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Adaptive Curriculum Sequence In Virtual University

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***Abstract*—In this paper I proposed a framework for a finding learning path of a learner in virtual university. Adaptive curriculum sequencing is needed to fulfill the requirements of different-different students like working class students, students those who are not capable of attending physical educational campus, sports centric students and also some students who do not want to follow the fixed curriculum sequencing or who can't study the fix number of subjects in a particular semester decided by the system. In adaptive curriculum sequencing student will enter number of subjects to study in a particular semester , subject's code of their choice, subject all ready cleared by the student in old semester or semesters, number of study hours student can spend for study in a particular semester, number of subjects which are attempted by the student but not cleared. After taking these input system will generate the output , it can guide the student too if it is needed for example if student selects a subject that has some prerequisite subject then the system will guide the student that before going for the selected subject/subjects the study of a prerequisite subject/subjects is necessary.**

***Keywords*—adaptive learning, curriculum sequencing, computer based instruction**

I. INTRODUCTION

Virtual university has been the subject of much debate in recent years; in short the concept of virtual university denotes a learning system based on the internet. In the past years, numerous virtual universities have become available on the Web. A virtual university is an infrastructure that does not have a traditional campus, classes or a library; instead there are hypermedia facilities that provide richer functionality and features than their physical analog. A typical hypermedia application serves the same pages and the same set of link to all users. In order to improve usability , adaptive web-based applications make it possible to deliver personalized views or versions of a hypermedia document for all the users with diverse needs and knowledge backgrounds gaining access to the system. A virtual university environment that adopted Intelligence in content providing is the Electronic Education Environment. However these adaptation techniques are focused to a specific service and therefore work completely independently in an environment that is supposed to cover a broad set of needs towards the common target of usability and learning improvement. The fruitful design and successful correlation of adaptation capabilities simultaneously for educational material and accompanying supportive services is a task not as simple as one may guess. System will also guide the student if student selects more number of subjects that is beyond the study hours entered by the student, system will also guide the student if student crosses the maximum number of subjects in a particular semester. Adaptive curriculum sequencing is an important research issue for web-based education system because no fixed learning paths will be appropriate for all learners .Web based instruction researchers have given considerable attention to flexible curriculum sequencing control to provide adaptable personalized learning programs [1][2][3] .Curriculum sequencing aims to provide an adaptive learning path to individual learners since every learner has different prior background knowledge, preferences and learning goals.

The virtual university is an important example of the potential use of ICT in the delivery of higher education [4] [5]. Although the term 'virtual university', has been used to denote quite a varied number of activities and institutions and can be considered as a metaphor for the electronic, teaching, learning and research environment created by the convergence of several relatively new technologies including, but not restricted to, the internet World Wide Wave, computer mediated communication [6].

The traditional approaches promote standard usage of teaching and learning processes and it is teacher centric. Through it offers interoperability, but lacks flexibility. In present days the learning process is student-centric and more flexible from the learner point of view [7][8]. In offering flexible [e-learning] program most important part to be incorporated in the learning environment is to simulate human role as guide can perform, curriculum sequencing seems to be a priority.

The paper presents a system to provide customized learning path for an e-learning of a flexible learning environment to help them achieve their learning objectives.

II. PROBLEM FORMULATION

First A learner in e-environment confuses to choose subjects from a wide variety of subjects of a course. Moreover each subject has its own constraints like preference, subject name, subject id, credit of subject, required time to complete the subject or study the subject and prerequisite subject or subjects. A subject may have one or more prerequisite subject ,that is why at first a learner must choose prerequisite subject/subjects of the subject. A student can select a subject if all prerequisite subjects are cleared by the student .It is not possible for all learners to take appropriate decision for opting subjects in each semester. The matter goes to more complicated state when a learner passes some semester without proper planning . In this case the machine suggest appropriate learning path to the learner to complete the course .Here the machine suggest the learning path for self e learning to provide desire support in different phases of the courses.

