Multi-agent Complex System for Identification of Characteristics and Personality Types and Their Relationship in the Process of Motivation of Students

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Abstract This paper presents a proposal design of multi-agent complex system for the identification of the characteristics and the types of personality of university students as well as their relationship in the process of motivation for them. Diagnosis and identification of personality types are based on the analysis of knowledge base and the collected information of students with concrete actions that agents through their communication skills and interaction with the rules and standards defined receive, analyze, and determine the identification of outstanding personality type and the most important motivating factors according to the identified personality.

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143

1   Introduction

Human beings have personality that distinguishes us and differs from others, which is formed by a pattern of thoughts, feelings, and behavior that persist across time and situations as well as the result of the influence of inheritance and the environment, on the other hand, the motivation that a person can have is influenced by personal characteristics, their physical characteristics, their skills, and their attitudes. In the educational environment, it is important to recognize the different personality types, identify the motivation that students have, and that it influences them to carry out their activities and definition of your goals and objectives. Knowledge of student personality traits to who is intended to influence or form allows you to achieve the best results in the process of teaching and learning information technologies are an important support in the development of systems that will assist in the identification of traits and diagnosis of personalities, through the integration and manipulation of large volumes of information.

The use of multi-agent systems favors a correct diagnosis, and through agents it is possible to decompose the classical procedures in tasks that are solved by making use of the capabilities of communication that agents have, and integrate any number of variables when making a differential diagnosis. This paper presents the design of multi-agent complex system for identifying characteristics, the type of personality of students, and its relationship with the motivation.

2   Justification

In the academic environment, the development of a student is influenced by different variants, one dominant is the type of personality and motivation to achieve the goals it pursues or plans to achieve that. The use of a tool that facilitates the diagnosis of the type of personality of a student that can be very useful in the learning environment since it allows to know more specifically the characteristics and possible reactions that this may present in certain situations, including academic development. A tool that can support this process is a social simulator, which allowed to determine the type of dominant personality of the student, as well as obtaining information useful in the teaching–learning factors that have a student. Be able to analyze the characteristics of personality and motivational factors will support the determination of the type of attention required for each student, as well as in the elaboration of plans and actions according to the best academic results.

In the academic environment, the development of a student is influenced by many variants, one dominant is the type of personality, motivations it has, and the goals it pursues or plans to achieve. The use of a tool that facilitates the diagnosis of personality of a student can be very useful, since it allows to know more specifically the characteristics and possible reactions that this may present.

3   General Objective

Design of a Social Simulator that allows to identify the type of personality and the influence of it on the personal motivation of students.

4   Personality

The personality of the human being is composed of the way in how it relates to others, how you react to stimuli from the environment, as well as physical and psychological traits that comprise it. It is possible to consider that the heritage, the environment, and what touches you live play decisive role in the identification of the human being. Referred to as personality to the set of mental qualities, thoughts, feelings, and emotions that characterize a person and differ from others. They arise as a result of needs and personal and social motivations and it persists over time, in different situations or moments [1].

For Robbins, the hereditary theory says that the definitive explanation of the personality of the individuals is in the molecular structure of the genes located on chromosomes. However, there are variables that can determine the personality as biographical characteristics, acquires skills, and learning style [2].

Different studies have been conducted, and thousands of individual characteristics, which determine different personality traits have been identified. This amount of features makes it almost impossible to predict the behavior of a person. This analysis was able to identify 16 groups that can be recognized as a constant and firm characteristic that predicts the behavior of a person in specific situations. These features have been integrated with indicator types MYERS-BRIGGS (MBTI), which is an inventory of preferences.

Psychological type is Myers (1980) clarification and development of part of Jung's theory personality. Myers suggested "16 kinds of people," describing all 16 primarily in terms of strengths and potential strengths. The central concept is preference, which means "feeling most comfortable and natural with." The theory assumes that each of us prefers some ways of behaving to others and that there are four main choices in this respect [3].

Is personality a determining factor in the motivation of human beings, this allows the individual to deal with situations and events and work to achieve their goals.

The motivation is closely related to the development of human being and this is possible to recognize it by the interaction of people with different situations, the motivation varies from person to person and personality may be a factor that determines the intensity or direction of motivation. It is possible to identify as main factors of motivation, the intensity, persistence, and the direction to achieve goals and these elements can be variables or indicators according to the type and characteristic of the personality. Talk about the features consider personal, biographical, psycholog-

ical, and physical situations that are influencing the person and personality trait is not a simple subject, it is a topic which by its terms is extremely complex, and it is important to identify the complexity and characteristics of a complex system.

5 System

Based on the concept of a system, we can identify a system as a set of elements or parts that interact among themselves in order to achieve a specific objective, there is the elements mutual influence, so that the behavior of each of them influences or impacts on others. That a system be described must be identified its parts, interactions and relationships between them, as well as the value of each of its elements, i.e., the functions and the structure of the system. The use of the theories of systems as a description and analysis methodology originates from impulsive to simplify reality and understand the natural events. The theories of systems try to unite different disciplines by its range of applications and at the same time act as a platform for multidisciplinary perspectives [4].

