

A BRIEF SURVEY ON THE CONCEPTS OF AGENT AND ARTIFICIAL IMMUNE SYSTEMS

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Abstract-Agents are probably the fastest growing area Information Technology. As agents has ability to migrate to any system, perform the tasks and return the results. The field of software agents is a broad and rapidly developing area of research, which encompasses a diverse range of topics and interests. Intelligent agent can accommodate with new problem solving techniques. The capacity to develop intelligent agent is mainly restricted by the knowledge acquisition effort required. The threat of a sophisticated computer attacks is growing at a rapid rate. The artificial immune system and its working in various fields are analysed.

Keywords-Intelligent Agent, Artificial Immune System, Intrusion Response, Fault Management, Learning , Coordination.

I.INTRODUCTION

In Mid 50's first ideas about software agents was developed by John McCarthy, Oliver G. Selfridge Today software agents are still a rapid developing technology, diverse topic in various areas such as distributed artificial intelligence, robotics, artificial life, distributed object computing, human-computer interaction, intelligent and adaptive interfaces, intelligent search and filtering, information retrieval.

Agents are probably the fastest growing area Information Technology. The main goal of this paper is to provide a brief idea on the progress of agents research.. An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through effectors. An agency is a collection of software agent that communicates and cooperates with each other.

Software agent is a software program that acts for a user or other program in a relationship of agency. Intelligent agents are defined as being software program that can perform specific task for user and possessing a degree of intelligence that permit it to perform parts of its tasks autonomously and interact with its environment. Intelligent agent can accommodate with new problem solving techniques, it's able to adapt, analyze itself in terms of behavior upon its environment. Coordination and learning ability is a crucial property of intelligent agent.

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II.CHARACTERISTICS OF AGENTS

Basic characteristics of agents

- Autonomous:* Freedom to act or function independently
- Mobile:* The ability to migrate to a remote system, perform the tasks and return the results.
- Persistent:* The agents are not executed on demand but run continuously and perform activities
- Goal Oriented :* The degree to which an agents focuses on tasks and the end results of those tasks.
- Collaborative:* The agents work together to complete the tasks faster.
- Cooperative :* Work done in cooperation with other agents.

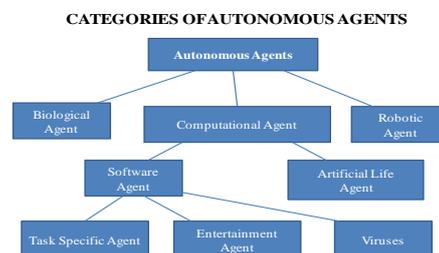


Fig 1: Categories of Autonomous Agents

The capacity to develop intelligent agent is mainly restricted by the knowledge acquisition effort required. An interactive intelligent agent is a specialized knowledge-based system that interacts with a user and assists him/her in various ways: by performing tasks on the user's behalf; by advising the user on how to perform a task; by training or teaching the user; by monitoring events or procedures for the user; or by helping different users collaborate.[3]

The threat of a sophisticated computer attacks is growing at a rapid rate, but the intrusion detection and response systems are not up to the level of controlling the attacks. Intrusion response systems counter attacks that attempt to compromise the integrity, confidentiality, or availability of a resource. Computer system security means the collective processes and mechanisms by which sensitive and valuable information and services are protected from publication, tampering or collapse by unauthorized activities or untrustworthy individuals and unplanned events respectively. Fault management is the set of functions that detect, isolate, and correct malfunctions in a telecommunications network, compensate for environmental changes, accepting and acting on error detection notifications, tracing and identifying faults, carrying out sequences of diagnostics tests, correcting faults, reporting error conditions.

The immune system is a complex of cells, molecules and organs that aim to protect the body against infection. In the

presence of infections, antigens, the substances capable of stimulating an immune response, are generated. Biological systems serve as guidance to various computational based learning systems such as neural networks and genetic algorithm. This uses human immune system as the inspiration for research. The immune system is seen as parallel and distributed system that has the capacity to control a complex system in a given period of time. The human body performs a variety of effective and powerful biological functions[5].

