Appendix A: Questionnaire Form

SURVEY ON RULE-BASED C TUTORIAL SYSTEM

Purpose: To investigate the way C programming subject being taught in higher learning institutes of Malaysia and evaluate how to improve the passing rates among the students using knowledge based C tutorial system designed in rule-based system architecture.

A. PERSONAL INFORMATION

1. University or College Name: _____
2. Semester & year: _____
3. Field or program of study in the university or college:

   ☐ Computer Science
   ☐ Information Technology
   ☐ Computer Networks and Security
   ☐ Others, please specify: _____

B. GENERAL QUESTIONS ON C PROGRAMMING COURSE

1. In what year this subject being offered in your university or college for your program of study?

   _____

2. Are there any prerequisites to take this subject? If yes please specify the prerequisites course.

   ☐ Yes. Course: _____   ☐ No

3. What do you think of this course and its level of complexity?

   ☐ Very easy   ☐ Easy   ☐ Moderate   ☐ Difficult   ☐ Very Difficult

4. Assignments, lecture materials and projects prepared for this course was good.

   ☐ Strongly agree
   ☐ Agree
   ☐ Disagree
   ☐ Others, please specify: _____

5. What are the methods being used to teach C Programming in your university or college?

   ☐ Slides or PowerPoint presentation
   ☐ Regular tests and quizzes
   ☐ Lab sessions to practice lessons taught in class
   ☐ Group project and assignment
   ☐ Others, please specify:

6. Does your course lecturer have the following characteristics? Please specify **Y**=Yes and **N**=No for the listed characteristics below.

   ☐ Able to explain course material clearly
   ☐ Able to stimulate student participation and understanding
   ☐ Available for help and consultation
   ☐ Communication skills (clear speech)
   ☐ Good Programming Skills

7. What is the average mark that you normally get for this course (quiz or test)?

   ☐ <50%
   ☐ 50% to 70%
   ☐ 70% to 90%
   ☐ 90% to 100%

8. Do you have any problems with this course? If yes, what are the problems?

   ☐ No proper guidance from the course lecturer
   ☐ Very few references available in the library
   ☐ Do not have personal interest in this subject

Lecture method does not improve my understanding and programming skills

Others, please specify: _____

9. Suggestions or recommendations to improve the course:

Course topics should be augmented by practical exercises and assignments

Tutors or lecturers to conduct lab sessions for students to practice the lectures

New rule-based C tutorial system installed in every computer labs as a tutoring tool

Others, please specify: _____

C. QUESTIONS ON PROPOSED RULE-BASED C TUTORIAL SYSTEM

Note: Rule-based system is actually a system run based on some standard rules set in the working memory. The proposed C Tutorial system will be designed in this architecture. The rules for this tutorial system will remain the same for different runs to encourage modifiability, extendibility and scalability.

1. What are the features you expect from this system?

Tutorials to cover all topics from a C Programming book

Short and long quizzes with answers guidance attached for wrong answers

Consultation session

Sample programs or source code

Search function for important keywords

Others, please specify: _____

2. How do you want the tutorials to be designed? Please choose only one option below.

By only selected important or complicated topics

By application eq: Simulation, Mathematics and so on

By all chapters following a reference book

Others, please specify: _____

3. How long do you need to finish a short quiz, which consists of only 10 simple questions?

8 minutes   10 minutes

12 minutes   15 minutes

Others, please specify: _____

4. How would you prefer the quizzes to be organized?

After every chapter   Mixed questions from all chapters

Both ways   Others: _____

5. Rank the C programming topics below based on their complexities as what you feel.
1 = Most difficult, **2** = Average, **3**= Moderate, **4**= Easy and **5** = Easiest

Arrays and Sorts

String functions and loops

Counters

Pointers

Controls Structures

6. If given a choice, which form of the rule-based C Tutorial system do you prefer? Give your reasons.

Standalone system installed in the lab   Online system

Reasons:

_____
_____
_____
_____

~END~
Thank you for your Co-operation

Appendix B: Evaluation Form

EVALUATION FORM

CTutorial4u

Name : _____ Course:_____

Year :_____ Institure/University:_____

1. What do you think about CTutorial4u? **1**= Simple, **5**= Very complicated

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

2. How much of your C programming knowledge has improved using CTutorial4u?

(1-5) 1= Little, 5= Very much

○ 1   ○ 2   ○ 3   ○ 4   ◉ 5

3. Did you find any difficulties in moving from one screen to another?

(1-5) 1= Not consistent, 5 = Consistent

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

4. Please rank the system in terms of user friendliness. (1-5) **1**= Not at all, **5** =Very

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

5. Are there error messages prompting to your understanding?

[_____] Yes   [_____] No

6. How long did you take to familiarize with the system?

[____] 1/2 hour   [____] 1 hour   [____] 3-5 hours   [____] >6 hours   [____] Never