The term agent is a concept that combines several disciplines ranging from artificial intelligence, software engineering, databases, distributed systems, to fields of knowledge such as psychology, sociology, medicine, economic theories, etc. An agent is a computer system located in some environment, within which it acts independently and in a flexible manner to meet its objectives. In addition to the interaction with the environment, an agent is characterized by the following properties [5].

A multi-agent consists of the description of each of the agents of the population under study, as well as rules of interaction between them. Once defined, this model gets underway which allows to observe a simulated reality [6].

6 Complex System

A complex system is composed of different elements or subsystems that interact dynamically, i.e., change over time is feedback in a nonlinear manner, i.e., that there is a proportional relationship between the causes of some and the effects of others. According to [7], a complex system is characterized because they are biological agents and psychic and social agents that have intentional or objective reasons which are diverse, dynamic, with different priorities and may be contradictory, in the same way are agents that act as modified reality and are modified by this, which have emergent properties that arise from interactions between them and present processes of self-organization in biological, psychic, and social agents; in the same way, they present states of chaos and predictability horizons, integrate actors and groups presenting homeostasis, perception, action, adaptation, and resiliency [8].

Therefore, it is possible to identify the human being as a complex system, in which human acts according to their reality and is able to modify it, as well as be modified by the environment.

Complex adaptive systems are born from the evolution of the concept of complexity and especially in the adaptation of the concept of adaptation of complex systems; these systems are naturally in biological systems or artificial systems that they have any relation to life [8].

Processes of thought and psychological characteristics of human beings by their diversity and multiplicity are complex systems, an analysis of them and the identification of each of its variables allows us to study them, predict their behavior or behavior patterns and identify the motivating factors according to the personality and characteristics.

For the realization of this prediction, a simulator system can be very important, since it allows to simulate their IDs, their evolution and support in the analysis and forecast as a basis for knowledge of factors that influence the development of a student.

7 Social Simulator

It is possible to define a social simulator as a model that seeks to imitate aspects and reality situations, so the conditions appear similar to reality, but have been created artificially.

Simulators from person to person are social simulations that are studying the reactions of individuals or groups.

Social simulation is the modeling or simulation of phenomena or social objects (society, organizations, markets, and human beings) that normally perform a computer [9].

Social simulation based on agents is one in which the computer simulation, i.e., the integration of artificial intelligence is integrated and the social sciences. On the other hand, an important element in social simulation is the use of computational agents that allow support of social simulation.

The agent is a concept that merges several disciplines such as artificial intelligence, software engineering, databases, distributed systems, and reaching areas of knowledge such as psychology, sociology, medicine, economic theories, etc.

An agent is a computer system located in any environment, within which it acts autonomously and flexible to thus meet its objectives. In addition to the interaction with the environment [10].

For models to define the object they represent, it is necessary to be built through a relationship with the reality which must be symmetrical, the relation of correspondence between the real object and the model must be reversed and convert some properties of the model to reality.

Intends to carry out a social simulator that allows to identify the characteristics and personality types and their relationship in the process of motivation, using a
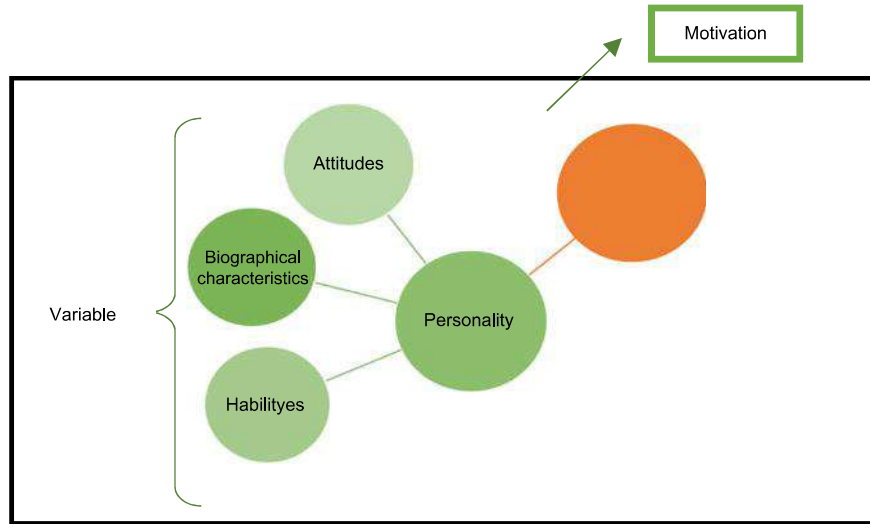
Fig. 1 Diagnosis of multi-agent system model

model of linear system, which is used to identify a subclass of models, in which it is possible to represent the complexity through related statistical theories.

