International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

Adaptive Question Paper Generation System

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Abstract -- *Now-a – days efficient development of question model is very important for intellectual growth of the students and also to fulfil learning objectives of course(Bloom's Taxonomy).Although there are several computer-based question paper generators but they typically use random selection from question bank. Also these databases(question bank) are not rich enough to avoid recalling of questions. In this paper we are designing the adaptive question paper generator picking questions from rich databases and representing the question models according to the inputs of the parameters provided by the teachers who are going to design the question paper. The evaluation of generated question model will provide a feedback to check overall students, level of understanding and this will be an advantage of organization for enhancing the growth of students. in this paper we are going to generate questions during the exam time, evaluating student's efficiency based on his/her profile.*

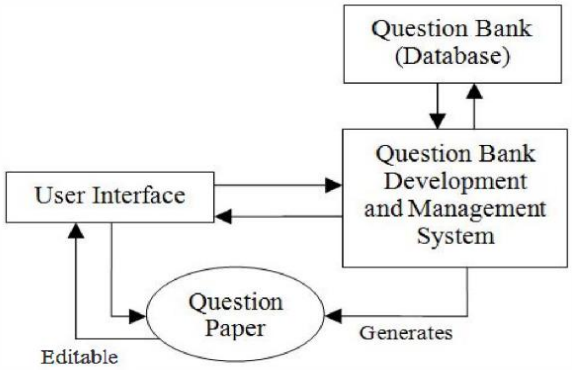
Key Words: **Question modeling, Bloom's Taxonomy, Question paper designer engine, Question storage engine, Question bank (Database), Concept map.**

1.INTRODUCTION

Learning is a complicated activity. Student's aim is to master knowledge and skills for their career. Most of the times, students get only recall (bottom of the Bloom's Taxonomy) type questions during assessment phase but professionally they are assessed on all aspects as per blooms taxonomy. This creates a knowledge gap which is not revealed in the former part. The current education system does not ruminate on this concern and intellectual growth of student's founders. Teachers' aim is to pass on knowledge and enhance students' learning ability. Every Courses have LO's (Learning Objectives), Assessment for such course is verification by the course's teacher to check whether the students have met or achieved the objectives or not. But designing such questions to test learning (categorized by Bloom) of the students with respect to particular courses needs enormous experience and is time consuming activity. This would be difficult for budding teachers and even experienced teacher may not be able to create such questions frequently as there are several tests, quizzes and exams in a year in any academic house.

Basically, our proposed system has four users:

- Teacher as Question Designer (QD)
- Student to be appeared in exam (STUD)
- System itself will act as Question Paper Designer (QPD)
- Administrator (for authentication)



Our system will be used in complaisant with the organization and uses organizational course curriculum for designing concept map. The above mentioned users have different roles in the system and they will provide inputs accordingly to Adaptive Question Bank Development and Management System.

2.LITERATURE SURVEY

As Data mining being the core disciple of the technology field, there are multiple numbers of study resources and papers available from various publication journals. On the basis of definition of our problem statement, we have selected few papers as a base reference for the completion of our project.

The following study represents a brief introduction of the papers we are using in our research project.

2.1"Prototype deployment of examination and quiz system (EQs) with outcome based education in networking system" by H.Rahmalan, Z.ZainalAbidin,Z.Abal Abas.

This paper focuses on alignment with learning outcomes (LO) and program outcomes (PO). It also focuses on deploying an evaluation system for lecturer to provide assessment document question sets such as final examination paper which is based on the outcome-based-education (OBE) approach

2.2"Online automatic examination system for digital circuits " by Vafeiadou, Catherine, PantelisVasiloudis, and Minas Dasygenis.

This paper represents the Normal Web based application to serve online exam . In this paper, the construction of a complete online automatic examination system of digital circuits is analyzed. Specifically, open source software was

used to construct a dynamic website for automated student examination in order to support asynchronous e-learning, supported by an RDBMS database.

2.3"Automatic Generation of Valid and Equivalent Assessment Instruments " by Banerjee, Shilpi, and ChandrashekarRamanathan.