The mathematical formulation of the system stated here:

(1) C_p = credit points

(2) C_{ri}= credit of i th subject

(3) P_i = points of the i th subject

(4) P_{min} =minimum point of subject

(5) SGPA= semester wise grade per average

(6) DGPA= degree grade for average

(7) T_i=study time requires in terms of hours for i th subject

(8) T= total duration of the course

(9) T_i= time spent in a semester

(10) T_r= remaining time in a semester

(11) $Cr_{(min)}$ = minimum no of credit to completion the course

(12) $DGPA_{min}$ = minimum DGPA required to complete the course

To complete the course follow some important formula, these are :

(1) To calculate credit points of each subject (ith subject)

$C_p=C_{ri} * P_i$

P_i is the credit point of ith subject which student got in a semester. P_i multiplies with credit of the subject and there after get credit points of the subject.

Note- P_i must be greater than minimum points of the subject

$P_i > P_{min}$

P_{min} = minimum point of subject

If $P_i < P_{min}$ then the student does not clear the ith subject

(2) To calculate the semester wise grade point average(SGPA)

SGPA= $\sum_{s=0}^{m} \cdot C_p / \sum_{0}^{m} \cdot Cri$

Here, m= no of subject chosen in a semester. m is depend on the learner, the number is not fixed.

(3) Calculate the Degree Grade Point Average(DGPA)

DGPA= $\sum_{s=0}^{n} \cdot$ SGPA / n

Where, n = no of the semester containing in the course. n is not a fixed number, it is depend on the learner. A learner can complete his semester his own preferences but it have a limitation have a minimum and maximum value.

(4) $\sum_{i=1}^{n} \cdot t \leq T$

total duration of the course should be equal or greater than to the sum of individual man hours each subject .

III. PROPOSED SYSTEM

This approach promotes designing a learning path for the e-learner by providing different alternatives of combinations of subjects for the currents semester depending on five parameters- credit, time, optional subjects which was selected by the student, subjects which was cleared and not cleared by the student in previous semester. The architecture of the system includes four components- User interface, Learning Constraint Sensor (LCS), learning Path Indicator Generation (LPIG) and learning Path Generation (LPG).

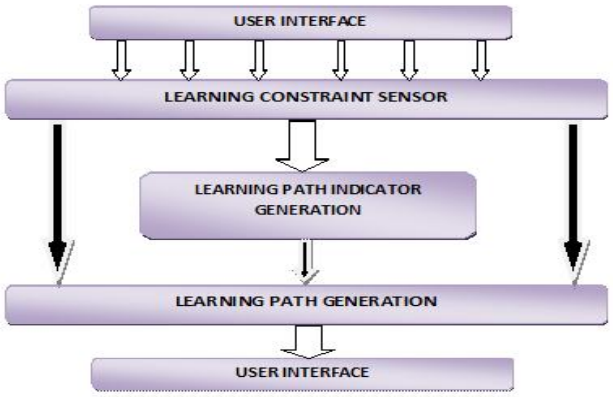

Figure1. High level architecture of the system

A. *User Interface*

User or Learner interface makes user capable of accessing and controlling the states of the system. Learner interface provides space where interaction between learner/student and system occurs. In learner interface inputs are used to allow the user to manipulate the system and outputs are used to indicate the effects of the leaner's manipulations. In web based applications like virtual university learner interface accepts input and provides output by generating web pages which are transmitted via the internet and viewed by the user using a web browser program.

B. Learning Contraints Sensor

The Component takes different diagnostic parameters from the learner through the user interface and provides different output by the constituent component LPIG and LPG according to their requirement. The diagnostic parameters include learners' choice of semester wise subject clearance status, learners' preference of subjects for the current semester, affordable time for the current semester etc.; whereas components presents present in this component perform different tasks for the further dispensation. The task involves constraints, hard or soft, manipulation, dependency estimation between subjects etc.

For each subject the system maintains subject identification number, subject name , credit required for the subject, approximately time required for the subject to complete it, prerequisite subject list is depicted as below.

