AGENT BASED APPROACH OF ITEM RESPONSE THEORY

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Abstract- The North Central Province, the largest province in Sri Lanka, has encountered with various problems related to the education field. Gaining poor results in Mathematics in national level exams, especially in the Ordinary level, is one of them. Although the knowledge of Mathematics is very important to the Implementation of every stream of subjects, statistical data of the Department of Examinations reveals that more than fifty percent of candidates who sat for the Ordinary level Mathematics got poorer (W) grade. According to the survey conducted by the author, it reveals that the poor knowledge of Primary Mathematical Concepts is one of main reasons for this situation. Introducing Agent based computer solutions is one of remedies for this. In order to introduce such a system, it is necessary to make psychosomatic measurements of the students. Item Response Theory (IRT) is a commonly used for such measurements. To adopt Item Response Theory into Agent programming, it is necessary to introduce a new model with Item Response theory. In this paper, it shows how to introduce such model with Item Response Theory & use to develop Agent based algorithm on modified Item Response theory.

Keywords- Agent, Approach, Implementation, Statistical, Mathematical Concepts, Psychosomatic

I. INTRODUCTION

Initial Survey

In this research, it is essential to collect data of primary students' Mathematics knowledge relevant to subject areas. In order to collect such information, the author conducted several surveys in schools selected in the North Central Province of Sri Lanka.

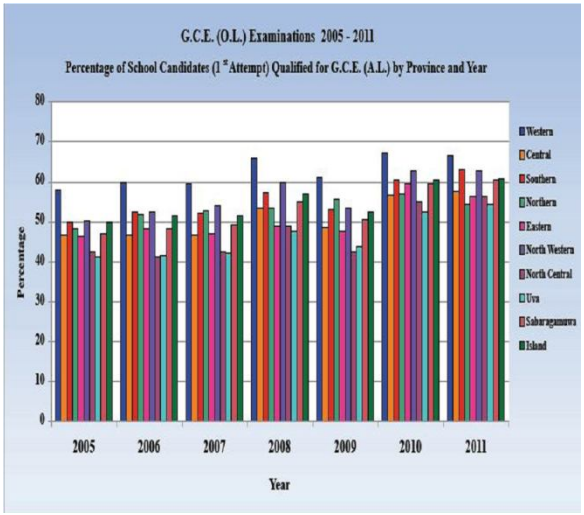


Table 01

At first, initially, the author conducted a survey covering all subject topics in Primary Mathematics in selected schools in the North Central Province. Afterwards, the second survey was conducted by selecting lower graded topics in the previous survey.
Data Collection and Pre-processing.

Table 01 shows that students of the North Central Province got lower results in Ordinary Level Examination compared to other provinces. Table 02 shows that students of the North Central Province got low marks for subject like Geometry, measurements… etc.

Table 03 shows the same subject areas that are in primary level students' scores in the survey conducted by the Author.