This paper focuses on the Generating valid assessment patterns automatically that satisfies the constraints provided by the instructor . This paper presents an assessment instrument for a course on Design of Digital Systems that is developed using the above approach.

2.4"A Novel Approach to Assist Faculties In Question Paper Generation " by D.Radha, R. Jayaparvathy, Bavadaarane M. , A.Jyothirmayi.

This paper concentrates to device an Intelligent Mathematical model to reduce the time dedicated to generate question papers. "Knowledge Discovery in Database", is the decisive role of Data Mining that adopts to transform raw data into constructive information from large data repositories, and so it is deployed to achieve the objectives.

3.PROPOSED METHODOLOGY

A Web-based application refers to any program that is accessed over a network connection using HTTP, rather than existing within a device's memory. Web-based applications often run inside a Web browser. However, Web-based applications also may be client-based, where a small part of the program is downloaded to a user's desktop, but processing is done over the Internet on an external server.

A. Concept Map

A concept map is tool to organize and represent powerful knowledge frameworks for a specific focus question. The concepts are represented in a hierarchical fashion with the most inclusive, most general concepts at the bottom of the map and the more specific, less general concepts arranged hierarchically above (see fig. a). In curriculum planning, concept maps are enormously useful. The hierarchical organization of concept maps suggests more optimal sequencing of instructional material. Since the fundamental characteristic of meaningful learning is integration of new with the learners' previous concept and propositional frameworks, proceeding from the more general, more inclusive concepts to the more specific information which usually serves to encourage and enhance meaningful learning.We are considering only a few sub-domains of "C-Programming" as listed below.

- Arrays
- Functions
- Structures
- Unions etc.

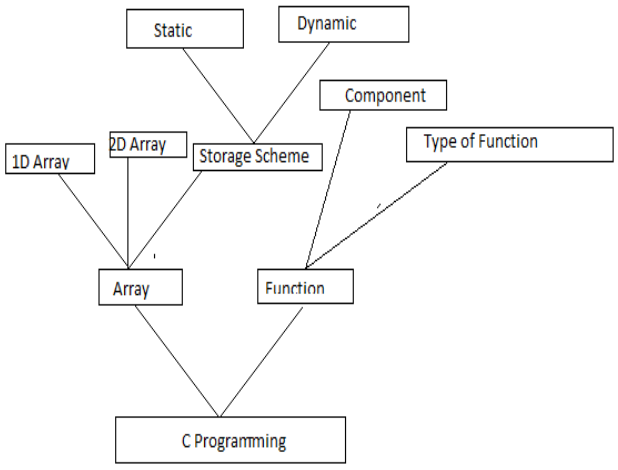


Fig.a Concept Map of C programming

B. Bloom's Taxonomy

Bloom's Taxonomy is a classification of learning objectives of education. We have classified questions on this taxonomy as it is considered to be foundational and essential elements of educational objectives (categorization shown below).

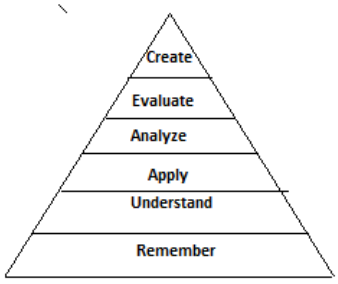


Fig. b Bloom's Taxonomoy

In this way, the editable generated question paper is represented to the QPD in the user interface. The QD (Expert) add questions to the database with the help of graphical concept map represented to it. QD has to provide all the attributes (dimensions) of questions as shown in Table I. above. The 'topic' attribute of a question is set by selecting the leaf concept of the graph. The question will be inserted in the data structure attached to the leaf node automatically by intelligent development system. As a question may use more than one concept so the topic attribute can also be multi-valued.

This is based on intelligent distribution of questions among the chapters selected. There are three steps to generate the question by Matrix Maker-

1. Creating 2-D matrix to establish a relationship between Bloom's Taxonomy and Chapters.
2. Creating 2-D matrix to establish a relationship between Level and Chapters.
3. Creating 3-D matrix to establish a relationship among Bloom's Taxonomy, Levels and Chapters.