S[i] =

P_{ref}	S_{id}	S_{name}	C_{ri}	T_i	P_{ri}	V

Here i= 1, 2, 3, 4……N total no of subjects

S_{id} = subject id

S_{name} = subject name

C_{ri}= credit of the subject

T_i= time requirement to complete the subject

P_{ri} = A set of prerequisite subject of the subject

P_{ref} = preference button for the learner

V = learning path indicator value

For dependency calculation, each subject is considered as the node of a directed graph. A certain edge e(i,j) indicates that there is a directed path from the node v_i to node v_j, where v_i and v_j node represent subjects S_i and S_j respectively and to clear S_i, learner has to clear its prerequisite subject S_j . A node with n- number of in- degree signifies that the node itself is a prerequisite for n number of subjects. Again, in the graph, there may be one or more isolated node. An isolated node characterizes a subject that neither has any prerequisite of any other subjects. Components responsible for the calculating dependency, computers prerequisites for all subjects and also maintains a reference identifier (RI). RI is being generated by total number of references that has been made by other subjects as prerequisite.

C. Learning Path Indicator Generation

Possibly every time LPI value was updated in each subject. LPI value was calculated by some parameter. Initially LPI value of each subject is zero. If learner selects any preference subjects having same priority then the subject having maximum Learning Path Indicator (LPI) value will be given first preference for the curriculum sequencing. This LPI value creates an important role for curriculum sequencing in a virtual university. Calculation of LPI is performed using the following formulae.

$$LPI = \{f1(n) + f(2) + f(3)\} * f(Si)$$

1[if all subjects in the set P_{ri} are being cleared]

f (Si)= {

0[if any one of the subject or subjects in the set P_{ri} is not cleared]

If any prerequisite subject or subjects of a subject are not clear then the LPI value of the subject is zero because reaming value multiply with zero then the subject belongs at the near about end position of the subject list which was made by LPI value with descending order and otherwise reaming value multiply with 1.

$\sum_{i=1}^{x}$ [if there are x prerequisite subjects and already cleared]

f1 (n) = {

0 [if it has any unclear prerequisite subject]

If a subject has one or more prerequisite subjects which are cleared and return to1 for every clearing prerequisite subject and help to increase LPI value for generating curriculum sequencing

1 [if it was attempted]

f (2) = {

0 [if it is was not attempted]

If a learner attempted any subject but not cleared the subject in any reason for his/her illness or time short or busy in any work etc. Then function value return 1for the subjects because the learner attempted the subjects, it means the learner may be knows something about the subject. That's why this value help to increase the LPI value of the subjects.

1 [if it is preference list]

f (3) ={

0 [if it is not in preference list]

A learner want to read some subject , can give choice option. This function return to 1if the learner gives choice option for any subject otherwise 0. A learner can increase LPI value of a subject for his preferences.

D. Learning Path Generation

Main objective of this Component is to generate learning path for users or learners. There are two steps to generates learning Sequences – at first the combination of subjects applicable to learner will be generated for the current semester and secondly it generates learning path for other subjects for rest of the semesters.

A sequence contains a collection of subjects depending on five parameters- credit, time, optional subjects which was selected by the student, subjects which was cleared and not cleared by the student in previous semesters. The system verify the current semester, time spendable of remaining semester and decide the student will able to completion the achievable degree or course. There have a limitation to completion the course a minimum time limit to maximum time limit. If a student can not earn total course subject in between the time limit that means the student unable to completion the course for particular degree.

The system calculates the total LPI value of the particular subject on the basis of some parameter which was described in LPIG (Learning Path Indicator Generation). It is a temporary value of the subject. The system selects the subjects on the basis of top LPI value.

After opting a certain sequence user will be provided a learning path for the rest of the subjects for the rest of the semesters. Since it is not possible self placed e-learner to specify time he can afford for the future semesters, the system considers affordable time for the current semester as the benchmark for the rest.

A subject S_{id} is to be chosen for being a member of current sequence for the current semester if it meets the following criteria: (1) If it is not a cleared one. (2) If all the prerequisites are cleared in the previous semesters. (3) If the time requirement for the subject is greater than the time affordable.

