

# A Novel Student Clustering Model for the Learning Simplification in Educational Environments

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**Abstract**—Students' clustering is considered to be a method of granting students many different ways of being able to learn by taking into account the student's degree. The definition of clustering can be "a group of steps that divide a group of information or (things) in a group of valuable secondary classes, which are named clusters. This implies that a cluster can be a group of things that are "alike" among them and that can be "not alike" to things that are part of other types of clusters. Thus, in this study we want to make students into different clusters or groups in order to organize students and lecturers into more interactive ways, and to extract an education that is related to some particular information and to produce some comments and feedback to the academic teacher. Conclusion, this is the specific research effort that forms the final phase. In particular, it is the result of satisfaction when deviations exist in the artifact behaviour, which is derived from the (multiply) revised hypothetical predictions. Accordingly, the results are then declared as 'good enough'.

**Keywords**—Clustering; students groups; education inter-active ways; students' clustering; student's degree; valuable secondary classes

## I. INTRODUCTION

Each has its own information and data that are available in different departments. There are several demographic, educational and situational changes that are collected and processed for each involved student entering the school. Although schools have high amounts of information spread everywhere through their campuses, they are still facing some major issues on how proficient and efficient should education be within the teaching atmosphere. Additionally, technological developments have brought more efficient and large quantities of data and information. The use of knowledge is concealed through the majority of these quantities where there is a persistent need and necessity of detecting and making use of this grasp, for instance in student's information. The importance of understanding the educational system could involve several opinions and suggestions of students on different offered courses.

## II. RELATED WORK

Several studies have been carried out through learning for assessing teaching and learning, and for evolving novel methods as alternatives to old methods in teaching and learning. Old learning is mainly associated with replying to the questions or inquiries starting with "W" and "How" that concern a large portion of students, only in case of being carefully taught, group teachings by nature neglects the presumptive "which" and "why" inquiry, which makes a major

concern on a small portion of students [1]. Moreover, old learning relies on the discussions of lectures in identical methods to the entire students. On the other hand, old learning relies on the grades and individualities of the students to evaluate the acquisition of knowledge [2]. Furthermore, every student takes identical data about the subjects. Several methods were proposed in learning, and which proved to be more efficient than the old learning, for example teaching through online instruments and students' clustering.

The data clustering of the students permits the to detect the students who are registering for certain academic courses including the students' identities where this fact could be beneficial for popularising particular goals, as well as from educational aspect. Teachers for particular subjects might also get data related on students to improve education.

Accordingly, this study aims at proposing an application of information mining methods to make information Student groups with their academic, demographic, and attitudinal changes to assist and estimate education. grouping algorithms was used in a big variety of implementations for instance image categorization and documentation restore, in education such as evaluate students based on incorrectness in practices and evaluate students dependent on their conduct of improving subject style [3]. Concerning attribute clustering and related attributes are distributed into categories depending on the relativeness among them.

### A. Process and Tools for Tropos Development

In Tropos, there are five basic stages for software development. These stages are as follows: early-requirements analysis, late-requirements analysis, architectural design, detailed design, and the implementation stage. The analysis of early requirements is the first stage and its emphasis is on gaining an understanding of the current organisational setting where one will present the system. The analysis of late-requirements is the second stage and it focuses on analysing the system-to-be. The architectural design is the third stage and it identifies the system's global architecture in terms of the subsystems. The detailed design is the fourth stage and it is responsible for determining the system agents' micro level. Implementation is the last stage and its emphasis is on generating code based on the detailed design's characteristics.

Models serve as the basis of the software development process. These models include the design and the requirements. They also serve as the main artefacts. The conceptual modelling language is used to structure these models. As seen in Fig. 1, this activity is called Agent-Oriented (AO). The modelling language has several main concepts. These concepts

are goal, actor, plan, and dependency in attaining the goal. The modelling tool of TAOM4e can be used to perform agent-oriented modelling. This tool is also capable of supporting automatic code generation based on the specifications of Jadex or Troposto JADE. It is able to do so by utilising the Tropos Meta model concepts and the concepts of target implementation languages.

Furthermore, other techniques are available for use in the tool-supported analysis in Tropos. One of these techniques is referred to as requirements validation, which is performed by checking the model or conducting a formal analysis on the system design and the goal models of requirements. Such analyses are specifically utilised in complex models.

The goal-oriented testing action is seen as one of the fundamental exercises to demonstrate AO and code age exercises. These experiments were specifically obtained from the AO details that helped formulate the procedure of advancement. Furthermore, the end goal of being able to assist in testing and approval was also kept in mind [4].

