

Improving content quality using student log data

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In Senegal as many developing country it has become increasingly difficult for student to focus on learning, define goals, and work toward them. Designing tools to complete and reinforce their work has become necessary. The purpose of this research is to help design an e-learning complemented with neural network that will advise student depending on their current status. The users in the improvement of learning. To achieve these goals, we use the evaluation of the students' performance coupled with the workload they receive. The results produced are distributed between student and teacher to facilitate their work. This feedback can be used by teachers to identify parts of their course they should improve. Armed with that knowledge we hope that student can make better use of the time they have to prepare for the challenges ahead.

Keywords : E-learning, Neural networks, Performance evaluation, Intelligent Tutoring System, Workload

1. Introduction

In Senegal as many developing country it has become increasingly difficult for student to focus on learning, define goals, and work toward them. The current communication between the actors (students, teachers, and so on) of education is not sufficient to adapt to the ever changing world. Designing tools to complete and reinforce their work has become necessary.

The purpose of this research is to design an e-learning that will advise student. The e-learning must also support the students in eliminating the weaknesses they have in the subject they are studying. The main target of this system are high school student of developing countries. Through the support we can extract information that could be relevant to the users in the improvement of learning. On this specific subject a few approach were used. We referred to ⁽¹⁾ a paper that present a way to use artificial neural network with Moodle log data to predict student in situation to succeed in a subject. The article ⁽²⁾ explain a method using multilayer perceptron to predict student result in first year of university. This prediction allow then the university to take pre-emptive actions against the phenomenon. Here the input data comes from the student profile. I ⁽³⁾ combine web usage mining and classification to generate model useful for decision making in education.

In this system case the student go through N phase. First assessment, its goal is to measure prior knowledge that would increase the speed of knowledge acquisition. Secondly the student the student go through the learning phase. Studying subject by accessing a chapter and completing the assignment related to it. Third phase is result assessment. The progress of the student are analyses using an A.N.N. simultaneously the results are compared to other student's. This way it become possible to alter the content structure in order to facilitate learning. If a lesson is too difficult, the

lesson can be simplified through division by Key points. The student progress is regulated by policies that are triggered by the comparison of the student performance and the overall performance. Finally the most important change can be made available to content providers (teachers). To improve quality and efficiency. In the examples we use mathematics but the goal is for the system to be able to receive any Learning material that conform to the model described.

The expected result is to generate data that will help both student and teacher. First for the student find out how far are they from their goal and what is the shortest path toward it. Through the policies the student can find an optimal learning path. Secondly the teacher can create more useful material for the students. By getting feedback on what change make the material easier to use for the students. Though the cycle personalized content and material quality improvement we can improve learning conditions.

We also referred to ⁽⁴⁾ which gives a basic introduction of ANNs. Then ⁽⁵⁾ where the characteristics of ANNs are elaborated. To create a multi-layer perceptron (M.L.P.). A multi-layer-perceptron is a type of feed forward neural network.

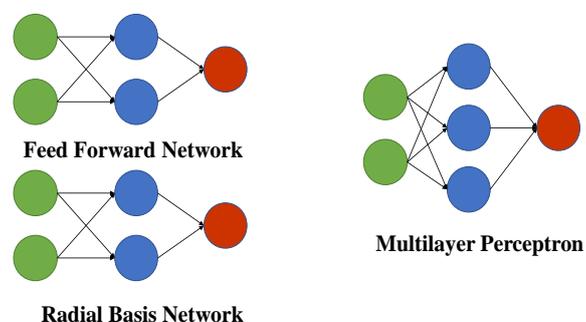


Figure 1 Feed Forward Networks

2. Learning control flow

2.1 Flow of the system.

For the given subjects

1. First the student will take an assessment
2. The student for each lesson complete a set of assignment dependent on a key point.
3. The progress of the student are compared to other student (Determine if the student need to put emphasis on the current point)
4. If a lesson is too difficult the lesson is simplified through division by Key point.
5. The result come out, the teacher get the data needed to update the material.
6. The training data is updated.

This is applied to a system where a subject has a set of lessons. Within the lessons there are the content and it is summarized by key points. To acquire the knowledge the student will have to solve a set of assignments.

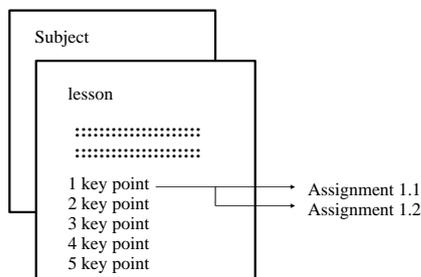


Figure 2 Format of the material

To start a subject the system give an assessment. The goal is to estimate how fast a student can advance.

2.2 The system configuration:

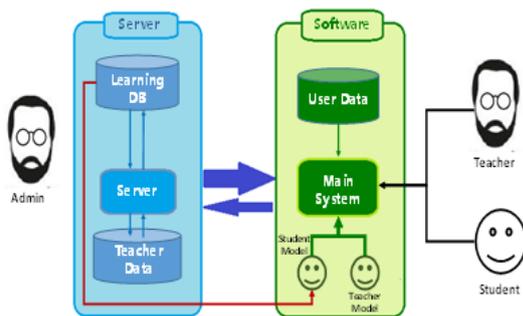


Figure 3 System configuration

In this system configuration, we have five different agents. Among them we have three real agents and two virtual agents.

Real agents:

- The admin is responsible for verifying that the user registered as a teacher is a really a teacher. Secondly the admin vetting the content supplied by the teacher.
- The teacher who is in charge of creating material for the student to use. Teachers can also review the performance of the student.