7. How do you rate the system in terms interactivity and efficiency?

(1-5) 1= Not at all, 5 =Very

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

8. Does exit from the system is easy?

[_____] Yes   [_____] No

9. Other value added comments to improve the system.

_____

_____

~End~

Thank You for your Co-operation

Appendix C: User Manual

PART 1: About CTutorial4u

a) Introduction

CTutorial4u is developed based on knowledge design in rule based system architecture. It is windows based system to teach the students the basic programming concept in C programming and to ease the tutors in teaching C programming. This system consists of four main functions as depicted in the Figure C.1. The four functions are divided into User Module and Admin Module.
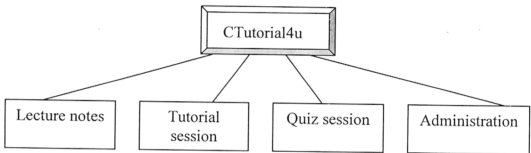
Figure C.1: Main functions of CTutorial4u

b) Hardware and Software Requirements

The minimum hardware and software tools required to install the CTutorial4u are Windows 98 as the operating system with Pentium II 100MHz speed. It is better to have at least 2 GB free space on the C:\ drive.

c) CTutorial4u Installation and Un-installation

Install Ctutorial4u

1. Insert the CTutorial4u CD to the CD-ROM.

2. Once the CD-ROM reads the CD, double click on the Setup file to install CTutorial4u. Then the setup wizard as in the Figure C.2 will guide further to the system installation.
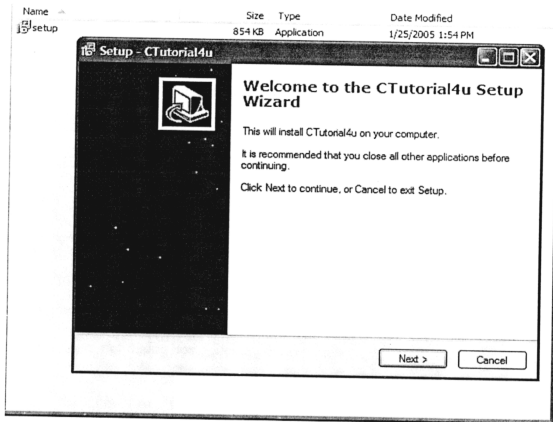
Figure C.2: CTutorial4u setup wizard

3. Click Next button and now is the selection for additional tasks which are optional to choose. There are options:

- Create a desktop icon - there will be an icon created on the desktop
- Create a quick launch icon – there will be quick launch icon on the desktop.

4. Click Next, and then choose Install and the system is ready to be install at location C:\CTutorial4u (defaulted).

5. Then choose to Launch CTutrial4u and click Finish to complete the installation and the system is ready to be used.

Configure System Data source

1. Click 'Start' from the Windows Start Menu, point to setting and click 'Control Panel'.

2. Double-click the 'Administrative Tools', and double-click 'Data Sources (ODBC)'.

3. The ODBC Data Source Administrator dialog box is shown. Click on the 'System DSN' Menu and click Add button.

4. In the Create New Data source dialog box, choose 'Microsoft Access Driver'(*.mdb) and click the Finish button.

4. In the ODBC Microsoft Access Setup dialog box, input the Data Source name (CTutorial) and description. Click on the Select button and choose the C:\CTutorial4u\C1.mdb database.

5. Click on the OK button

6. You will see the newly created data source name and its driver on the ODBC Data Source Administrator dialog box. Click on the OK button.

Uninstall CTutorial4u

1. Click uninstall from the Windows Start Menu. **Start>Programs>CTutorial4u>Uninstall.**

PART 2: How to use

a. User Module

User can start using the system from start menu by pressing the CTutorial4u or from the desktop icon if it is selected during installation earlier. The screen below shows the Logon menu which is the first screen after the user activates CTutorial4u.exe. This form is to authenticate only authorized user access the system.