III. RELATED WORK

A. TEACHING INTELLIGENT AGENT: DISCIPLE APPROACH

An approach to learn intelligent agent is discussed. The ability to build intelligent agents is significantly constrained by the knowledge acquisition effort required. An interactive intelligent agent is a specialized knowledge-based system that interacts with a user and assists him/her in various ways: by performing tasks on the user's behalf; by advising the user on how to perform a task; by training or teaching the user; by monitoring events or procedures for the user; or by helping different users collaborate. Disciple approach, an expert teaches an agent through five basic types of interactions.

The process of building Disciple-based agents consists of four stages, Knowledge Elicitation, Apprenticeship Learning, Autonomous Learning, and Periodic Retraining. Disciple approach for teaching intelligent agents, stressing the interactions between the user and the agent. One of the most important features of the Disciple approach is its multiple types of interaction between the user and the agent being taught. Such rich interaction is rare among machine learning systems, but is necessary to develop more powerful agents. In the first phase, *Knowledge Elicitation*, a user (possibly assisted by a knowledge engineer) defines the tasks the agent will perform as well as an initial KB. The user defines a list of typical concepts and various correlations between them, using a toolkit of elicitation methods. The resulting initial KB will contain whatever knowledge could be easily expressed by the user. An underlying assumption is that this initial KB is incomplete. In the second phase, *Apprenticeship Learning*, the agent will interactively learn from the user by employing apprenticeship multistrategy learning. The user will show the agent an example of a typical situation and indicate the correct actions to take in this situation. From this scenario, the agent will learn a general rule that will allow it to respond adequately to situations similar to the one indicated by the user [3].

B. INTELLIGENT AGENTS FOR NETWORK MANAGEMENT

In recent years all networks are centralized, intelligent agent used for fault detection. There is no possibility to have high scalability and less congested network management. Distributed intelligent agent for network administration focuses on design of generic intelligent agent able to improve their behavior by acquisition. Agents are hierarchically organized with possibility to share and

delegate activities and responsibilities. All systems are distributed with agents. If any intrusion occurs, all agents are informed and reacts accordingly. Agent architecture is based on two components Brain and skill. This architecture is based on flexible capabilities of intelligent agent.

C. USING INTELLIGENT AGENTS TO PROVIDE AUTOMATED INTRUSION RESPONSE

To provide an automated response to incidents using a heterogeneous collection of software agents. These agents collaborate to protect the computer system against attack and adapt their response tactics. This creates a methodology for adaptive and automated intrusion response using software agent. Most of intrusion response generates reports or alarms due to this it is difficult to take appropriate actions when intrusion has taken place and report is understood. Intrusion response systems success is dependent on time gap between intrusion detection and response. To solve this problem the system uses automated intrusion response with the help of heterogeneous collection of software agent that responds to the intrusion in reduced time gap. As the number and complexity of computer attacks increases, more robust intrusion response systems will be necessary. This research significantly extends previous work and provides a framework for building effective intrusion response systems.

Curtis A. Carver, Jr., John M.D. Hill and John R. Surdu, says, The majority of intrusion response systems (IRs) react to attacks by generating reports or alarms. The success of an attack is dependent on the time gap between detection and response. The IDS notifies the system administrator that an intrusion has occurred or is occurring and the system administrator must respond to the intrusion. Regardless of the notification mechanism employed, there is a delay between detection of a possible intrusion and response to that intrusion. Response is a fundamental factor in whether or not an attack is successful. For the response to be successful against skilled attacker, the response system must adapt its tactics so that the response system does not always respond with a static defense. Attackers would simply adapt their approach so as to mediate the defense [2].