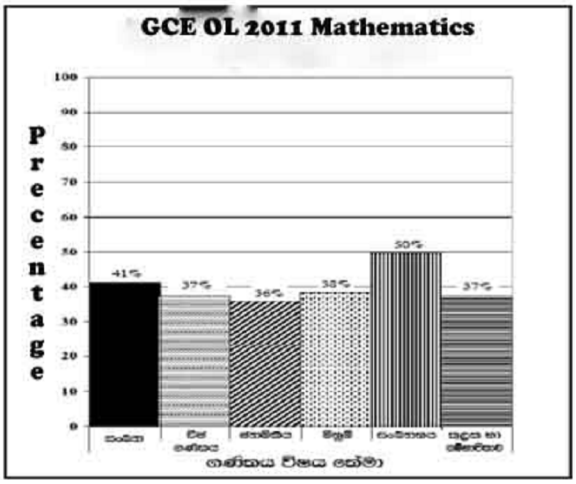


Table 02

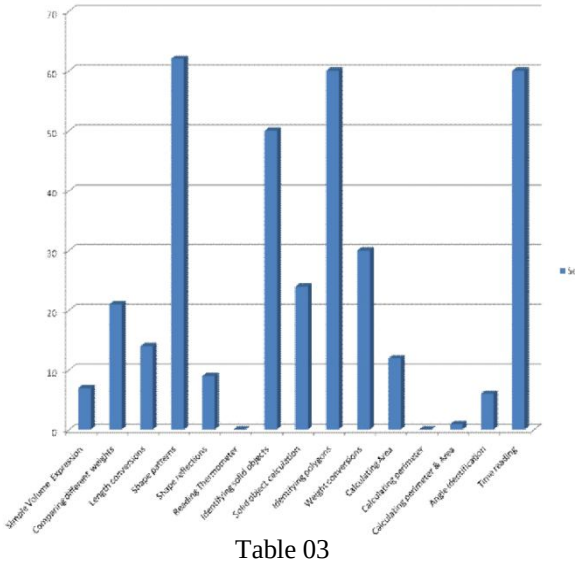


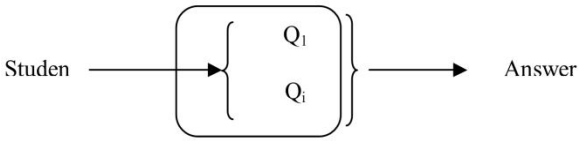
Table 03

II. RESULTS OF SURVEYS & CONCLUSION

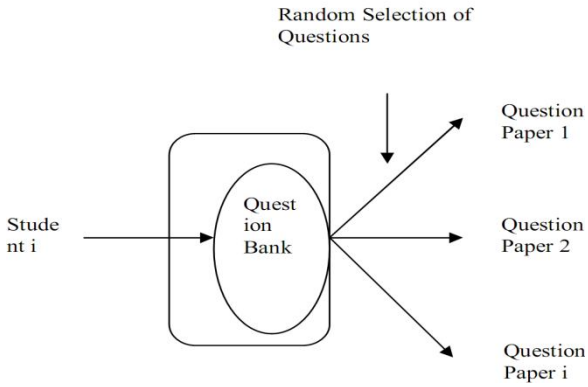
It is clear that weaker Mathematics topics for students in Ordinary Level Examination & those in Primary Level Mathematics are almost similar. Therefore, this research reveals that results for the lower grade in Mathematics especially in the North Central Province is a root cause of lower knowledge in Primary level Mathematics. As such, it is essential to enhance Primary Mathematics knowledge in Primary Students in the North Central Province.

In addition, it is understood that there is a severe dearth of primary Mathematics teachers in the North Central province. Therefore, introducing Agent based system for primary Mathematics may be a great contribution to overcome the shortage issue of primary Mathematics teachers.

Testing Types
There are two types of testing.
1) Conventional Testing - In this case all students are facing to the same question paper (Q1 to Qi) and correct answers are same.



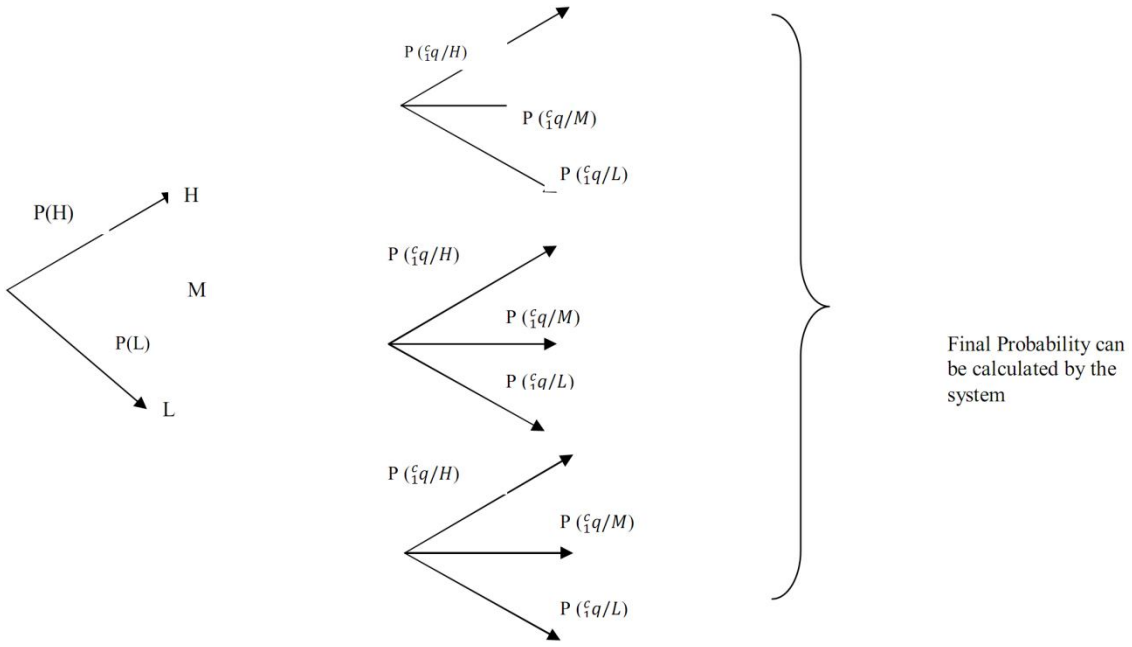
2) Adaptive testing - In this case all students are facing to the different question paper (Questing bank should be prepared.



This can be done with a computer System. Such system is called Computer based Adaptive Testing (CAT).In developing Agent based system with IRT; it is used Computer based Adaptive testing method.