### B. TAOM4e and Functions of Code Generation

Tropos can be modelled graphically using the TAOM4e framework, which supports the modelling throughout the complete stages of Tropos. As shown in Fig. 2, it is seen as a plug-in for the eclipse project and it also serves as an extension for the existing plug-ins. Illustrates how the EMF plug-in provides a code generation and modelling framework that can be used to develop tools and applications based on the model descriptions that are given in XML.

The Tropos' meta-model is utilised at the top of EMF (for the TAOM4e model). The Graphical Editing Framework was then used to illustrate how the graphical representation of the model as well as the differences in prospective (TAOM4e platform). The Tefkat plugin can then be used to help turn top level plans and the decompositions of such plans to the UML's activity diagrams. Any UML2 editor can then be used to modify the resulting diagrams. The sequence diagrams are responsible for determining the communication protocols that are used among agents.

The TAOM4e modeller provides the TAOM4e generators so that code skeletons can be derived for the "JADE and Jadex" agent platforms. This derivation is performed from the goal model of Tropos or from the UML specification of the detailed design artefacts [5]. The TAOM4e generators involve Tropos-2UML, t2x, and UML2-JADE. The UML2-JADE is responsible for producing the JADE agent code based on the UML activity and sequence diagrams, where the Tropos plans are thoroughly provided. The latest version is capable of producing UML activities diagrams from the Tropos' goal model. The knowledge level refers to the portion where the agent is given the responsibility to select the correct plans in order for the goals to be accomplished. In this part, the knowledge level is made up of goals and decomposition, means-end relations to plans, and contributions and dependencies to other agents. The knowledge level inclusions serve as inputs for the t2x tool. This tool uses the architecture of BDI as a basis in producing skeletons for agents. One can then perform these skeletons on the Jade BDI agent's platform.

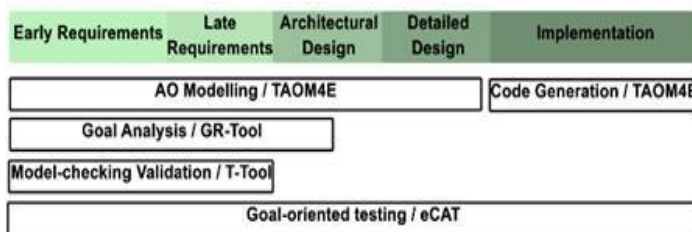


Fig. 1. Phases of the Development Process: Activities and Supporting Tools.

The skeleton code generated can then be applied to the software agent's reason ale. This includes agent definition file (ADF) that is presented in an XML format, and the identification of the beliefs, messages, goals, and plans of every system agent that is part of the GM [6]. One can then apply the single plans in the Java files, which are related to the ADF elements.

### III. TEST DESCRIPTION

#### A. Goal

Nomenclature lists (lists of symbols and definitions) generally follow the Abstract and Index Terms and precede the introduction.

#### B. Tested

This study measured the round-trip time, which can be defined as the time needed to conduct a circular ACL message exchange between a receiver agent and a sender agent.

To evaluate the platform scalability, the study will start with a single Sender/Receiver couple. The number of couples increased so that one could observe the manner by which the round-trip time increases. For each measurement, the average round-trip time (avgRTT) should ideally be obtained. This refers to the total measurement time divided by the amount of times that every couple exchanges a message as well as the ctual number of couples. Thus, avgRTT refers to the average time it takes to send a message and obtain a reply.

Fig. 3 shows that the Sender i-th only communicates with the Receiver i-th, where each couple exchanges 10000 messages. A seven characters string occupies the content field of each message.



Fig. 2. TAOM4e and eCAT Architecture.

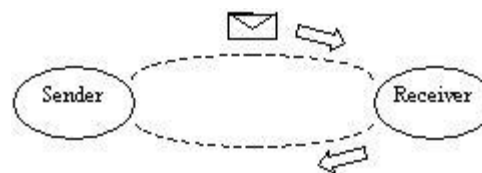


Fig. 3. ACL Round-Trip Message.



Fig. 4. Architecture of a Testbed Scenarios.

One can implement the two agents using the Cyclic Behaviour class (i.e. the JADE abstraction that is used for a repetitive cyclic agent task) to manage incoming messages. The following are the steps executed by both agents receiver and sender shown in Fig. 4.

The initiator role is filled by the sender agent [7].

