Assessment Software Program For Use In Polytechnics In Ghana Using MATLAB

Emmanuel A. Sarsah, Felix A. Uba

Abstract: In grading students' scores, tutors in Ghana often use spread sheet programmes for this purpose. This approach is subject to errors (in the case where a student score is mistakenly entered as being greater than the total mark) and involves more manual work by tutors after entering students' raw data - marks and grades have to be copied to a word-processing program and a final output form adopted by Polytechnics in Ghana is then prepared. We have developed a software program named 'Assessment Program for Polytechnics' to relieve tutors of this burden. This assessment program uses inputs specified by tutors and generates the final output form automatically without much work. The software program warns tutors of wrong inputs, if any. It was developed using MATLAB and has a graphical user interface to make it user friendly

Key Terms: Assessment, MATLAB, students, program.

————————————————◆————————————————

1 INTRODUCTION

Marking of students' exercises is a time-consuming and labour intensive task. Another labour intensive task involves entering the students' raw data in spread sheet programs and obtaining the grades; only for the relevant columns of data to be copied to word-processing software with extra finishing touches to obtain a final assessment form. Despite this unfortunate situation, little or no effort has been put in place to automate the assessment process [1], in Ghana. The final output assessment form developed by Polytechnics in Ghana is in Fig.1. The final assessment form is forwarded to the department's examinations officer who then copies the total marks column of data for use in generating students' cumulative averages.Students' assignment or classwork raw data have to be converted to 20 marks, mid-semester exams raw data converted to 20 marks and end of semester raw data converted to 60 marks. With spread sheet programs, extra columns of data or new sheets have to be created for converting the raw data to the final form in Fig.1; a situation where most tutors usually feel reluctant to carry out. To avoid this, some tutors squeeze their marking schemes such that the total mark is always 20 and 60 so that there will not be the need to create extra columns of data forconverting the marks.

————————————————

- *Sarsah Emmanuel is a lecturer in the Mechanical Engineering Department, Wa Polytechnic, Wa, Ghana. E-mail: emmanuelsarsah@gmail.com*
- *Uba Felix is a lecturer in the Mechanical Engineering Department, Wa Polytechnic, Wa, Ghana. E-mail: felix_uba@yahoo.com*

WA POLYTECHNIC
SCHOOL OF ENGINEERING
MECHANICAL ENGINEERING DEPARTMENT

2ND YEAR COURSE ASSESSMENT SHEET – 1ST SEMESTER

LECTURER'S/INSTRUCTOR'S NAME:
COURSE TITLE:
COURSE CODE: 2013/2014

STUDENT'S INDEX NUMBER	ASSIGN./ QUIZZES/ CLASS WORK ETC.	MID-SEMESTER EXAMS	SUB TOTAL	END OF SEMESTER EXAMS	TOTAL	GRADE
	20 MARKS	20 MARKS	40 MARKS (40%)	60 MARKS (60%)	40% + 60% (100%)	A+, A, B+ ....
1013080001						
1013080003						
1013080004						
1013080005						
1013080006						

* A+ (85-100%), A (80-84%), B+ (75-79), B (70-74), C+ (65-69), C (60-64%), D+ (55-59%), D (50-54%), F (BELOW 50)

DATE SUBMITTED: ....   DATE RECEIVED: ....

SIGN: ....   SIGN: ....
(LECTURER/INSTRUCTOR)   (DEPT. EXAMINATION OFFICER)

Fig.1: Final Output Assessment Form (From Word Program)

Our interview with tutors also revealed that, they use the grading key beneath the table in Fig.1 to fill the last column of the table. Even though, spread sheet software can be programmed to do the grading, tutors were not taking advantage of this. For all these reasons, we have designed and developed a program using MATLAB to automatically generate the final assessment form. The program was tested with previous data samples from tutors in Wa Polytechnic; the program offering much faster final assessment form than was previously done.

2 WORKING METHODOLOGY

The first step towards developing the software program was the creation of a figure window named 'Assessment Program for Polytechnics'. The appropriate menu items *File* and *Help* were created with their submenus. Six toggle

buttons namely *Semester Information, Assessment Data, Fill table, Results, Plots/Details and Summary* were created in the figure window. Seven push buttons were also created. Various static texts, pop-up menus, edit boxes and user interface tables were created using MATLAB functions. The toggle buttons were programmed to set the appropriate fields' visibility to on or off. A push button named, 'Press to Get Summary' opens a new figure window showing the final assessment form based on the entered data in the main figure window. The final function was then compiled in MATLAB. The next section explains how to effectively use the program.

3 HOW TO USE THE PROGRAM

To use our program, the user must have MATLAB Compiler R2012b (32-bit/64-bit) installed on Windows 8 platform. One can download the 32-bit or 64-bit of the compiler from www.mathworks.com. Users are required to obtain the source folder containing the executable file from any of the authors of this paper via email. The user then runs the executable file from the source folder. A welcome screen in the form of Graphical User Interface (GUI) is displayed. We now explain the use of various menus, toggles and push buttons in our program using typical data collected for testing our program.