1. Key in correct username and password.

2. Press [OK] button to enter the main menu of the system. Press [Cancel] button to cancel the operation and exit from the system.
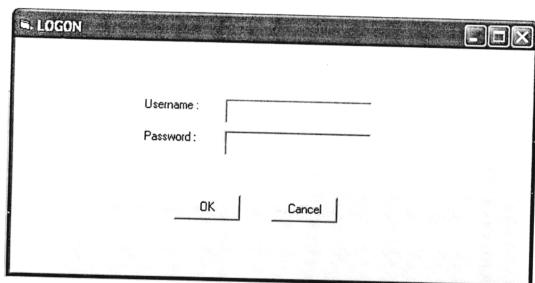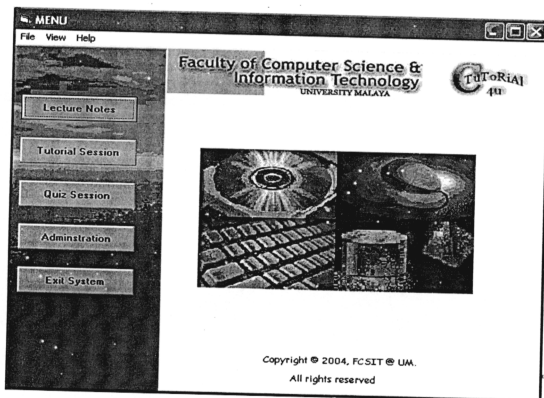
Figure C.3: Logon page

Figure C.4: Menu page

The main menu above will be displayed if the user correctly key in his or her username and password in the logon page.

Users have five command buttons to choose in the menu screen which are:

- **Lecture notes** – contains power point show of the C programming subject's notes where the students can refer before they start to attempt tutorial and quiz session.

- **Tutorial session** – contains the important function of the system where the student will be guided on the important chapters in C programming subject.

- **Quiz session** – contains multiple choice quiz where the users can test their capability of programming knowledge and skills by answering the objective quiz.

- **Administration** – enables the administrator to add, edit and delete users and the quiz questions.

- **Exit System** – Exit from the system
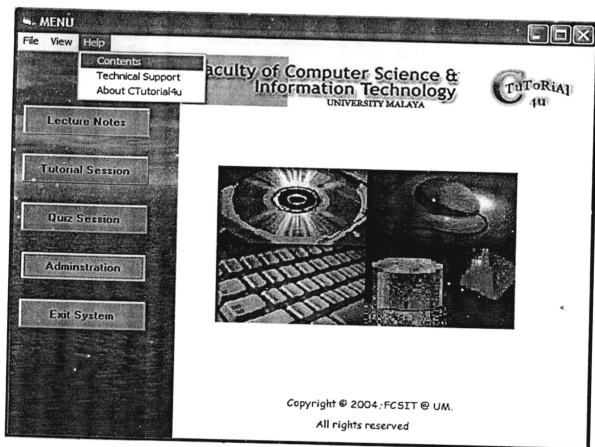
Figure C.5: Menu page highlighting the menus

The main menu also contain the menu bar where user can choose File menu to open a page, close the page and exit from the system. The Help menu provide guide to the user where it has Contents page, Technical Support page and About CTuorial4u (summary of CTutorial4u).
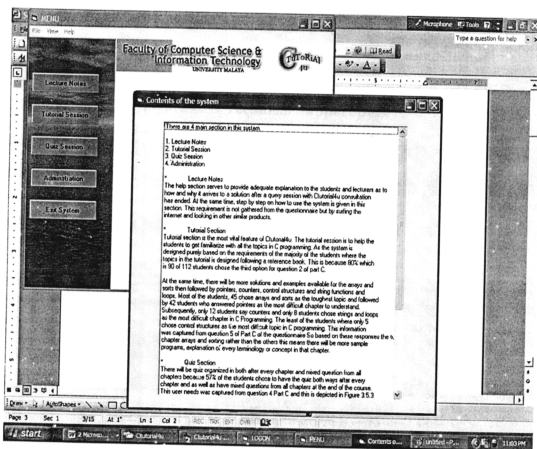

Figure C.6: Contents page

The figure C.6 is a screen shot of the contents page. It gives brief description about the system.
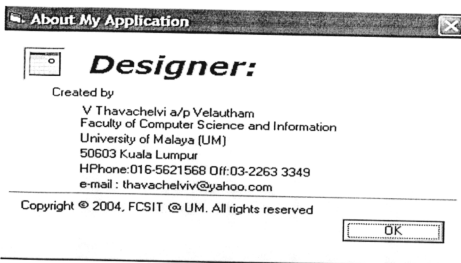
Figure C.7: Technical Support page