A system that is consistent with a moment in which a knowledge society is built, in which activities are predominantly important activities that are sustained and closely linked to education. According to [11], the knowledge society is a new techno-economic paradigm, where science has transformed into one of the most productive activities; to ensure the success of this model all agree that is necessary to closely relate to education. The present work presents a model of social simulator that will be implemented in an educational environment to identify the personality characteristics and motivation that drive students. The realization of a social simulator represents the complexity of the elements of factors involved in the personality of a student and the factors that influence the same motivation to achieve their goals or objectives.

Previous, a diagram with the elements is shown to evaluate and consider in the system (Fig. 1).

8 Multi-agent Systems (MAS)

A multi-agent system (MAS) is a set of generally heterogeneous and independent, autonomous agents that work together, integrating resources and capacities to achieve the expected functionality. These systems have the ability to interact in a common environment and are able to coordinate, share knowledge, and negotiate to achieve the desired goal and resolve specific problems.

This network of agents goes beyond the capabilities or individual knowledge of agents [12]. It is possible to identify a multi-agent system, as an organized society consists of semi-autonomous agents that interact with each other, whether it is to collaborate in the solution of a set of problems or the achievement of a number of individual or collective objectives [13]. These systems composed of multiple computing elements interact with each other, called agents, who are responsible for the coordination of the intelligent conduct of a group of autonomous agents, which have the ability to coordinate their knowledge, goals, skills, and take decisions and plans [14].

A multi-agent system (MAS) is basically a network of organizations focused on solving problems and work together to find answers to problems that are beyond individual capacities or knowledge of each entity [15]. In previous concept, find similarities, coincidences, and it is possible to consider that these systems are part of a new technology trend, their abilities to solve problems that require coordination and communication model oriented to objects in many ways, allowing the construction of dynamic systems capable of adapting to changes to suffer their environment [16].

9 Design of Multi-agent System Model

The model of multi-agent system for diagnosis of personality types consists of a system that will be able to make the diagnosis of personality identified, in particular, those defined, the system is composed of a set of subsystems of intelligent agents, which interact and perform specific activities focused on perceive, analyze, evaluate, and present preliminary diagnosis. This model features a responsible agent to receive information, through the questions made to patients through applied questionnaires, an agent that integrates the information received, an agent coordinator responsible for control between communications generated between agents, and a responsible agent generates the diagnosis or the identification of the type of personality presenting the user once it has analyzed the information received by the agent's data.

Open distributed systems can be modeled as open multi-agent systems that are composed of autonomous agents that interact with one another using particular mechanisms and protocols. In this respect, interactions form the core of multi-agent systems. Thus, perhaps not surprisingly, the agent research community has developed a number of models of interactions including coordination [17], collaboration [18], and negotiation [19]. Figure 2 shows a graph with the components that comprise the model of multi-agent system with the component that comprises it, such as the coordinating agent, the personality identifier agent, the agent that determines the type of motivation, as well as the knowledge base and the algorithm that determine the patterns of behavior of each type of personality.
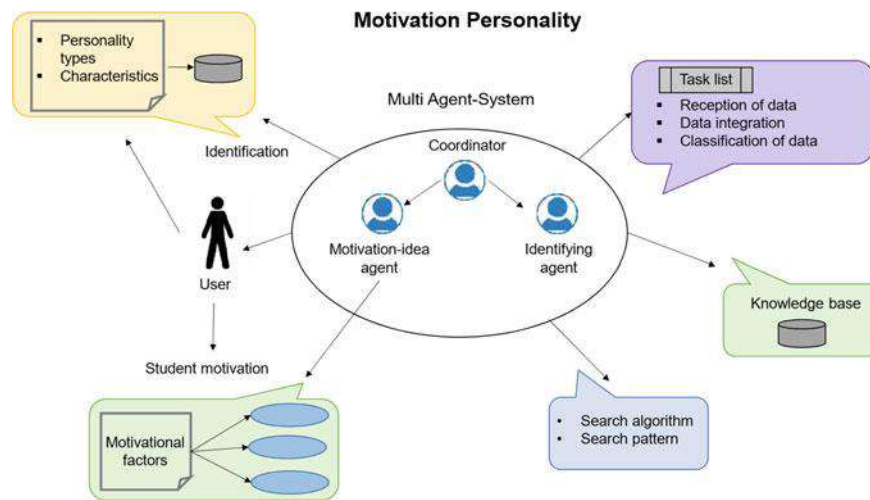
Fig. 2 Model of multi-agent personality-motivation system

10 Conclusions

A model of multi-agent complex system will support the academic area, with the achievement of a diagnosis or identification of the personalities of the students on the basis of the analysis of the information and the established knowledge base.

This type of system allows to integrate different processes, by agents of communication and interaction with the environment with other agents, as well as the ability to consider a large number of variables to integrate a differential diagnosis and to adapt to situations in a changing environment.

This article discusses the design of a model of a diagnosis or identification of personality type based on the use of a complex system with multi-agent with specific tasks for each agent, including the agent coordinator. The intelligent agents will use reasoning algorithms with software patterns, in which they have access to a knowledge base and determinate personality types.

The integration of the different agents and appropriate technologies provides benefits that can be exploited in different areas and serve as support in making appropriate decisions.

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