Development of Software Application to Auto-Generate RT-1 Examination Question Paper

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Abstract

Industrial radiography involves extensive use of x-ray and gamma-ray radiationwhich is hazardous. Hence trained manpower is required to avoid accidents and control the harmful effects of radiation by safe handling and work procedures. Radiography testing (RT) certification program accomplish this need. It educates, prepares, and makes Radiographic Testing personnel capable for the work. Therefore truthful evaluation of each person, after imparting training (RT-1), is very important in making decision to certify a person as a trained radiographer. Radiography testing examinations are conducted by BARC as per the ISO-9712 guidelines. The examinations are conducted setting up question papers covering all the topics covered during the training. However, due to drastic increase in the number of courses in last five years, it became difficult to keep track of recurrence of questions and weightage of each topic during manual setting up of question papers. To overcome this difficulty software called 'Quickpaper' is being developed indigenously. The software has facility to securely create topic wise question bank. These questions can be classified in three grades as easy, medium and difficult. To generate the question paper, software has automatic and manual option. In manual option user can select the questions from the listed topics as per category. The software is tested successfully by generating multiple choice question paper with its answer key for RT-1 general examination.

Keywords: Radiography Testing, RT-1, software, gamma radiation, question paper

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Introduction

Industrial radiography involves extensive use of x-ray and gamma-ray radiation which is hazardous. Hence trained manpower is required to minimize accidents and to control the harmful effects of radiation by safe handling and work procedures. Radiography Testing (RT) certification program accomplish this need. It educates, prepares, and makes radiographic testing personnel capable for the work. Radiography testing training creates a certain level of awareness and provides knowledge on radiation safety that includes safe handling and transport of equipments having ionizing radiation. Therefore truthful evaluation of each person, after imparting training, is very important before certifying a person as a trained radiographer.

BARC is conducting RT level-1 (RT-1) and RT level-2 (RT-2) courses every year. RT level-2 courses are being conducted by BARC in Mumbai whereas level-1 courses are conducted in

partnership with private playersat four training centers across the India [1]. BARC has successfully conducted 67 RT-2 and 146 RT-1 courses in last 20 years, out of which 75 RT-1 courses are conducted in last five years. About 450 students appeared for examination and ~300 personnel were certified as trained radiographersin fifteen RT-1 courses conducted last year.It is expected that the number of courses will increase in future due to industrial and economical growth in India [1].

These radiography courses are conducted by BARC as per the ISO-9712 guidelines [2]. The evaluation is carried out setting up question papers covering all the syllabus of the training. Certificates are issued to candidates who pass the examinations successfully and recognized as Radiographic Testing personnel [3]. However, due to sudden increase in the number of courses, 15 per year from merely 4 per year, it became difficult to keep track of recurrence of questions and weightage of each topic during manual setting up of examination question papers. To overcome this difficulty a software application called '*Quickpaper'*is being developed indigenously to generate question paper automatically from existing question bank.

Materials and Methods

User requirements to auto-generate question paper are identified before development. The key requirement is a bank of questions, format of question paper, number of questions etc. In RT-1 examination, RT-General question paper contains 50 MCQ based questions, so it was decided to start the development of software application forRT general question paper. Another important requirement is to maintain confidentiality. So the software is equipped with the facility to securely create database containing topic wise questions for RT general examination. To maintain confidentiality and safety it is decided to authorize the administrator to create two separate users one to input new questions in the database and another to generate question paper.

The software application is developed under windows environment using Microsoft visual basic as front end user interface and Microsoft access in the back end for database management. To generate question paper one needs question bank. Thus software application is divided into two components one to generate question bank and other to generate question paper. The data entry mode is provided to add questions into the database. Confidentiality is maintained by avoiding unauthorized use of software by providing different levels of security (user login) at every stage, for every user as shown in figure 1. The administrator has given supervisory rights to create different users. Two types of users are created, first type to enter questions and second type to generate question paper. After login the first type of user is authorized to add new questions to the question bank and to modify the questions from the question bank if required. The second type of user is authorized only to generate the question paper and not given access to add or modify questions in question bank. Similarly first type of user has no access to generate question paper.