The Figure C.7 shows the screen of the Technical Support page. It gives contact person's information about the person to be contacted when any problem occurs.
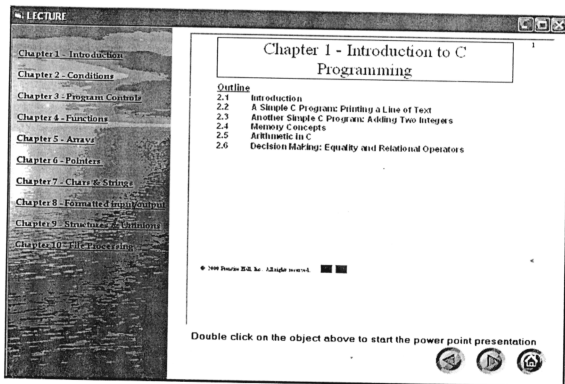
Lecture Notes:

Figure C.8: Lecture notes page

As what explained earlier, the lecture notes page contains lecture notes in the format of power point slides. It contains the links to ten basic topics of C programming. The chapters available for reference are:

- Chapter 1: Introduction
- Chapter 2: Condition
- Chapter 3: Program Controls
- Chapter 4: Functions
- Chapter 5: Arrays
- Chapter 6: Pointers
- Chapter 7: Characters and strings
- Chapter 8: Formatted input/output
- Chapter 9: Structures and Unions
- Chapter 10: File processing

Select the link Chapter 1: Introduction. Then the first slide of the power point slide will display in the OLE object. Then double click anywhere on the slide to start the power point presentation.

Tutorial Session

The chapters available in the tutorial session are:

- Arithmetic   - Multiplication, Division, Addition, Subtraction & Average.
- Control Structures - Selection structure (If, If/Else, Switch)
                     - Repetition Structure (Do, Do-While, For)
- Functions   - Maximum & Minimum
- Array   - Size of array from 1 to 10 & with or without histogram.

- Pointers   - Call by reference & call by value
- File Processing   - Create a Sequential file

                        - Writing to a Random Access file

                        - Reading a Random Access file

Table C.1 to Table C.6 is the listing of required field, selection and description of each and every topic in tutorial session.

- **Arithmetic**

Table C.1: Arithmetic Tab

| Required input	Input type	Selection value	Description
Arithmetic Type	Combo box	Multiplication, Division, Addition, Subtraction & Average.	
Variable Type	Radio button	Integer, Floating point, Double	
Variable Value A: Variable Value B:	Text boxes	User's input.	If variable type is integer then only numbers are allowed but for floating point and double types allows ".".If correct values entered then only code will be displayed
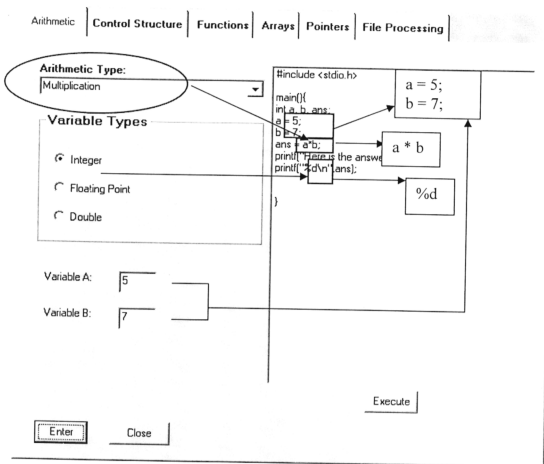
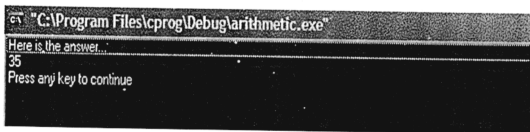**Figure C.9: Arithmetic tutorial page**

Figure C.10: Arithmetic.exe

Based on the arithmetic type selected, variable type and input for variable A and B, the source will be displayed in the list box as depicted in the Figure C.9. Then, when the code is executed the output is as in the Figure C.10. If the arithmetic type is multiplication, and variable type is integer, value variable A is 5 and value variable B is 7 then the output is 35.