**Sender:**

- Formulates a message to send
- Obtain start time
- For all the messages that have to be sent
- Forward message to the receiver
- Wait for the response of the receiver
- Obtain finish time

The responder role is fulfilled by the Receiver agent:

**Receiver:**

- Wait for the sender's message

One can repeat the measurement for various configurations by putting the agents in different or the same platforms. One can therefore distinguish between the Inter-platform and Intra-platform communications.

Two sub-cases are generated when the whole agents run into a single platform. The first one involves communication among agents who are within the same container. The second one refers to communication among agents who are situated in two different containers [8].

**Message Transport Protocols**

JADE implements the MTPs (standard Message Transport Protocols) so that interoperability can be promoted among different (with non-JADE) platforms. According to FIPA, the transport protocol definition is contained in every MTP, as well as the message envelope's standard encoding [9].

**IV. RESULTS**

One of the concerns in the MAS software is finding a way to properly organise and enhance cooperation among the individual agents. Two different approaches were examined. The first one approach is the direct communication, where agent coordination is handled by the agents themselves. The second one refers to assisted coordination, where the agents accomplish coordination by relying on specific system programs. The benefit from direct communication is that this approach does not rely on any other programs existence, capabilities, or biases.

The direct communication popularly has two architectures: contract-net approach and specification sharing.

In the specification sharing approach, the agents give the other agents information about their needs and capabilities so that these agents can then use this information to coordinate their activities.

The second approach is called market-based or contract-net organisation. Thus, agents need to distribute service or transmit requests to other different agents so that they could be used for proposals. The requests are then evaluated and the recipients of the messages submit the bids to the originating agents. The originators use the bids to decide which agents they would task and award contracts to. Often, specification sharing is seen as a more efficient approach compared to the contract-net approach since it lessens the amount of communication that has to be done. However, cost remains as the major dis-advantage of direct communication. As long as there is a small number of an agent, no problems are encountered. However, when there is a larger number, there is an inhibition in the cost of the bids broadcasting and the messages' consequential processing or specifications. As such, in this case, the only alternative is to organise the agents in a way that would prevent such a broadcast. Another drawback has to do with the complexity of implementation. In direct communication schemes, every agent is responsible for negotiating with other agents. Thus, they should have all the codes needed to support such negotiations. The complexity of the application programs may be decreased if the system supplies those capabilities. A common alternative that does not have the two previously mentioned disadvantages is by organising the agents into a federated system. As proposed in the diagram, agents do have direct communication. Instead, they only have communications with system programs called mediators or facilitators.

**V. EXPERIMENT RESULTS JADE**

**A. Intra-Platform**

- This section will describe the measured round-trip time when the students are found in the same platform. Fig. 5 demonstrates that three results were obtained, which means one for each configuration:
- Abstract must be one paragraph, and no more than 250 words. A minimum of 150 words are suggested, but not mandatory. The abstract must be written as one paragraph, and should not contain displayed mathematical equations or tabular material & should not include references.
- The abstract must be self-contained, without abbreviations, footnotes, or references. It should be a microcosm of the full article.

It can be seen from Fig. 6 that there was low standard deviations during the conduct of the tests. For every graph, the couple's number is found on the X axis, while the related mean round-trip time (avg RTT), presented in the magnitude of milliseconds (ms) is found in the Y axis.

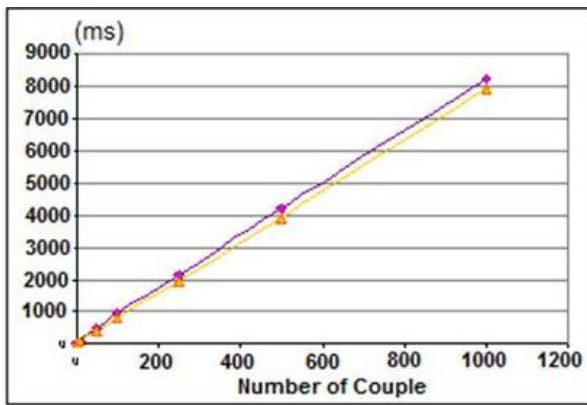


Fig. 5. Round-Trip Time; Intra-Platform Communication.