4.ALGORITHMS

4.1 Algorithms

4.1.1 Algorithm for creating 2D matrix to establish a relationship between Bloom's Taxonomy and chapters by Matrix Method

CreateMatrix_BloomsChaps(bloom[],chap[])

1.Initialise matx1[p][r]← 0;ch[]←0;b←0;c←0;

2.for b←0 to p-1 do

3 .while bloom[b]!=0

4. do

5. if c>r-1 then

6. set c←0;

7. ifch[c]<chap[c] then

8. matx1[b][c]←matx1[b][c]+1;

9. ch[c]←ch[c]+1;

10. bloom[b]←bloom[b]-1;

11. c←c+1;

12. else

13 c←c+1;

After passing through these steps we get 2D matrix as:

2	**2**	**1**	**1**	**6**
2	**2**	**3**	**2**	**9**
2	1	1	2	6
3	1	4	1	9
9	**6**	**9**	**6**	

Matx 1[p][r]

4.1.2 Algorthim for creating 2D matrix to establish a relationship between level and Chapters by Matrix Method

CreateMatrix_LevelChaps(level[],chap[])

1.Initialise matx2[q][←0; ch[]←0;c←0;

2.for 1←0 to q-1 do

3. while level[1]!=0

4. do

5. if c>r-1 then

6. set c←0;

7. ifch[c]<chap[c] then

8. matx2[1][c]+1←matx2[1][c]+1;

9. ch[c]←ch[c]+1;

10. level[1]←level[1]-1;

11. c←c+1;

12. else

13. c←c+1;

Again , after passing though these steps we get a 2D matrix as:

3	**2**	**2**	**2**	**9**
2	**3**	**2**	**2**	**9**
4	**1**	**5**	**2**	**12**
9	**6**	**9**	**6**	

Matx2[q][r]

4.1.3 Algorithm for creating 3 D marix to establish a relationship among Bloom's Taxonomy. Levels and Chapters by Matrix Method.

CreateMatrix_BloomsLevelChap(matx1[I],matx2[I])

1,Initialisematx 3[p][q][r]←0:I←0:c←0:b←0;

2.for c←0 to r-1 do

3. for b←0 to p-1 do

4. while matx1[b][c]!=0

5. do
6. if l > q-1 then
7. set l← 0;
8. matx2[l][c]←matx2[l][c]-1;
9. matx1[b][c]←matx1[b][c]-1;
10. matx3[b][l][c]←matx3[b][1][c]+1;
11. l←l+1;

After executing this first function, we get a 3D matrix whose realationship is used for querrying the graph and picking up the questions from database attached to leaf node as shown below:

4.1.4 Algorithm for traversing the concept map, distributing questions(The good combination generated in Algorithm 4.1.3) to different nodes (According to question paper designer(QPD) input) and then picking them (from leaf node) for generation of standard question paper.

Traversal (chapter[],root)

1.for c←0 to r do
2. for each vertex u E adj (root) do
3. if name[u]==chapter[c] then
4. Distribute (name[u]);

Distribute(name[])

1. for each vertex E adj (chapter_node)
2. count←count+1;
3. if count==0 then
4. Query & maintain history;
5. else
6. d←d%count;
7. e←a/count;
8. j←0;
9. for each vertex vEadj (chapter_node) do
10. question[v]←e;
11. childnode_name[i]←name[v];
12. j←j+1;
13. if d!=0 then
14. question[v]←question[v]+1;
15. d←d-1;
16. for j=0 to count do
17. DISTRIBUTE(childnode_name[i]);

Here traverse O takes the chapter [] as input i.e: provided by QPD for paper generation and root is the initial node. This function searches for each adjacent node of root and calls distribute O when the chapter node is found.

5.CONCLUSION

To implement this project several databases are required. The Question Database or Question Bank is implemented using graphical hierarchy with the integration of the concept map of that curriculum which stores questions pertaining to a specific curriculum. User Database is a relational database which stores information of the users, authorized to interact with the system i.e. QPD & QD. Question Paper Database is a relational database which stores the Question Papers generated by QPDE and is accepted by the QPD for the future review.

6.REFERENCES

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