- **Control Structure**

Table C.2: Control Structure Tab

Required input	Input type	Selection value	Description
Structure type	Combo box	Selection structure & Repetition structure	
Selection structure	Combo box	(If) One-way condition (If/else) Two-way condition (Switch)Multi-path condition	(if) code shown. (if/else) code shown. (switch) code shown.
Repetition structure	Combo box	While structure Do-while structure For structure	(while) code shown. (do/while) code shown. (for) code shown

Figure C.11: Control Structure tutorial page
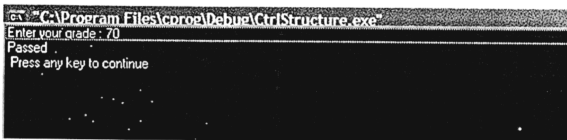
Figure C.12: CtrlStructure.exe

Structure type and the grades are vital in getting the source code and the output right in the control structure topic. Figure C.11 shows the controls structure tutorial page and the figure C.12 depicts the execution page for control structure with the relevant input is keyed in. Passing marks is 60 (unknown to user), so when the grade is entered 70 then the system will execute and message Passed is displayed as in Figure C.12.

- **Function**

Table C.3: Function Tab

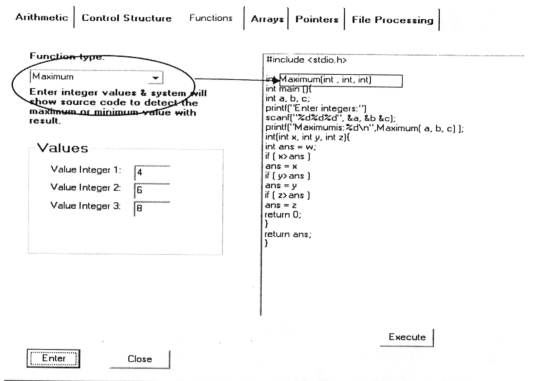| Required input	Input type	Selection value	Description
Function type	Combo box	Maximum & Minimum	
Value Integer 1: Value Integer 2: Value Integer 3:	Text boxes	User's input.	Key in the values for all 3 integers. Program code to select the maximum or minimum integer among all the 3 values will be displayed.

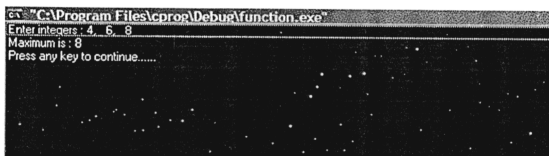**Figure C.13: Function tutorial page**

Figure C.14: Function.exe

Function tutorial requires the user to choose their preferred function either maximum or minimum and key in the values for integer 1, 2 and 3. Based on the information retrieved from the user input, then source code will be displayed. When the code is executed the output is as in the Figure C.14. In the Figure C.13, integer 1, 2 and 3 has respective values of 4, 6 and 8. So, in the Figure C.14, 8 is concluded as the maximum number.

- **Array**

<div align="center">

Table C.4: Array Tab

</div>

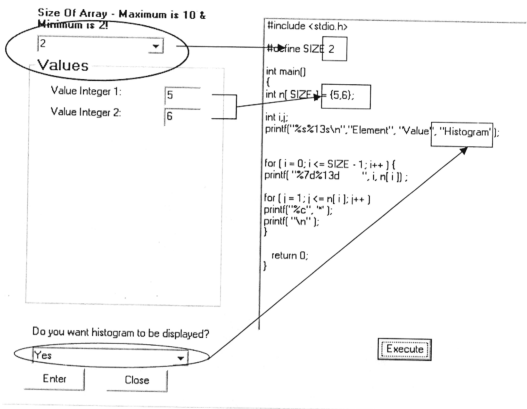| Required input	Input type	Selection value	Description
Size of array	Combo box	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	
Value Integer 1: Value Integer 2: Value Integer 3: Value Integer 4: Value Integer 5: Value Integer 6: Value Integer 7: Value Integer 8: Value Integer 9: Value Integer 10:	Text boxes	User's input.	Key in the values for the integers. Number of integer values to be keyed in, is based on the selection in size of array combo box. If 1 is selected then only 1 value need to be keyed in. All the text boxes displayed are mandatory fields.
Choose yes/no	Combo box	Yes /No.	This combo box needs user to choose whether user wants to view the histogram of the value keyed in the value integer text boxes. If yes, the program code to show the histogram will be displayed. If not, the program code to show the array values will be displayed.

Size Of Array - Maximum is 10 & Minimum is 2!
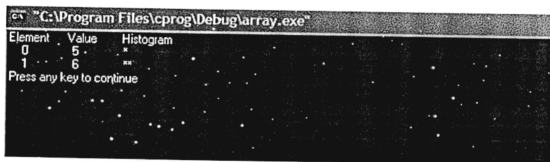
[2 ▼]

Values

Value Integer 1: [5]

Value Integer 2: [6]

```
#include <stdio.h>

#define SIZE 2

int main()
{
int n[ SIZE ] = {5,6};

int i,j;
printf("%s%13s\n","Element", "Value", "Histogram");

for ( i = 0; i <= SIZE - 1; i++ ) {
printf( "%7d%13d        ", i, n[ i ] ) ;

for ( j = 1; j <= n[ i ]; j++ )
printf("%c", '*' );
printf( "\n" );
}

   return 0;

}
```

Do you want histogram to be displayed?