In the previous semesters a learner may not clear some of the subjects or may not attempt to sit for some of the subjects. Therefore to clear all the subjects within the minimum time frame learner has to set for the examination in more papers then that are required to meet the minimum criteria to pass the course.

System Inputs are:

(1) Current semester [p]

(2) Subjects cleared [y1, y2, y3,……..,yn]

(3) Subject/Subjects attempted but not cleared [x1, x2, x3,…….,xn]

(4) Time can be spent in the semester [y hours]

(5) Choice of subjects [at beginning].Show in "Fig. 3".

Curriculum sequencing depends on the input parameter. System verify and analysis the parameter and then follow the algorithm. Show in "Fig. 2".

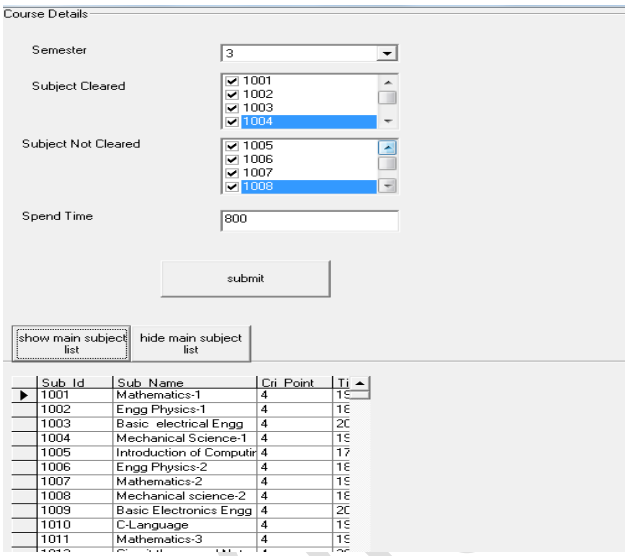

Figure2. Student information acceptance screen

This algorithm proposed for curriculum sequencing. First output is coming for P_{th} semester then start algorithm at beginning for the $(p+1)_{th}$ semester , this process is continue until the summation of cleared and selected paper credit is greater than or equally minimum credit point to completion the course. Here we declare only p_{th} semester time. System will make others semester curriculum sequence on the basis of the time which learner can be spent in the p_{th} semester.

Step 1-if $\sum$(cleared subject+ selected subject) $C_{ri} \geq C_{ri(min)}$
then end the program
else
first remove the cleared and selected subject.

Step 2 -Create a subject list descending order on the basis of LPI value.

Step 3-Highest weight LPI value of the subject selected and check if ($t_i \leq y$)

Else same logic checks next highest LPI value of the subject.

Selected papers are deleted from the list (in step-2).

Repeat the process.

Then to be continue the step 3 process and select every subject and check between subject time and reaming time of the semester.

Stop the program.

When $y_t=0$ and $ti < y_t$

t_i = subject time of ith subject , y_t= remaining time of the semester.

Select every subject after checking the condition step-1 and end of the step-3 update LPI value on subjects.