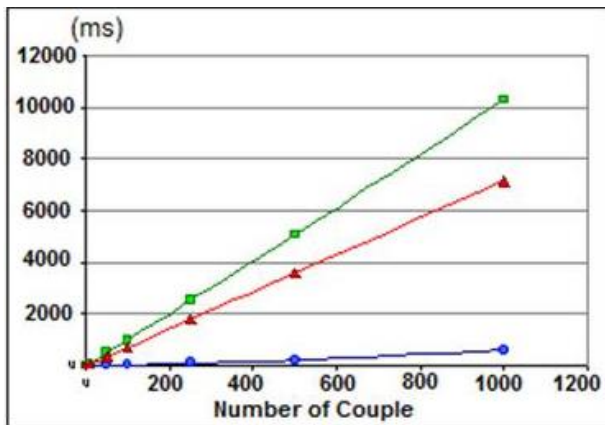


Fig. 6. Round Trip Time; Inter Platform Communication.

At first glance, it was observed that the avg RTT was very low when the students were within the same container. When the students are found inside the same container, JADE optimises the localisation of the students and uses event passing.

Furthermore, for all the cases in the range considered, the middleware demonstrated a linear round-trip time growth as a function of the couple's number.

JADE makes use of MTPs that comply with FIPA specifications. This is an indication that for inter platform communication, JADE needs to use String ACL Encoding to add an envelope to the message before it can be delivered and parsed at the side of the receiver. For instance, the round-trip time for the inter-platform scenario bears great similarity to the intra-platform scenario. Furthermore, the FIPA-MTP that was based on IIOP performed well. Lastly, the FIPA specifications' JADE implementation proved to be very effective.

JADE sends messages using RMI when students on two different containers communicate. It was observed that there was a lower round-trip time for the 2 hosts configuration compared to the one-host case because the load of the computation has to be divided between 2 CPUs. Compared to other cases, the low growth rate of the avg RTT for the same container configuration is an indication that this middleware messaging architecture is capable of supporting the computation high-load and without incurring heavy execution degradation.

## B. Inter Platform

Fig. 6 shows the round-trip time among students found on different platforms and where each one is living on a different host.

As a result of the possibility of altering the MTP (Message Transport Protocol), the results that were obtained using the ORB that was made by Sun microsystems went through a comparison with those of ORB acus, which was created by IONA without having any influence on the students' code. According to the results, the performance of ORB acus showed more efficiency.

## VI. DISCUSSION

In this system, the agents utilise an agent communication language so that they could document their needs and abilities for their local mediators (facilitators). Furthermore, the agents transmit application level information and requests to their mediators, as well as accept application level requests and information as a response. The mediators use the documentation provided by these agents to convert those application level messages and send them to a place that is suitable or appropriate. Thus, the agents form a federation where they surrender their autonomy to their mediators. The mediators are then responsible for meeting their demands.

## VII. CONCLUSION AND FUTURE WORK

Further research may require the extension of the solution so that it can be applied to other platforms, such as the mobile platform due to the fact that the JADE system integrates the LEAP library that provides the earth where the operator for cell phone is built and which can be used to deal with genuine servers. Future work may also aim to make this study applicable in answering various contextual analyses.

Agent-based systems have recently gained popularity in industrial and academic fields. AOSE offers diverse conceptual, frameworks, techniques, and notations. Consequently, it provides a platform that offers support for the dynamic, generalisation and autonomous, which in turn helps introduce robustness and the ease of using software methodologies so that challenges can be met and goals achieved. The Menial condition was used to try to control the consequences of c take and use the span postulate as follows: the quest of Coffin-nail configuration was associated to the Ebb method. It is business-like and is therefore dissimilar to multi-agents systems. There are also numerous versions of the methodology, such as ROADMAP, Jade V2, and AUML.

Numerous viewpoints can also be checked and assessed regarding their ability to improve the Jade philosophy, regardless of whether the process is in the execution stage, the stage of framework necessities, within the periods of outline and investigation, or within the Jade system, among others. An answer was obtained regarding the framework necessities that the JADE strategy has disregarded, therefore improving the Jade methodology by giving a formal specification. After a search of the formal specification's part in the system, a way of providing a formal specification of the system via Object Constraints Languages (OCL) was achieved. After selecting the OCL, the unified modelling language models (Class

Diagrams) was selected and combined with the OCL so that it can help introduce a formal system specification into the verification task. After the formal specifications were obtained, these specifications were combined to serve as input during the JADE analysis phase. The combine process was then evaluated via the JADE framework.

This study introduced a correlation with the alteration test from the e-travel principles. It also introduced an antisocial task close to the Etiolate system so that it could help develop agent-based systems in Coffin-nail status through the use of class diagrams that are extendable with OCL constraints. The puppet fit helps enhance the look of the system in terms of rectify performance and management.

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Khalaf is the instructor for a popular Mupad on undergraduate topics in programming languages and functional programming.