[Yes ▼]

[Enter]   [Close]

[Execute]

Figure C.15: Array tutorial page

Figure C.16: Array.exe

The array topic is not that difficult as we thought after going through the lectures and do the tutorial session. This topic requires the user to select the array size, key in the values for the variables and choose to display histogram or not. Based on the selection and input the system will display the source code and when being executed the output is as at Figure C.16.

- **Pointer**

Table C.5: Pointer Tab

Required input	Input type	Selection value	Description
Ways to pass arguments	Combo box	Call by value Call by reference	**If call by value:** Cube the value & Square the value options will be displayed **If call by reference:** One variable & more variable options will be displayed
Cube the value or Square the value One variable More variable	Radio button	Choose one option.	
Value of the number or integers	Text box	User's input	The code for call by value or call by reference with the user's input value of the integer will displayed.

Figure C.17: Pointer tutorial page
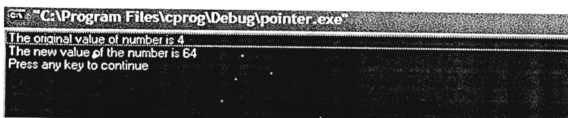
Figure C.18: Pointer.exe

Pointer topic covers the call by value and call by reference as a way to pass arguments. The difference of the way to code the two types of passing arguments can be seen clearly when all the selection has given input. Call by value is very straight forward where based on the chosen options whether to cube the value or square the value the source code is displayed. When value of the number is 4 and chosen to cube the value, the output is as at Figure C.18. Whereas for the call by reference there is concept of array incorporated, if it more than one variable array made the code simple and shorter. Other than that, the concept is as same as call by the value but the source code will be different in terms of way of coding.

- **File processing**

Table C.6: File processing Tab

Required input	Input type	Selection value	Description
Select a process	Combo box	Create a Sequential file Writing to a Random Access file Reading a Random Access file	
Variable type	Combo box	int, double, char	
Variable value	Text box	User's input	
Name of file to be opened	Text box	User's input	Program code based on the selected criteria will be displayed

File processing types:

Create a Sequential File

Variable to be written into the file

Variable type: **Variable name:**

int   A

File name to be opened?   create

```
#include <stdio.h>
int main(){
int A;
FILE *cfPtr;
if((cfPtr = fopen("create.txt","w"))==NULL )
    printf( "File could not be opened\n" );
else{
printf("Enter the A\n");
printf("Enter EOF to end input.\n");
printf("Enter your data here:");
scanf(%d,&A,);
while(!feof(stdin)){
fprintf(cfPtr,"%d\n,'A);
printf("? );
scanf(%d,&A;
}

    fclose( cfPtr );
  }

  return 0;
}
```

Enter   Close

Figure C.19: File processing tutorial page

The topic file processing actually covers how to write the code to create a sequential file and writing to a random access file based on the variable type, variable name and name of the file to be opened. The source code will be displayed based on the user input. As in the Figure C.19, if the file processing type chosen is create a sequential file, variable type is int, variable name is A and the file name is create, the source is as in the right panel. Other than that, when the option to read a random is selected then a simple source code on how to read a random access file, sequentially updates the data that already written to the file and create or delete new data to the file will be displayed for the users viewing.
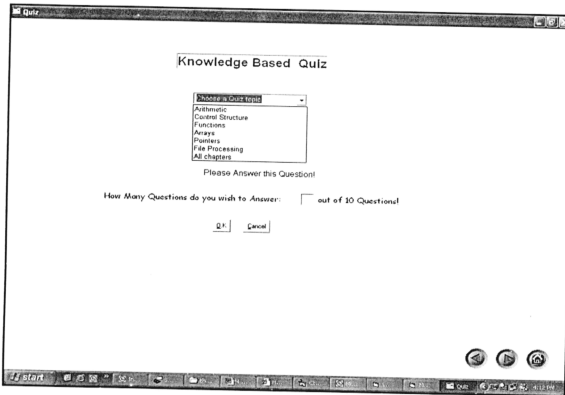
Quiz Session:

Figure C.20: Quiz session page

The Figure C.20 shows how the initial Quiz page looks like. This is the input form to generate quiz questions in the later page. Based on the user's input the system will generate the questions.

