

Multi Path Based Intelligent Tutoring System

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Abstract – The paper introduces a system that has several paths to solution in an intelligent tutoring system platform and then chooses the most desired path to the solution. The desired path in this case is the right path to knowledge or solution that the student tends to understand after several attempt. This system models the student's level of assimilation while tutoring with any chosen path per time. It possesses the capability to note or store the best path to solution at any given time so as to use the best path to solution whenever it has to deliver lecture the next time thereby not start all over again. This ensures that tutoring is done using the desired and best path to knowledge, thereby reducing the student learning curve. This system still works with the previous intelligent system structures as discussed by Nwana, 1990;[11] , Freedman, 2000;[2] , and Nkambou et al, 2010;[3] but rather than just have the knowledge base populated with just one path to solution within the domain model, it will now contain more than one path to solution, then after several teachings and modeling the students based on their understanding level in each case, the system should be able to know the best path which is the shortest and desired path to the solution. In this work, we shall be looking at how this system works and its relevance to our tertiary institutions in Nigeria.

Keywords - *Multi Agent Intelligent Tutoring System (MAITS), Intelligent Tutoring System (ITS), Single path ITS (SPITS), Multi Path Intelligent Tutoring System (MPITS).*

1. Introduction

This paper looks at a typical Multi Agent Intelligent Tutoring System (MAITS) with several paths to solution; making the student assimilate a subject matter by modeling the students(s) in question to know when they have understood the subject matter before going ahead in course of the lecture(teaching). Intelligent Tutoring System (ITS) are growing in acceptance and widely deployed with following reasons: increment in student performance, (ii) a deepened cognitive development, and, (iii) a reduced time for the student to acquire skills and knowledge [12]. The integration of software agent into ITS would provide a framework that would facilitate learning to meet variety of learner needs. Recall that software agent is best described as an intelligent code which has a specific plan of action

specified in a limited domain and is capable of a behavioral pattern which allows it to change at the right moment its own interaction with the world depending on the stimuli from the environment[13]. Agents when deployed in systems intelligently and autonomously pursue their actions and sub goals to corporate, and coordinate to respond flexibly to dynamic and unpredictable situations. Because of the features which software agent exhibits, they are widely deployed in various application domains[14]. Hence, this system was tailored to utilize those properties of the multi-software agent technology in building the proposed system. It is designed in such a way that at every module of a subject matter being tutored, the system has a way of getting a feedback from the student(s) to know whether the student(s) is(are) following the lecture or not. The system will always ask the student(s) if they understand the subject matter or not. If they do then it continues to the next module of lecture. If not the system will go over the lecture module again but in this second or next time, the system follows another path to the knowledge (solution). For this to be possible, lectures in any particular subject(course) has to be segregated into module or section for proper modeling of the students understanding level at each stages. As discussed by Nwana, 1990;[1] , Freedman, 2000;[2] , and Nkambou et al. 2010[3] in their work about the structure of a typical Intelligent Tutoring System(ITS), they stated that it is made up of four models:

1. The Domain model
2. The Student model
3. The Tutoring model, and
4. The User interface model

This new system will be achieved by expanding and reprogramming the domain model which is the knowledge base of the system to have several solutions path to each of the subject matter being tutored as well

as the tutorial model which is in charge of the tutorial [10], to be able to access the various paths within the domain.

2. Single Path Intelligent Tutoring System (SPITS)

This system administers lecture without considering any path. This means that even though it has all the four compartment of the Intelligent Tutoring system, it only has one knowledge base of the subject matter under tutor within the domain model and as such if the student(s) do not understand, the system goes over the lecture module

again using same path. This really will not help the students that much because it repeats same thing time and time again. It therefore means that if students did not understand that path to knowledge then the purpose of teaching that subject matter will be in vain. This happens to be the platform with which ITS were established [4, 5, 6, 7]. This is the weakness of this system that made us to come up with this multi path system. That will explain that subject matter again but through another explanation path rather than repeating same thing again and again. The diagram below explains better how a single path system works:

