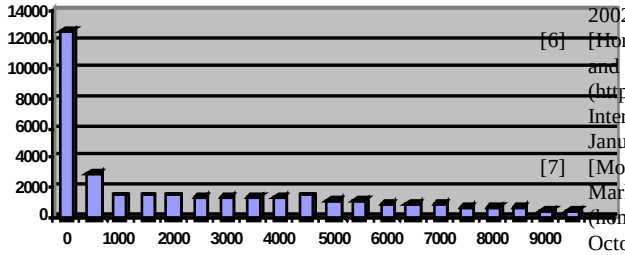
Joint distances, larger scale



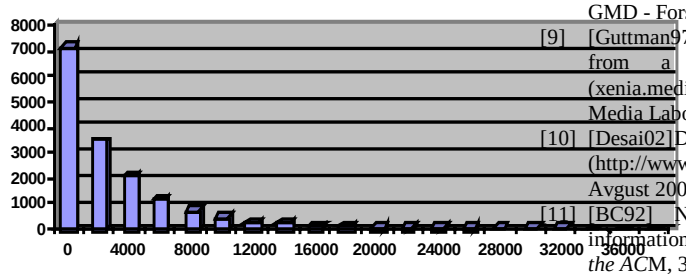
Distance of the closest appearance of the name related to e-mail.



Distance between email and the start of file



Distance between name and the start of file



Number of files sorted by their size

V. Conclusion

Designing software agents for Virtual Marketplace is interesting, but alson not an easy task. One has to take care about many things, like customer wishes, executions time, resources needed for work, available communication channels, decision system, end-user notification system, and many other things. Software agnets, as independent programms, maka a unique set with decision making, movement monitoring and reporting systems. Results taken from our analysis showed that it is possible to make an stable working agent, but for that, communication with other agents and users is needed. Virtual marketplace is continualy changing system, and it's modelling is not simple. Our work had a goal to examine a part of this system. We processed large amount of documents, and only a small portion is presented in the result section. Most important thing in this system is to get results quickly, so we can serve potential customers as soon as possible.

VI. References

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