1. Select one of the topics in the combo box which displays 'Choose a Quiz topic'.

2. Key in the number of questions to answer in the text box.

3. Press [Ok] to start the quiz session.

4. Press [Cancel] to end the session and go back to menu page.
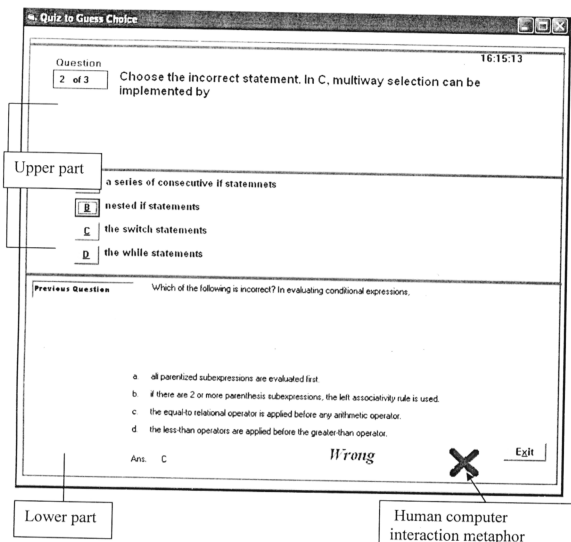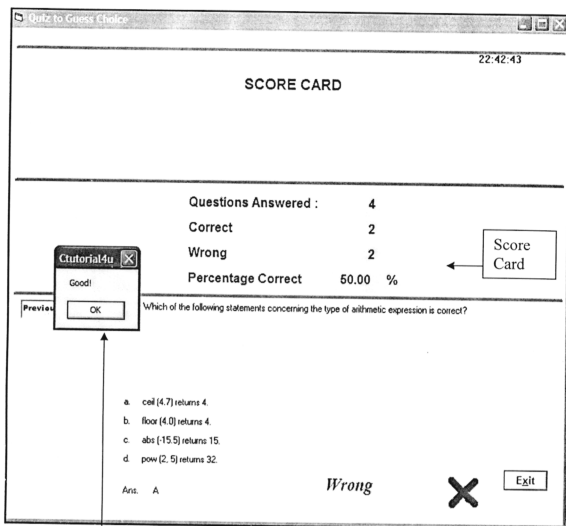
Figure C.21: Quiz to Choose answer page

The Figure C.21 depicts the quiz session which is divided into two parts. The upper part is the current question for the user to answer whereas the lower part is the previous question which already answered by the user. The correct answer is given for the previous question. At the same time, it is shown as wrong sign if the answer is wrong and correct sign if the answer is correct for purpose to give a clear notification whether their answer is correct or wrong.

SCORE CARD

22:42:43

Questions Answered :	4
Correct	2
Wrong	2
Percentage Correct	50.00 %

Score Card

Ctutorial4u

Good!

OK

Which of the following statements concerning the type of arithmetic expression is correct?

a. ceil (4.7) returns 4.
b. floor (4.0) returns 4.
c. abs (-15.5) returns 15.
d. pow (2, 5) returns 32.

Ans.   A

Wrong   ✗

Exit

Message box
*Try again*: if result <50
Good: if 50=<result >90
Excellent: if result >=90

Figure C.22: Score Card page

The Figure C.22 shows the score card which contains the total number of questions answered, number of correct answers, number of wrong answers and percentage or marks of the quiz. If the percentage scored is more than 50% then there will be a message prompted indicating [Good]. Click [ok] to proceed. Press [Exit] button to exit from the quiz session.
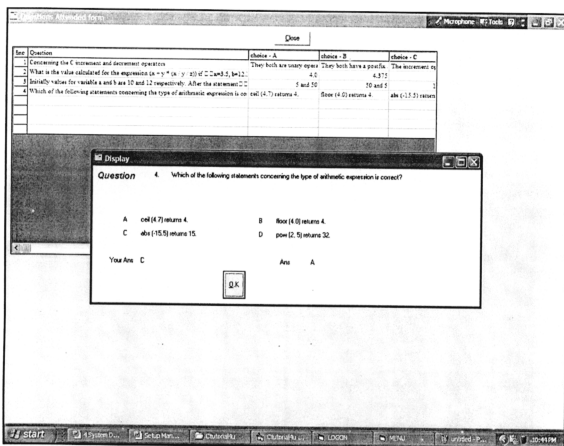
Figure C.23: Questions Attempted page