- The student who can study access the material review their record.

Virtual agent:

- The virtual teacher will receive the lesson published by teacher that no longer use the system.
- The virtual student is a model of the students' performances.

2.3 The neural network and its policies

Its purpose is to estimate the student situation compared to the norm. Which is overall results of the students in that subject. While trying to comprehend a lesson the students result depend on the prior knowledge they might have. The number of opportunities they have to apply the knowledge. So for these reasons the following simulation have been made:

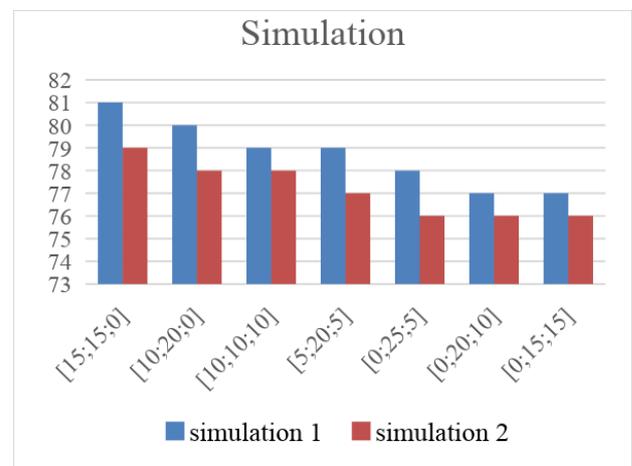


Figure 4 Performance of students depending on number of assignment and assessment score

The more assignment there are to more likely it is for students to understand the lesson.

Then the other influence on the student understanding is the workload. The time the student have to complete these assignment

Input data

- Assessment: Initial head start.
- Number of assignment
- Time: the time required by the student to complete a set

Output data

- Estimated Score

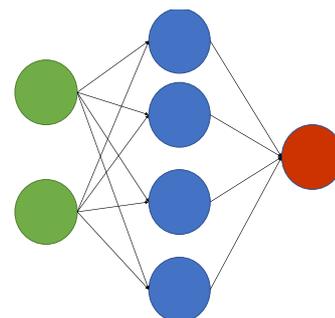


Figure 5 Multilayer perceptron used in this research.

To complement the network policies triggered by the network results are.

The number of assignments modifying the number of assignment make it easier for the student to understand. To make sure the student is not dissuaded to use the material the number of assignment to do for the student is maintained under six6 for one key point.

Simplification, this use the key point of each lesson to create sub lessons to divide a material into more manageable parts. For one lesson with eight key points we can separate into two lessons with four 4 key points. In the case two key point are interdependent since they cannot be separated they will stay in the same group or be their own group.

Lesson a	Lesson b
1.Key point	1.Key point
2.Key point	2.Key point
3.Key point	3.Key point
4.key point	4.key point
5.key point	5.key point

Figure 6 Illustration of simplification

Material update by the teacher allow to gradually address the flaws in the material. When the teacher review the student's record he will see which part of the lesson has the higher rate of failure. From then first check if the simplification has solved that problem. If so make the change permanent. In the case it didn't the teacher can propose a different solution or try solution that have been used before if they apply.

3 Expected result

For this research the data we focus on is log data from students' performance for the A.N.N. inputs. Through the support of the policies. The format of the log data we use is illustrated in Table 1.

Table 1 Format of the students log data

Id	stu_id	less_id	time	a_score	a_num	result
1	140	7	00:07:00	24	3	78
2	144	8	00:06:00	23	2	70
3	262	2	00:11:00	10	3	78
4	172	6	00:08:00	20	3	75

The id represent the following values:

- stu_id for student id
- less_id for lesson id
- time the student used to finish the assignment
- a_score for Assessment score
- a_num for the number of assignment the student must complete
- result the score of the student (percentage)

For the teacher when a large number of student

get stuck at the same problem this material will be marked as something that must change. First the teacher can know if simplification solve the issue. Otherwise he can implement other solutions.

By adjusting the complexity of the material, we can adjust the workload of the student to manageable level.

The student will get to quickly isolate the points that trouble them and resolve these issues.

4 Summary

In this paper, we described the e-Learning system with neural network for facilitating studies. By dividing the workload, facilitating student studies become possible to improve the learning environment. We hope that student will get the habit of managing their performance. As well as allowing the study material to improve over time

Currently we are developing NTE an e-learning coupled with artificial neural network (work in progress). At the network training phase.

References

- (1) "Predicting students' marks from Moodle logs using neural network models" by M. Delgado Calvo-Flores, E. Gibaja Galindo, M. C. Pegalajar Jiménez, and O. Pérez Piñeiro.
- (2) Predicting students' results in higher education using a neural network" by Bogdan Oancea and Raluca Dragoescu and Stefan Ciucu (2013).
- (3) Web Usage Mining for Predicting Final Marks of Students That Use Moodle courses " by Cristobal Romero Pedro G. Espejo Amelia Zafra Jose Raul Romero Sebastian Ventura (2010)
- (4) "Basic of Artificial Neural Network" by Ms. Sonali. B. Maind, Ms. Priyanka Wankar (2014)
- (5) "A Comprehensive Study of Artificial Neural Networks" by Vidushi Sharma, Sachin Rai, Anurag Dev (2012)
- (6) Roger Marples, "Well-being as an aim of education". In Roger Marples(ed.), "The Aims of Education", pp.133-144, Routledge, London and New York(1999)
- (7) Neil T. Heffernan III, "Intelligent Tutoring Systems have Forgotten the Tutor: Adding a Cognitive Model of Human Tutors", School Of Computer Science, Carnegie Mellon University, Pittsburgh (2001)