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Adaptive Model using MAS

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Abstract: **In this paper, we propose an Adaptive Model using MAS. The MAS represented by three principal agents that allow adapt roles based on humans' requirements. The model describes explicit interactions between the elements of the system; these elements may reflect feedback from the system allowing adaptability at any moment and circumstances to be ready to the complexity of the real world.**

Keywords: **Adaptive, MAS, Interactions.**

1. INTRODUCTION

Globally exists an acceleration of the continuous change that has been taking place regarding the need for daily interaction of users with computer systems. Every day it becomes more necessary to interact with different interfaces: ATMs, daily activities or events, search for information in libraries, multiple and varied management systems, such as business systems, commerce, teaching, etc.; Especially the use of the Internet as a global provider of services, communication and information source. In turn, computer systems are becoming more complete, more complex and have more interaction with other systems.

Along with this growing diversification and complexity, there is a decentralization in access to information, which transfers the user responsibility and works to obtain what he seeks, for these reason arise some questions , how can you improve the use of computer systems to make them easier to use and learn? How can this interaction be made more effective and successful? The answers to these questions come from the research and development of more intelligent interfaces, that adapt to the user in a natural and progressive way, trying to detect its characteristics so that the system is suited to its level and preferences. These interfaces start from the premise that the systems must adapt to the people and not the opposite, these are named adaptive systems.

1.1 Adaptive System:

In this research, it is understood by adaptability the possibility of allowing the user, modify the parameters of the system to adapt it to its behavior, while by adaptability is known as the ability of the system to adapt automatically to the user, based on assumptions about it.

According from Benyon [1], an adaptive system is one that, based on knowledge, automatically alters aspects of functionality and interaction to accommodate different preferences and requirements of different users. Examples of adaptive behavior include the presentation of forms and menus depending on the task to be performed, the presentation of relevant information based on user requesting.

1.2 Multi-Agent System:

At present, multi-agent modeling can be represented as a useful paradigm such as the Multi-Agent Systems (MAS), an active and promising field of research in the computational sciences. MAS provide adaptability, scalability, distribution, fault tolerance, intelligence and autonomy. All these features make multi-agent technology an attractive approach to a wide range of applications. Currently, research topics on multi-agent systems include definitions, standards, methodologies, programming languages, semantics, platforms, and communication.

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The context-sensitive environment composed of heterogeneous, autonomous agents requires some forms of social control, and this control allows agents to work and collaborate with a group to achieve objectives and goals, ensuring order and predictability. [2] Interaction among individuals is a complex process, to solve problems, research in SMA becomes an important direction of artificial intelligence to help with this issue [3].

The key features of MAS in self-adaptive systems engineering are explicit, context-sensitive, robustness in response to failures and unexpected events. The MAS can be goal-based, coupling agents provide the necessary flexibility for self-adaptability and reuse [4]. Agents are autonomous and independent objects that achieve their tasks, objectives, goals and are flexible components can be combined and segregated from one another in an environment [5].

The MAS is one of the most used methods for the modeling and simulation of interactive environments. The MAS can model the behavior of a set of entities organized according to social laws [6], agents have autonomy and are embedded in an environment where they have interaction [7]. The MAS can be applied in several areas, and it can be used as a modeling paradigm or as a solution for software implementation. Modelers can also use the MAS to create computational representations of dynamical events. An MAS is a powerful modeling technique to simulate individual interactions in a complex, dynamic and interactive system.

2. ADAPTIVE MODEL REPRESENTATION

The need for adaptive systems derives in the first instance from the heterogeneity of the user population. The propose adaptive system model representation determines the original adaptation of the user's interaction with the environment. To identify the need for learning of a user, in this model the Adapter applies rules to compare the situation requirements with the properties of the user. This refers both the Domain and Adapter serve as inputs for meters for the identification of user interaction. The Domain defines the state of the object (knowledge), the Adapter represents the current knowledge or competence of a user. Also, Domain relationships (for example, a prerequisite relationship) may be part of the adapter agent rules. While the User and Adapter functions are visible, the importance of the Domain and its impact on adaptation is often underestimated. The domain represented by the domain agent has four primary functions. Fig 1 depicts the Adaptive System Elements.

