ABSTRACT

Knowledge would give us an edge to success. However, the process to achieve such knowledge needs a lot of effort. Nevertheless, the information itself somehow should also be easy to be absorbed by people. It needs technique and strategies to make sure that to happen so that those people can utilize and benefit from it.

CyberCPP is a web-based interactive multimedia learning package system developed for courseware tutoring simulation purpose. CyberCPP is an solution to tackle this situation by using the multimedia elements. It is designed to create an informative rich environment so that the knowledge could be obtained from this place in any time. User also would feel that it would be easy to learn C++ programming language because CyberCPP would more help in understand the flow of the language. Other than that, user would found that CyberCPP is full with learning resources and quizzes which give them more secure foundation towards C++.

CyberCPP used Rapid Application Development model for the development technique to ensure the best quality result of project. The development tools include Macromedia Dreamweaver MX, Macromedia Flash MX, JavaScript, ActionScript, Perl, Java and Microsoft Access XP.

It is hoped that CyberCPP could open up a new way of learning C++ programming language and build up a good foundation towards C++ which is beneficial and useful.

C++ PROGRAMMING TUTORING SIMULATION "CYBERCPP"

MUHAMMAD NOR MAHAT
WEK 010181
SESI 2004/ 2005

Supervisor
Pn Maizatul Akmar Ismail

Moderator
Puan Norjihan

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CyberCPP is a web-based interactive multimedia learning package system developed for anyone who is interested in learning C++ programming. CyberCPP is an attempt to tackle this situation by using the multimedia elements. It is designed to create an information rich environment of education resources, which could be obtained from any place at any time. User also would found out that it would be easy to learn C++ programming language because CyberCPP would show how to understand the flow of the language. Other than that, user would found that CyberCPP is full with lessons, exercises and quizzes which give them more strong foundation towards C++.

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It is hoped that CyberCPP would give user a new way of learning C++ programming language and be able to promote users' interest towards C++, which is powerful and useful.

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First of all, I would like to express my deepest appreciation to Puan Maizatul Akmar, my project supervisor whom has given me continuous guidance, support and helpful advice throughout the development of CyberCPP. Under her supervision, my project goes smoothly. She has been with me in every step of the way and make sure I didn't lose the track. I sincerely appreciate her comments and suggestions given to me during the development of the project.

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CHAPTER 1: INTRODUCTION

1.1   PROJECT OVERVIEW

The internet was developed by the department of Defense in late 60's in the United States of America to establish a communication vehicle that would survive nuclear war. Internet is made up of thousand of network that connects to each other through common routers, and they all agree to carry each other's traffic. A number of different access providers and phone comparison has been set up as a backbone service to carry Internet traffic between major routes. [1]

There is no doubt the Internet is one of the greatest inventions of all in this technology-driven era. Most of us do not go to the library as frequent as before to get study materials. Information can be easily accessed with the help of Internet rather than traditional hard copies. Further more, the world is turning to graphical user interface that provide an interactive learning space for the community. Multimedia and any presentation that involves two or more media such as text, graphic or sounds.[2]

With this technology, people demand more rather just information. In fact, people want to interact with the information such as in learning process. Therefore, the main focus of the development of the C++ programming tutoring simulation is to fulfill this need by utilize the full potential of the information technology in the education field. Named as CyberCPP, it is initiates as a web-based multimedia application which is interesting, entertaining and informative. It will show the student that he needs to understand the concepts C++ programming language using visualizing technique. Designed for long distance learning it could also be used as teaching tools by lecturers in

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lecture halls. Online interactive learning is always the first choice for it is easy and operates efficiently.

CyberCPP provides the students an overview of C++ programming and it is concentrated for the beginners. So whether the student actually has little or no experience at all in this language programming, the student is still able to follow up the course. It offers deep and rigorous treatment of theory and practice that was demanded by traditional method of C++ course. This is an excellent application for anyone who wants to understand the basic of C++ programming concept in a new way.

CyberCPP also contains a rich collection of examples, exercises and quizzes from various fields to provide learners with the chance to solve problems using C++ programming. CyberCPP guides student with suitable examples.

Lessons in CyberCPP are presented in a sequence that will allow the programmer to deal with C++ programming language in a proper way. Its main objective is to ensure that students could differentiate between what they should read and do by using step-by-step approach. Each lesson begins with an overview of the topic.