D. AN ARTIFICIAL IMMUNE SYSTEM APPROACH WITH SECONDARY RESPONSE FOR MISBEHAVIOR DETECTION IN MOBILE AD HOC NETWORKS

In time based network node acts as terminal they have common routing protocol that is, dynamic source routing (DSR). Routing sometimes will not work as expected because of malicious node. To solve and remove this malicious node misbehavior detection system is used. A system that helps to solve this misbehavior problem is developed. This takes inspiration from human immune system and use the concept of learning and detecting misbehavior that is named as artificial immune system. This uses the human immune system which trains the brain to act according to situation learns and detect those node that are misbehaving. The system is inspired by the natural immune system (IS) of vertebrates.

Slavisa Sarafijanovic and Jean-Yves Le Boudec, says, the IS is thought to be able to classify cells that are present in the body as self and non self cells. The IS is made of two

distinct sets of components: the innate IS, and the adaptive IS. The innate IS is hard-wired to detect (and destroy) non self cells that contain, or do not contain, specific patterns on their surface. The adaptive IS is more complex. It produces a large number of randomly created detectors. A “negative selection” mechanism eliminates detectors that match any cell present in a protected environment where only self cells are assumed to be present [7]

E. AN ARTIFICIAL IMMUNE SYSTEM MODEL FOR INTELLIGENT AGENTS

In every computational process Immune system is used. Artificial immune system uses biological basis learning and training. The exploitation made on immune system is identified and distributed with various systems. New concepts of the agent-based parallel and distributed control systems are developed”. Functionalities of the biological immune system are identified for use in intelligent agents [6].

Roger L. King and et.all says “Innate and adaptive immune responses are produced primarily by leukocytes. There is several different types of leukocytes, but the most important for our consideration is phagocytes and lymphocytes. The phagocytes are the first lines of defense for the innate immune system. These cells use primitive, non-specific recognition systems that allow them to bind to a variety of organisms, engulf them, and then internalize and destroy them. An interesting strategic maneuver on the part of the immune system is that it positions phagocytes at sites where they are more likely to encounter the organisms that they are most suitable to control. Immune response is a two step process – *recognition* followed by *resolution*. It is also proposed that immune system based intelligent agents for task allocation utilize a two step process – *recognition* of a specific hardware and/or software instance followed by an *allocation response* (i.e. a resolution) that will better utilize the computing environment’s resources to perform on-going and planned tasks. Two types of intelligent agents are proposed to accomplish the recognition process” [6].

F. AN ARTIFICIAL IMMUNE SYSTEM APPROACH TO DOCUMENT CLUSTERING

In many machine learning tasks artificial immune system is used. Clustering process can perform well using AIS because it uses biological features. Concept of AIS is used in document clustering. Study of raw data is done by this system it identifies and removes redundancy which results in good clustering process. Principal component analysis is combined with this method to reduce the time complexity. The results is compared with HAC and K means clustering.

Na Tang and Rao Vemuri V says, “Document clustering, i.e., unsupervised document categorization, is a very important and challenging problem in the area of information retrieval and text mining. It has been proposed for use in navigating and browsing document collections or as a tool for Web search engines . The Hierarchical Agglomerative Clustering (HAC) and K-means are two commonly used clustering techniques for document clustering . HAC starts with all data points each in its own cluster, and repeatedly merges two closest clusters into one cluster. It finally generates a hierarchical grouping of data. The K-means aims to find K clusters by starting with K

randomly selected centroids and then repeatedly assigning all points to the closest centroid and re-computing the centroid of each cluster” [5].

G. INTELLIGENT AGENTS AS INNOVATIONS

The study of how intelligent agent can be used in innovations is done. It analyzes the concept of intelligent agent , degree of innovativeness, impact of intelligent agent in market is calculated. A competitive innovation is analyzed in appointing new agents for the purpose of market agents used are standalone, service, existing embedded agents.

IV. CONCLUSION

Thus the study of concepts of agent and artificial immune system is done An agent is a computational process that implements the autonomous, communicating functionality of an application. The concept of *agent* is associated with many different kinds of software and hardware systems. Still, we found that there are similarities in many different definitions of agents. Unfortunately, still, the meaning of the word “agent” depends heavily on who is speaking. The approach of artificial immune system for various situation like network management, document clustering and in mobile ad-hoc in detecting misbehaving nodes is studied.

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