3.1 Main Figure Menus

The main figure menus are File and Help as in Fig.2. The file menu contains the following functions:

Save: Saves the contents of the graphical user interface (GUI) without opening a new window.

Save As: Opens a submenu, for saving the contents of the current GUI in portable document format (pdf).

Import: Gives options for importing numeric data from excel file or text file saved in the source folder, to the table under Fill Table Section. Text Headings in text files should be deleted before importing to the assessment program.

Save Table Data: Gives options for saving the table data, under Fill Table section, as excel file or text file to the source folder. The contents of the text file can be copied and pasted in a spread sheet program. For index numbers exceeding nine digits, some editing must be done in the spread sheet program.

The Help menu contains the following functions:
Help: Opens a pdf window describing how to use our program.

About: Opens a new window giving a brief description about our assessment program.

3.2 Semester Information

This toggle is made of two sections. It contains various pop-up menus in the first section, for selecting Institution's name, school, department, etc. The selected options are shown in edit boxes. There are options for entering data not included in the pop-up menu lists. Other data are entered in the second section of the current GUI. A sample is shown in Fig.2.

Fig.2: GUI - Semester Information

3.3 Assessment Data

Semester assessment records are entered in this section. Records include number of students in class, number of quizzes, projects and assignments including mid-semester and end of semester examinations as in Fig.3. It must be stated that the total marks boxes are based on all quizzes or assignments, etc., done in the semester.

Fig.3: GUI - Assessment Data

3.4 Fill Table

This section contains the following push buttons:

Press To Fill Table: Creates a table of zeros based on the data entered in the assessment data section. 'Shift + mouse click' automatically fills the contents of column one

25

(Index Number) in increments of 1 based on the first number entered. For Index Number of ten or more digits, values appear as exponents as in Fig. 4. These should be ignored. 'Shift + mouse click' for other columns fill the table in increments of zero based on the selected number. Data can also be imported from a spread sheet program. Excel data extensions '.xlsx' and '.xls' can be imported. The data in Fig.4 was imported from Excel data saved in the source folder.

Press to Show State of Table: Contains the same information entered in the table with all digits of the index numbers shown as in Fig.5. This may be helpful for cross-checking the data entered earlier. This push button **must always be executed** before moving to the Results section.

Press to Restore Last State of Table: Restores the last state of data entered in the table.

Fig.4: GUI - Fill Table (a)

Fig.5: GUI - Fill Table (b)

3.5 Results
This figure window contains the following push button:

Press to Show Final Table: Shows the complete table format for the Polytechnics with grades, based on the information entered in the table. 'Press to Show State of Table' function **must always be executed** before turning to this section. If there are wrong entries in the table (in a situation where the converted raw data mark is greater than the allowable total mark), this function warns of those errors.

3.6 Plots/Details
This figure window contains the following push buttons:

Grade Count: When pressed, it shows the number of people who obtained a particular grade. It shows the same information in a bar chart.

Performance Analysis: Shows the measures of statistical performance (mean, standard deviation, etc.) for the assessment data entered. These are based on the *raw data* entered in the table under **Fill Table Section**. Messages are reported if there are no entries for a particular assessment type.

3.7 Summary
This figure window contains the following push button:

Press to Get Summary: Based on the information entered, a new figure window opens to show the final output assessment form for Polytechnics in Ghana. This figure window contains the 'Print' and 'Save As' functions. The *Print* function prints the current figure. In situations where there are more students, the vertical scroll bar can be used to create new set of students for printing. The whole figure is always printed. The *Save As* function gives options to save the current figure as a MATLAB figure or pdf file. In situations where there are more students, the figure can be saved in turns and irrelevant portions can be cropped using any pdf editing software. This can then be forwarded to the department's exams officer. The contents of the table can be copied and saved separately as excel file or text file. A sample is in Fig.6.
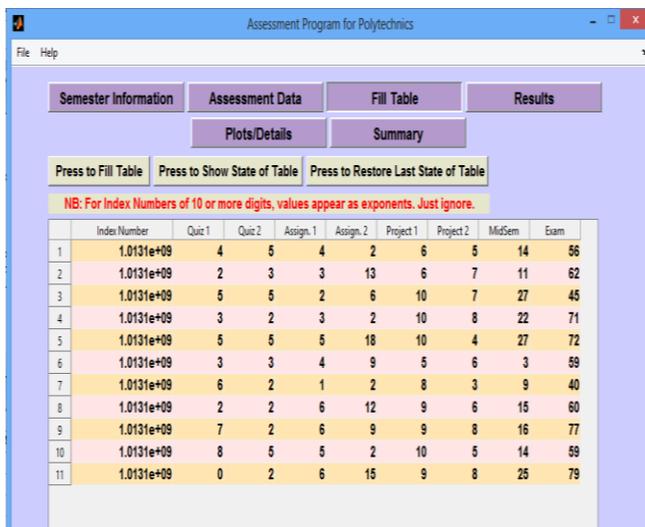