After exited from the previous quiz session, there will be a list of questions attempted in the previous session displayed in the questions attempted form as in the Figure C.23. Click on the question then details of the question will be displayed in the Display form. Click [OK]. Then click [Close] to close the form and go back to the menu form.
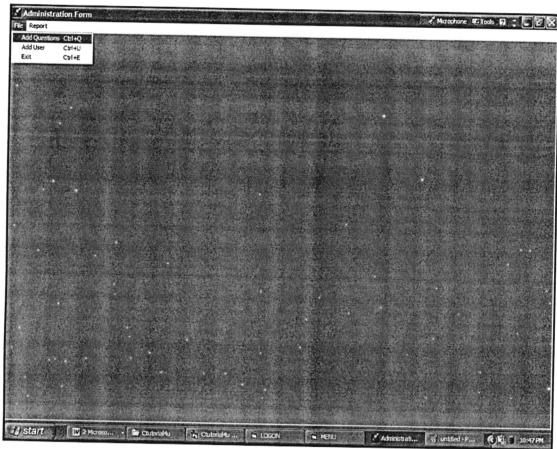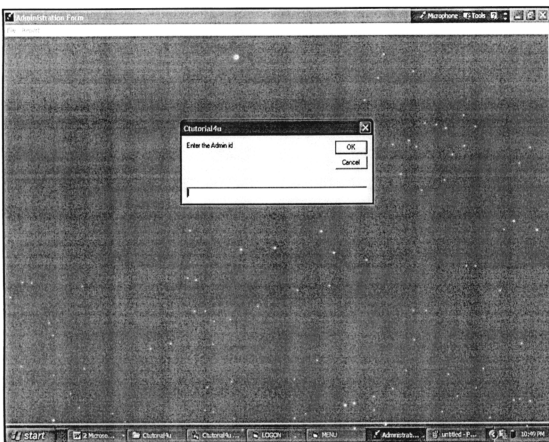
b) Admin Module

Figure C.24: Administration page

Admin page:

1. If the administrator wishes to add, edit and delete questions, click on Add question menu.

2. If the administrator wishes to add, edit, delete user then click on the Add user menu.

Figure C.25: Input box for Admin ID

Before adding user or a question there will be input box asking for the admin id and password. Supply correct admin id and password to continue with administration session. If the admin id and password supplied is wrong then the system will pop a message that "Incorrect logon. Please key in correct username and password."

Figure C.26: Question page

The admin id that user input in the previous input box will be captured in the username text box of this page..

Add Question

1. Firstly, choose the chapter to add the question in the [Add questions to chapter?] combo box.

2. Just key in all the fields as displayed in the figure above.

3. Click [Add] command button to add the question.

4. A message will prompt to indicate the question successfully added.

Edit Question

1. Firstly, choose the chapter to edit a question in the [Edit questions to chapter?] combo box.

2. Key in the question ID to select the question to be edited.

3. Once the question details have been displayed, then edit the question.

4. Click [OK] command button to save the edited data.

Delete Question

1. Firstly, choose the chapter to delete a question in the [Delete questions to chapter?] combo box.

2. Key in the question ID to select the question to be deleted.

3. Once the question details have been displayed, then edit the question accordingly.

4. Click [OK] command button to save the edited data.
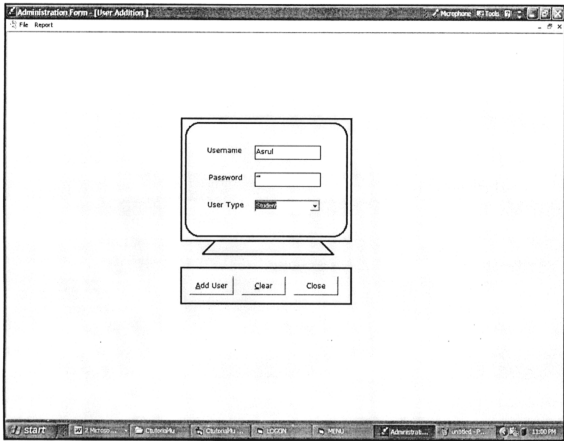
Figure C.27: User page

The Figure C.27 shows the user management module.

1. Key in the username, password and user type either student or administrator type.

2. Then click [Add User] command button.

3. Click [Clear] button to clear the form.

4. Click [Close] button to close the page.

5. Once the details of the user successfully added then there will be a message prompt [User created successfully].