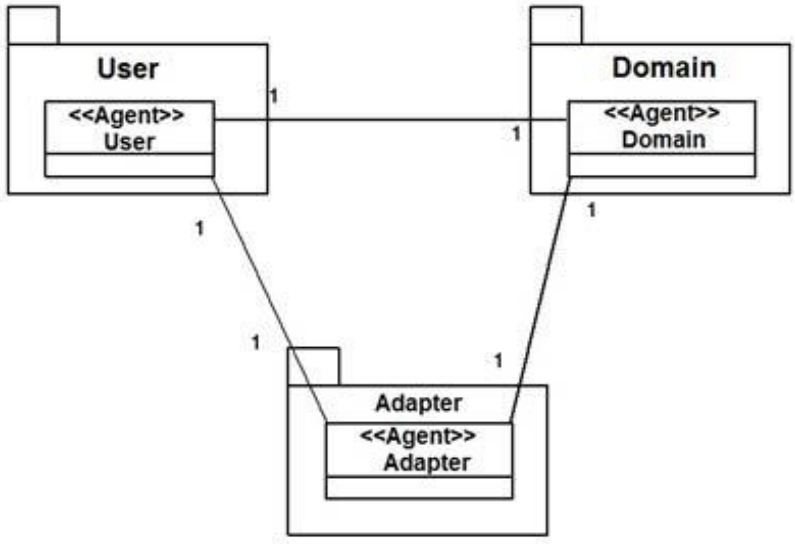

Fig. 1: Adaptive System Elements.

First, the domain agent forms the basis of all deductions and predictions that can be made from the user's interaction with the system. Second, you can only change aspects of the request, which are described in the domain agent. Third, in most cases, it forms the basis of the adapter agent. Because the adapter model is typically performed as an overlay of the domain model, it determines the scope of the adapter model. Fourth, the domain model has the measurable characteristics (e.g., skills) that are necessary to evaluate the effectiveness of the system. Fig 2 depicts schematically the three elements involved in the adaptation process and their interrelationships.

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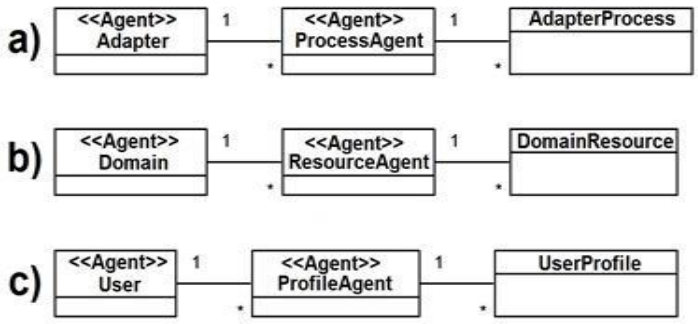

Fig. 2: Process Relationship: a) Adapter Agent b) Domain Agent y c) User Agent.

- Agent adapter is directly related to the process agent which is responsible for handling all user requests. Processes all content and services according to user preferences, an agent can have many agents processes to attend in a more optimal way the requests of the users. The process agent is directly related to the adapter process, which offers the users contents or services with processes adapted based on the profile of the user, a process agent can have several Adaptive processes that allow offering the appropriate contents.

- Agent domain is directly related to the resource agent being responsible for the management of all the resources and contents that the user needs. Agent domain is directly related to the resource agent being responsible for managing all the resources and contents that the user needs, a result of their interactions in the adaptive system. Also can offer multiple resources, a domain agent can have many resource agents to provide resources more according to the user, the resource agent has a direct relationship with the resource domain that allows the resources to be delivered with the content according to the user profile.

- The user agent is directly related to the profile agent allowing to identify and directly relate to the profile of the user all the contents that are according to him. The profile agent manages and controls all user profiles that have interacted in the adaptive system, a user agent can have many agent profiles, the profile agent is directly related to the user profile, the user profile allows to the user fully identify, know history, preferences, and requests for services.

In an adaptive system, the model represents the assimilation of the interaction system and contains information about the user and the current context, increasing the system's ability to show pragmatically correct behaviour, helping effective communication [8]. By designing an easy-to-use environment with efficient and distributed services to support human-computer interaction, users are surrounded by a knowledgeable environment. These aspects refer to operations associated with context detection, contextual adaptation and contextual resources discovered, in general, control the presentation of information, services for the user and the automatic execution of the environment actions.

Fig 3 depicts the adaptive system model, composed of three elementary components: user model, adapter model and domain model

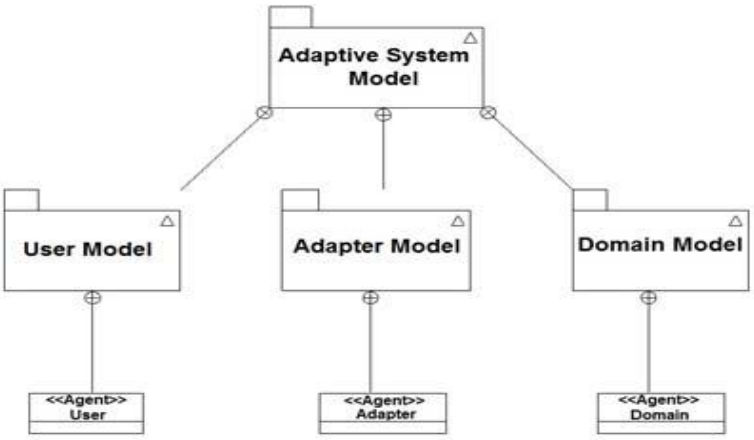

Fig. 3: Adaptive System Model.