Figure 1: GUI for user login

Result and Discussion

To add new question in question bank, the user interface (GUI) is shown in figure 2 below in which three control buttons are provided. *Add* button is to add new question in the database. It generates question number automatically. The fields are provided to enter the question, its four answers and the correct answer. The user can set the topic of question and its difficulty level like easy, average and difficult. A unique ID of the question is automatically generated when it is saved in database using *Save* button. In case of any mistake*Reset*button is provided to clear all the fields.
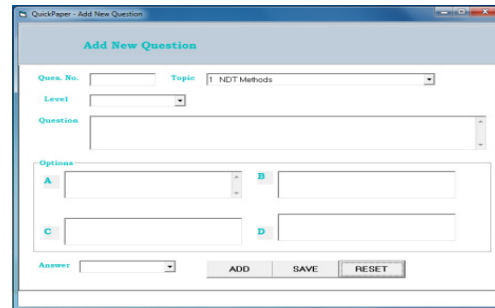
The user is also authorized to modify any question or its grade if required. To modify the questions a user have to login again in edit mode. The user interface of edit mode is shown in figure 3. Three buttons are providedto modify the questions and each button has specific function. The *Retrieve*button is to retrieve the question from database with respect to the number entered in the question number fieldand display it for modification. Modified question is then saved in the database using *Save* button. The retrieved question is modified only if it is saved.*Exit* button to come out of the edit mode.
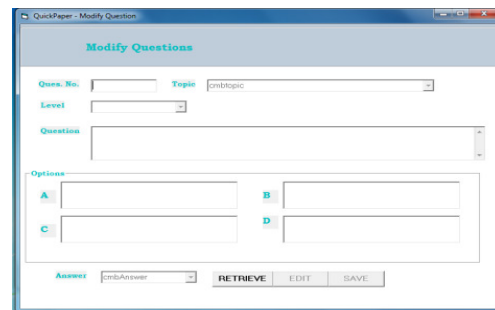

Figure 2: GUI to add new question

Figure 3: GUI to modify question

To generate question paper, authorized user login with valid user ID and password. User login and password created for data entry cannot be used for question paper generation and vice versa. Once logged in, the user interface contains information as shown in figure4. Facility is provided to select the date of examinationand Institute. Three buttons are provided at the bottom side of GUI to generate the question paper and one more to exit this mode. First two buttons are for manual-generate and third button is for auto-generatethe question paper.In manual-generate mode the user has control over total number of questions and its difficulty level, as per his choice. In this mode, the question list is generated using first button. Then user can manually select the questions from the list displayed, as per level of difficulty,in three columns. The counter at the top of the each list indicates the number of questions selected by the user. Once required numbers of questions are selected,press the second button to generate the question paper.

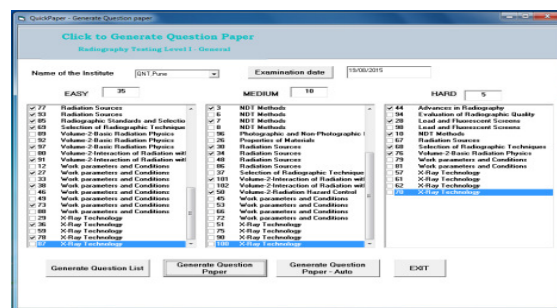Figure 4: GUI to generate paper

The third button is provided to auto-generatethe question paper. It randomly selects 50 questions from the question bank and displayselectedquestion numbers as shown in figure5 below. Generate the question paper by pressing OK button. The question paper is generated with answer key and saved automatically in the default folder with file name QPaper.doc. It also opens automatically in read only mode using Microsoft word document editor for further viewingand editing.

The application is very small in size (~1MB) and do not consume much memory. The major part of a memory is consumed by the database. The size of database file depends on the number of questions in the question bank. It is to be created by an individual using the software application and not bundled with the application. The software application works on a windows based computer having Microsoft

Figure 5: GUI to auto-generate paper

office (word and access) preloaded. The software application is tested successfully by generating RT-General question paperon a desktop computer having Windows-7 operating system and Microsoft Office 2007 preinstalled. It is observed that software application avoids repitation of questions and no two question papers are same. It has easy to adopt intuitive interface, data entry also becomes easy. It restricts the use of Microsoft word by other application for successful question paper generation.
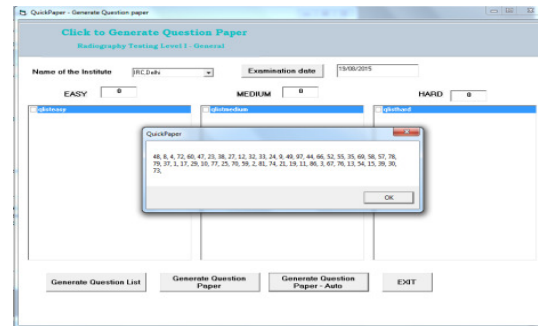
Conclusion

The software application is tested successfully for generation of RT-General paper which is fully MCQ based examination. The automation of paper generation reduced the occurrence of human error and ensured the non-recurrence of questions. It is a powerful tool to generate question paper in very short span of time with minimum dependency. The applicationis under revision to incorporate questions other than MCQ type.

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