III. IRT MODEL

In this paper, agented based system is proposed to develop basic mathematical knowledge of primary level students. Before developing such a system, it is essential to develop model of the system. A brief description of the system as follows.



At the initial level, the question bank is prepared in three levels of questions. They are Hard (H), Middle (M) and Low (L). These categories & questions are prepared according to the results of initial surveys. At first, for any other student, the system fired 09 questions as a mix of all three categories randomly selected. A student belongs to H the probability of answering question q1 correctly given by P ($_1^c q/H$).

As the difficulty of each question is previously calculated, probability of P ($_1^c q/H$), P ($_1^c q/M$), P ($_1^c q/L$), can be calculated. This is shown by following tree diagram.

Then we can categorize the student who has faced to the initial test, belongs to which group i.e. Hard (H), Middle (M) and Low (L) by the final conditional

probability of each student. Then the system present relevant lessons to the student according to students' level.

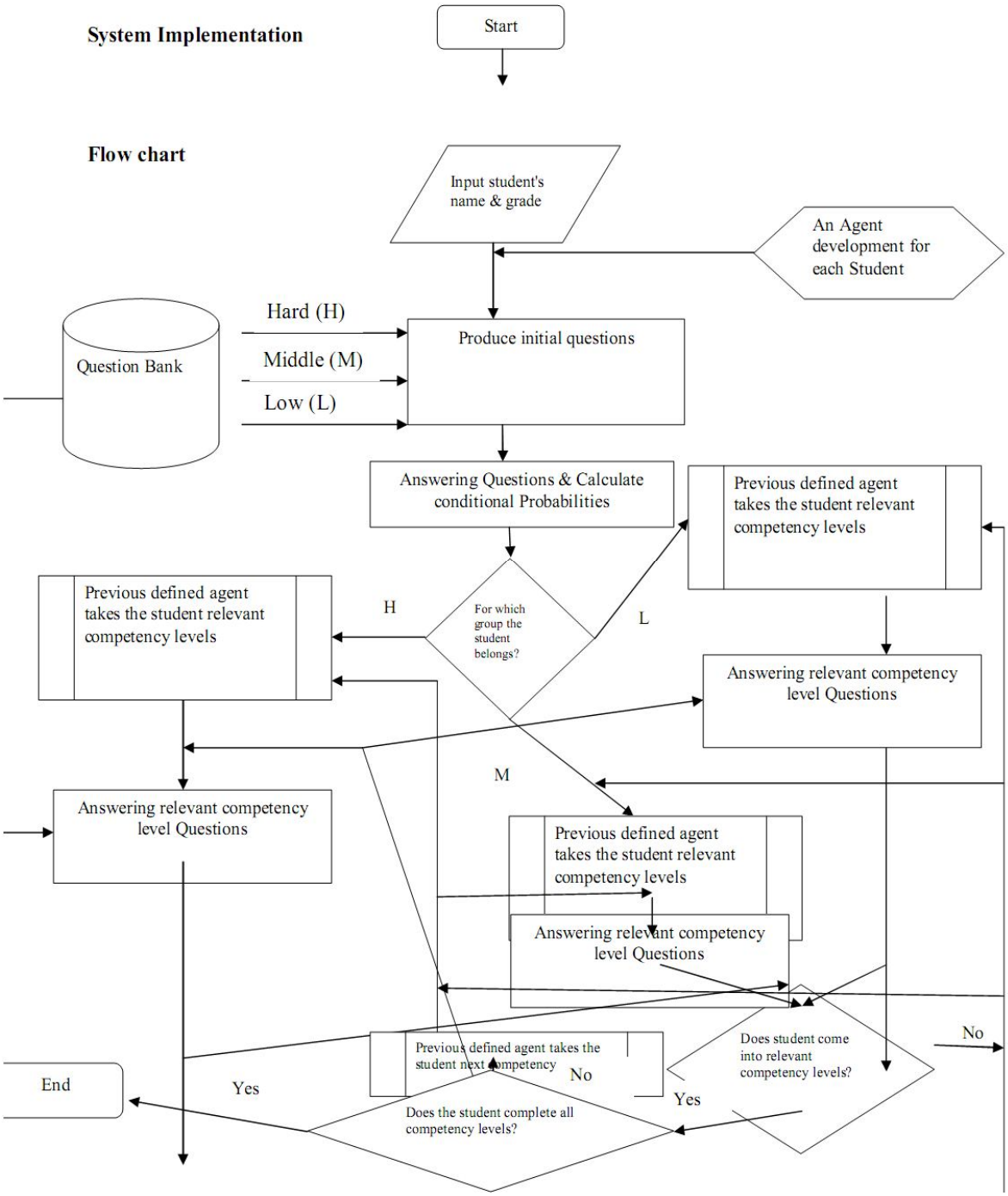
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Annex 01



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