Fig.6: Final Output Form
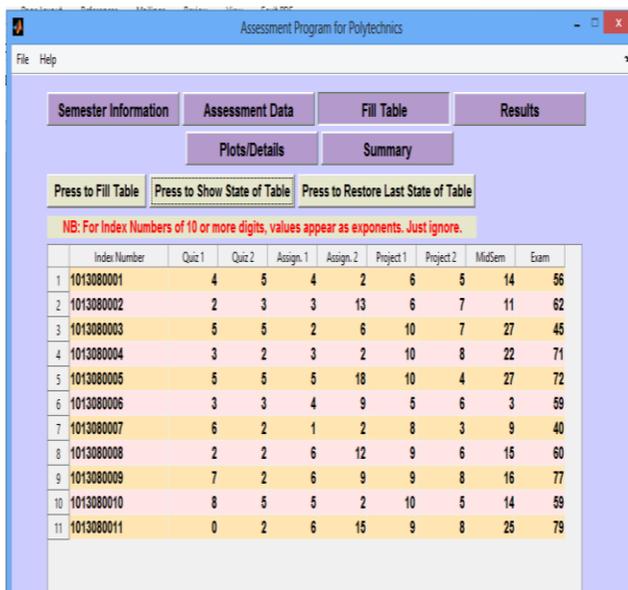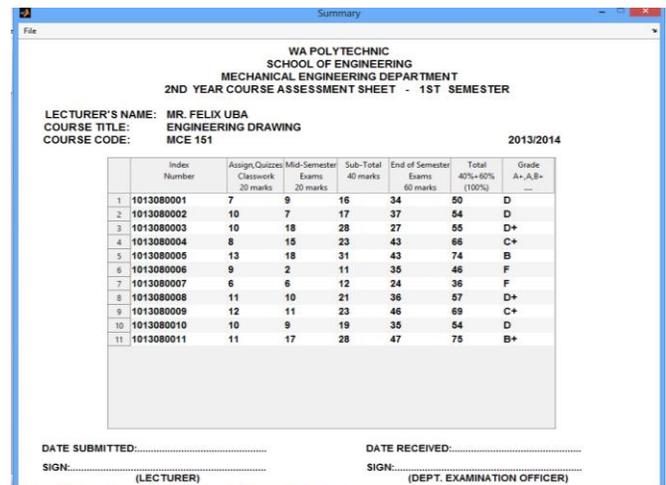
4 ERRORS IDENTIFIED BY OUR PROGRAM

Let us consider this situation. In a semester, there were two quizzes, two assignments, a mid-semester examination and an end of semester examination. The total marks were 20, 30, 40 and 100 respectively. The data for a student is in Fig.7 where a score of 5 for quiz two is mistakenly entered as 25.

↓	C1	C2	C3	C4	C5	C6	C7
	INDEX NUMBER	Q1 (10)	Q2 (10)	A1 (15)	A2 (15)	MidSem (40)	Exam (100)
1	1013080001	4	25	8	9	25	70
2							

Fig.7: Sample student data (From Minitab)

Now when the quiz and assignment raw scores are converted to 20%, that will be 18. This value is then added to the 20% of raw mid-semester exam mark and is used to generate the final sheet even though there was an error. If the same data is entered in our program, an error message is generated when the Results toggle is pressed as in Fig.8.
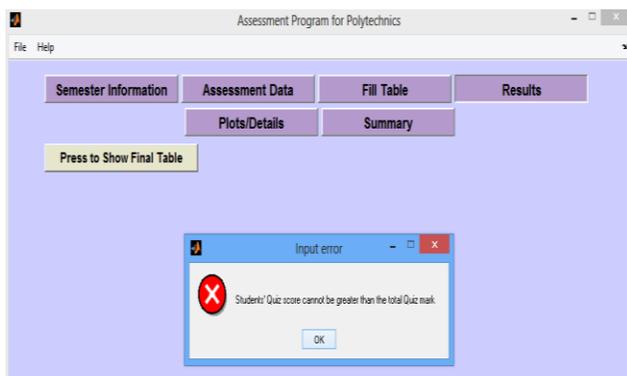

Fig.8: Error message window for wrong input

It must be stated that the program does not check for individual assessment type for wrong inputs. It only generates errors if any mark is greater than the total mark entered. If there is a wrong input and as far as the summation of the marks is less than the total mark, no error messages are generated. For instance, in the above scenario, if the wrong input had been 15 instead of 5 (the actual score), no error will be reported.

5 CONCLUSION AND RECOMMENDATIONS

We have designed and developed a program using MATLAB that generates a final assessment form adopted by Polytechnics in Ghana. With the help of our program, tutors can easily import spread sheet data and the final assessment form is automatically generated. With our program, tutors no longer have to squeeze their marking schemes to conform to some predefined data set in spread sheet programs. A simple breakdown showing what number of students obtained a particular grade is also provided in our program. Further work must however be carried out to generate error messages in situations where students' scores are mistakenly entered as being greater than the total marks for individual assessment types. It is also recommended that the *Print* function in the new figure window be programmed to print all data where there are more students, instead of using the vertical scroll bar to generate new set of student data.

REFERENCE

[1].   D. Jackson, "A Software System for Grading Student Computer Programs", *Computers Educ.*, vol. 27, pp. 171-180, 1996.

27