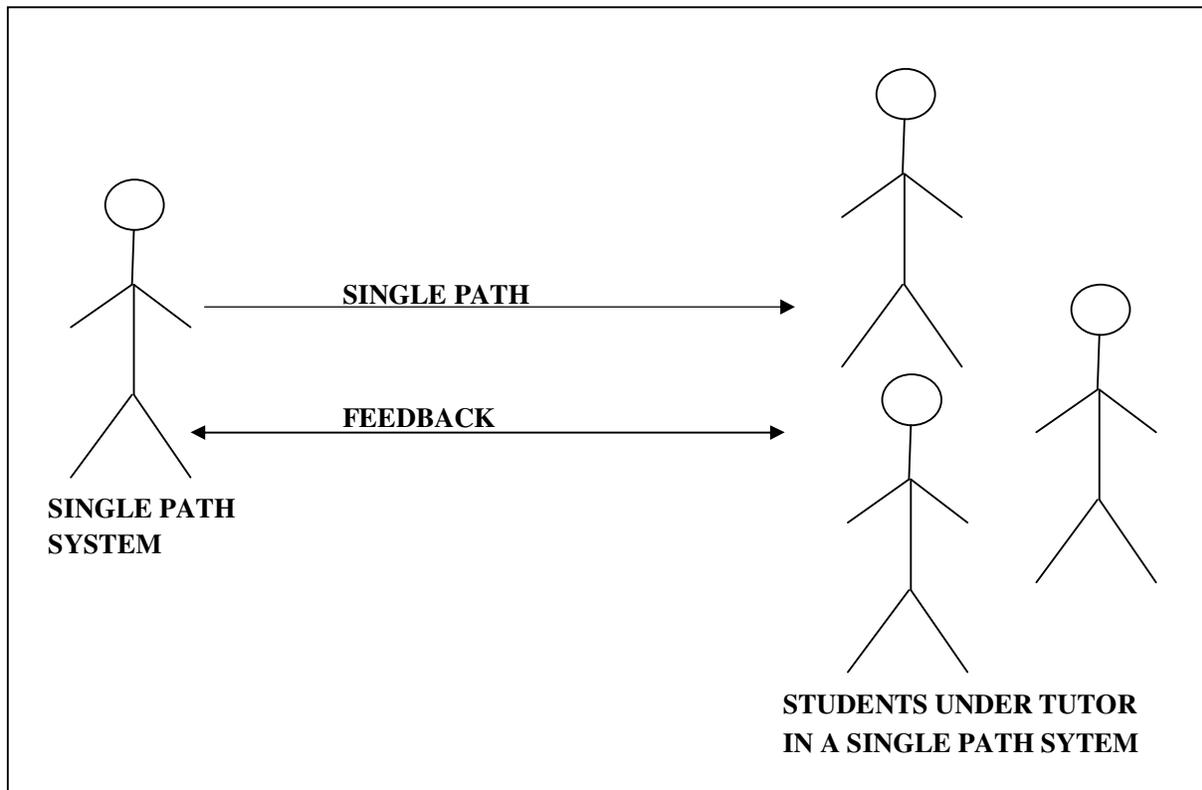


Fig 1: Single Path Intelligent Tutoring System

3. Multi-Path ITS

This is an improved system when compared to the Single Path system in the sense that it has many paths to

solution on a particular domain of study. This system operation is better explained with the diagram below.