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- User model results in interactions and time of occurrence by the user, a user agent contains all the information about the user profile as the type of preferences, design, context, communication, and interaction.

- Adapter model is responsible for custom processing and adaptation of all services, interactions, and content based on the user profile, allowing greater sensitivity to the context in different situations or circumstances among to the user and the environment. Therefore, the adapter agent implements for each entity capable of collaborating through exchanging information and services with other programs to solve complex problems [9].

- Domain model has all the objects and information contents that make up the scene to interact with users. Contains the domain agent that has the description, media, content, interaction, and timeline of the entire environment. In this model, the user information is used to offer contents and services according to the profiles of the same.

3. ADAPTIVE MODEL INTERACTIONS

It is important to consider the interactions between the parts of the system; these parts may reflect feedback from the system. Thus, it is not only possible to study emerging behaviors, but also to examine the reaction and adaptation of the parts of the system in response to the global behavior or external factors. The interactions are made by several agents and have a purpose, which all agents pursue a communication protocol. The most basic case of interaction can be the method of invocation of messages between objects, and a complex case may be the possibility that an agent reacts after observing certain events that occur in their environment. This scale of interactivity can grow considerably until it reaches agent societies with multiple parallel interactions between all of them with competitive behaviors, collaborative, negotiators, etc.

Fig 4 depicts a scheme of interactions between the entities (agents) of the adaptive model. In the scheme, it is possible to observe the existence of well-defined interactions, this environment is the medium where agents receive information and can act.

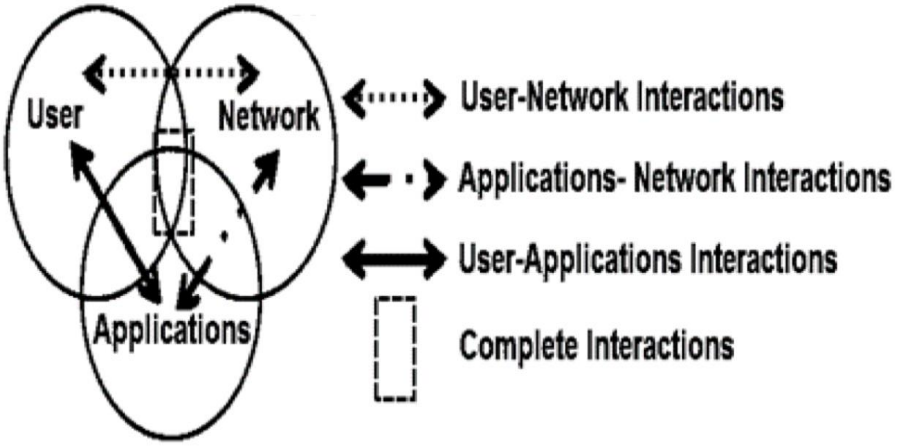

Fig. 4: Interactions Scheme in an Adaptive Model

Here are the different types of interactions:

- User-network interactions. They represent the interactions between a user (or several users) and the native network applications, i.e., the user is connected to the environment (online user), being ready to request and receive information.

- Application-network interactions. They represent the relationships between all the applications (agents, programs, etc.) and the network, here the applications are connected to the environment (online application) and are ready to request and receive information.

- User-to-user interactions represent interactions between users (across various types of interfaces) and all the requests in the environment, and these interactions represent direct physical and logical communication with everything embedded in the environment.

- Full interactions are the most important since they make use of all the interactions (user-network, network-applications, user-applications). In these interactions, the user is ready to establish any interaction with the environment. Receives information from the network, applications request and receive information from the network, users request and receive information from the applications, these interactions define the full scope of interactions that occur in the environment with the participation of all user elements, network, and applications.

4. CONCLUSIONS

The use of Adaptive Model using MAS for a society with knowledge of the situation that people have intelligent environments to help them act, make decisions and in some cases to reach their goals and goals. This help can be through tools, applications, and devices, enabling them to act proactively and autonomously to achieve purposes, reducing the time a human is engaged in the interaction to acquire information. Delegating your attention and effort to other tasks or activities. So far different intelligent models and systems have been developed, some following a cognitive and other approach to the reactive school.

The model is represented by intelligent agents that can adapt learning mechanisms, selection, coordination among others. The characteristics of the agents allow the predictive environment to have adaptive features, having the nature of learning through the users and can feedback to the system, obtaining a way of continual learning, this is achieved when the user returns to the environment. The system will can recognize it and identify its predilections, behaviors, actions and performance of this, being able to suggest some other interesting areas to the user.

The adaptive model must be embedded in a pervasive environment allowing to be invisible to the user. Helping its elements to have a good reasoning, planning, and learning of implemented devices, a key to the model is that it allows control and a method of unsupervised administration. The use of this type of model can adapt automatically to changing conditions and/or requirements offering adaptability at any moment and circumstances to be ready to the complexity of the real world.

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