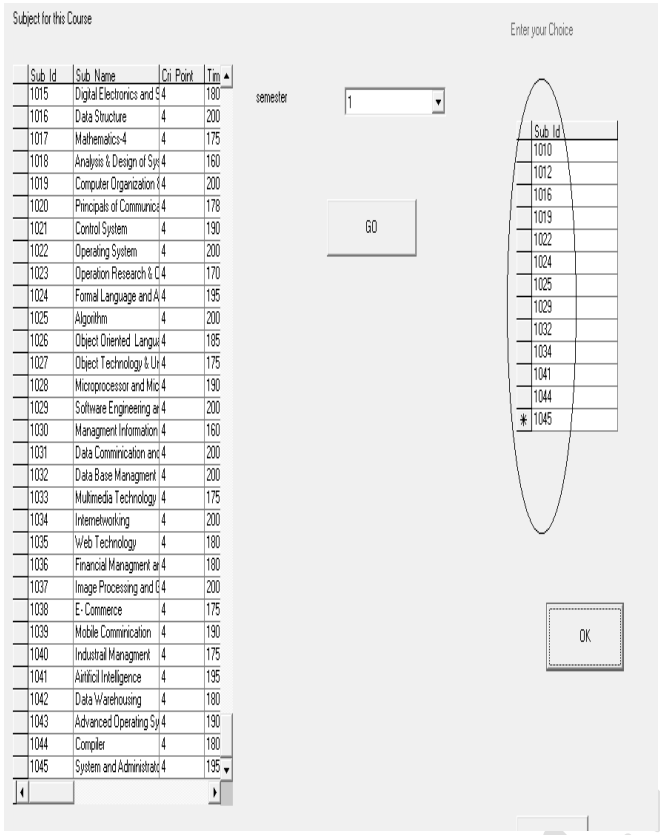

Figure3. Subject choice input screen

IV. EXPERIMENTIAL RESULT

The frame work is experimented in visual basic dot net environment. Microsoft access is used as the database to store learner's information. Apache Tomcat is used as virtual server to simulate web interface. At first System take input which course is want to a learner? At the beginning of the semester a registered student select some subject which the learner want to read it in his/her course duration in future.

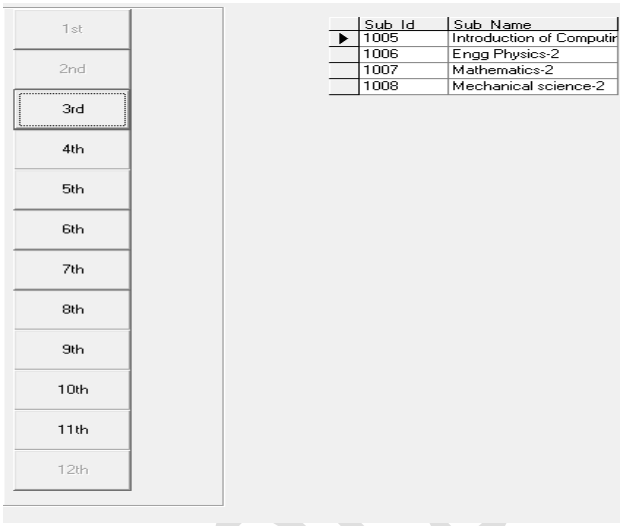

Figure4. Learning path for the current semester

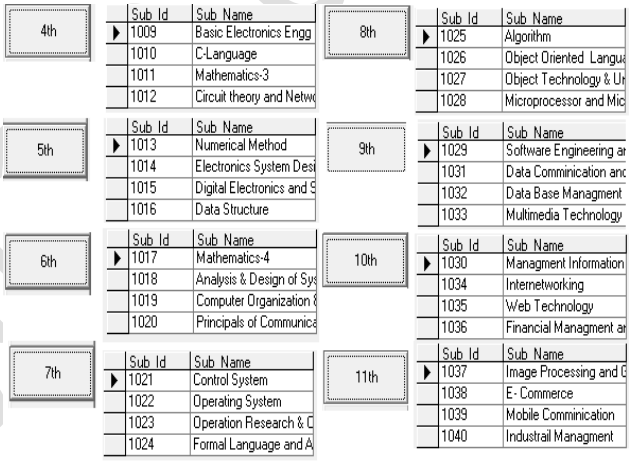

Figure5. Learning path for the rest of the semester

V. CONCLUSION

After Adaptive curriculum sequencing seems to provide most suitable and flexible learning materials in virtual university to its learners. It seems that this project will fulfill the requirements of different different learners like working class , learners with very low grasping power, physically challenged learners who are not capable of attending physical education campus, sports centric learners etc. Now a day these types of virtual university (which provide flexible learning environment) become very popular. Any sport centric person, working persons who cannot give their time for regular course time and also cannot attend school or colleges. They are easily read their course work by the proper way.

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