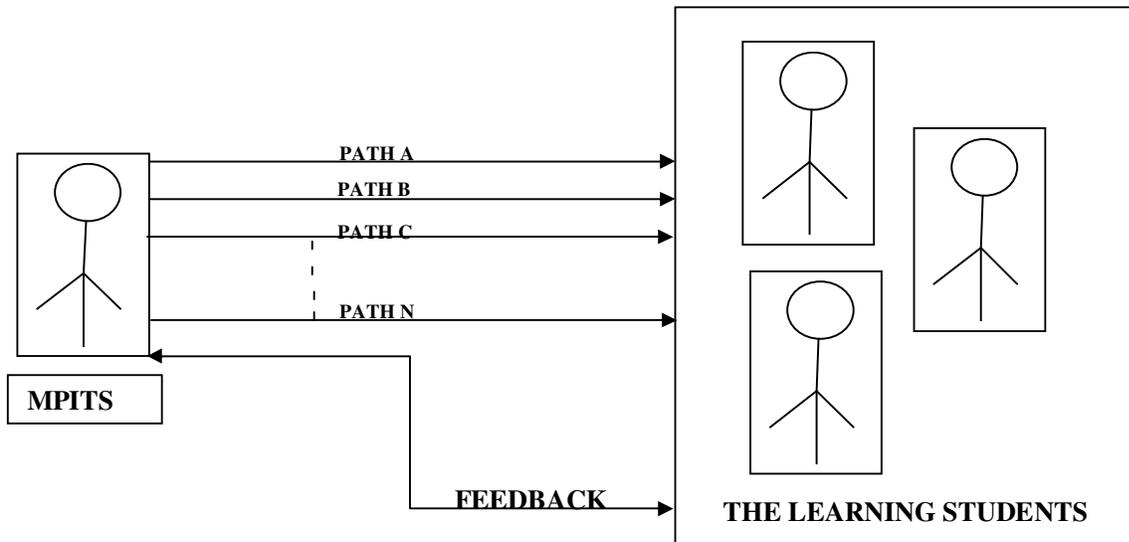


Fig: 2 How Mpits Works

In the above figure, the paths A-N signify the different paths to knowledge. A being the first path and N could be any other number depending on the system in question. The system could start with any of the paths but during feedback, especially in case where the

students did not understand the subject matter, then it returns and takes another path to to knowledge to the solution.

This mean if the system starts with path A and the student did not understand it, then it comes back to the system via the feedback to choose another learning path B. This happened until the student gets what is being taught by the system. This is the future of ITS as proposed earlier on [8, 9].

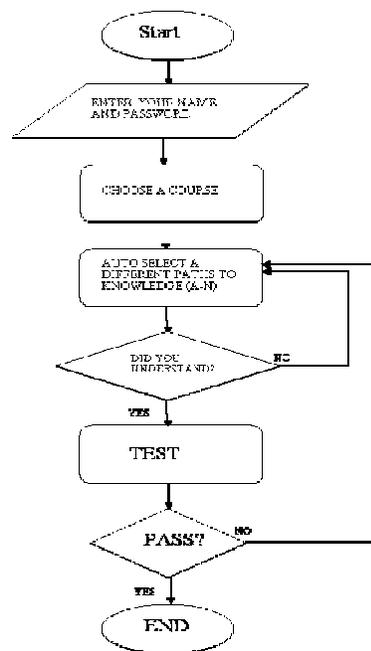


FIG:THE MULTI-AGENT ACTIVITY DIAGRAM FOR MODELLING THE STUDENT LEARNING PROCESS

Fig 3 Flowchart Diagram

The figure above shows a flowchart describing the flow of event in modelling the student learning process in a multi-path intelligent tutoring system. At inception the system allows a student when logged into the system to choose among several path to a learning process after choosing a particular subject of interest. If the student fails to understand the subject based of the learning path, he can go back to select another learning path. He can only proceed if the learning path satisfies the student and he is able to comprehend the subject of study.

4. Benefits to Education in Nigeria

1. It will reduce the learning curve of our students here in Nigeria and the world at large. Learning by choosing the best path to solution is faster and thereby reduces the length of learning.
2. It will ensure that student understands a subject matter before moving on to the next module. It eradicates every form of assumption during learning.
3. Reduces examination failure in our education system here in Nigeria and the world at large. This is because if students tend to understand a subject matter before sitting for an examination, it will guarantee that the students pass.

5. Conclusion

This multi path Intelligent Tutoring system will be helpful in our education system here in Nigeria if fully developed and deployed. This is because it does not only provide teaching services but it also models the students under tutor to know if they understood the subject matter tutored or not before they can proceed to the next step which is the examination. As against other systems which use examination as a yardstick to determining the students understanding of a subject matter.

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