CyberCPP also gives a comfortable environment and efficient learning space. It also gives alternative ways of study that will give advantage to those who are far away and have low budget plan.

1.2 PROJECT OBJECTIVE

The main purpose of this system is to accomplish objectives below: They are

- **To let the user understand the concepts of C++ programming language using visualization.**

  C++ programming language is a complex and powerful tools for building software. But it is hard to understand such unique programming language. People found out it are a difficult language if they just learn it using traditional ways. It is believed that people will be more understand on something if we show them how they work rather just telling them. By using new technology and method, CyberCPP tend to fulfill this gap.

- **To deliver an interactive learning over the borderless geographical location and an alternative method of learning/teaching C++ programming**

  People of this generation realized that printed source will be out-dated and people are more inclined to learn interactive ways. More and more people seem to connect to the internet and all the information they want could be obtained by a single click. In fact, people no longer find it necessary to go to a library just to a borrow book to learn C++ programming language. Therefore, they save time and money so they could use it on other things instead. It creates space where learning C++ programming language can be a reality anywhere and any time. Nowadays, teaching and learning process involved face to face interaction. Without a teacher, there will be no lesson. Without students, there will also be no

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lesson. In this particular case, CyberCPP provides an alternative approach to teachers and students to keep up with their lessons without wasting time and money.

- **To build up interest in the user so they will be more willing to learn C++ programming language and increase the number of user with C++ programming knowledge.**
  By making use of multimedia elements, it is hoped that more people will more interested in learning C++ programming language. It is known that learning C++ programming language is boring. However by incorporating some interactive elements in it, learning will be more fun and less tiresome compared to traditional methods of learning in the class.

- **To provide self study**
  Trained user will be more independent and able to do self study properly manner. CyberCPP contains a set of objectives that the user has to accomplish if they are keen to learn C++ programming language. In this way students are given a chance manage their own learning. It also provides the users self-testing so the user could examine how they fare as they go through.

1.3   PROJECT SCOPE

1.3.1 System scope

These systems are divided into four main sections. There are sections for lessons, quizzes, exercises and references. Below is brief information on each section.

i)   Lessons

This section will provide the user on C++ programming language's information in organized modules. In this way, the user can follow each module step-by-step systematically.

ii)   Quizzes

This section will give an opportunity to the user to test their understanding in a particular lesson.

iii)   Exercises

This section comprises of several questions in a subjective format. Student will answer each question by applying what they have learned in every lesson. Solutions for each question asked will be provided.

iv)   References

This section contains links to other C++ recourse websites. It provides student with more reference on C++ programming language.

1.3.2 User Scope

Basically, CyberCPP is suitable for anyone who is interested learning C++ programming language at any age. But in this particular project, CyberCPP is focused on University of Malaya students who are undertaking C++ programming language course. These applications also focus on beginners who are have no experience at all in C++

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programming language, programmers who have no knowledge of C++ programming language and those C++ programmers who want to polish their skills.

1.4   Project Motivation

C++ is an important programming language. It is very complex yet powerful tools that could be used to develop a simple application into a sophisticated one. Owning of it complexity, it is a difficult language to master without proper training.

The main reason is that a student finds it hard to understand the language just by hearing the concept without showing how it works. For the lecturer, he would also difficulty to show and convince it to the student well due to the limitation of the white board. A fine student could miss the main point and for the lecturer to repeat again would be a tiring process. This created an opportunity to come up with this project so as to assist help both the lecture and the student to easily gain understanding in learning this eccentric language by visualization it.

It is also help to change the process of learning C++ from traditional method to web-based application. This is because, some of the processes of teaching and learning cost so much time, which involve a lot of resources. CyberCPP is a good site to change most of the traditional methods of learning and teaching into a new way by using latest technology as well as ideology and methodology.

Besides that, it saves lecturing time. Some of the task in practice of lecturing need many step and waste a lot of time of doing it all over again and again using the traditional easy. For example, the student need to wait their lecture to enter the hall, open up the computer, projector then refresh their thought, then say 'hi' to everybody

after that lecture start. By using CyberCPP student can cut the introduction and start learning at anytime at anywhere.

1.5 Expected Outcome

CyberCPP will be used as a part of learning tool in learning C++ programming language whether in a university. By utilizing the internet, user can benefit greatly because it can be accessed easily at any time and at any location around the globe. Therefore it will be more versatile as well as saving money and time.

CyberCPP will be a way moving towards smart school. It will replace ordinary classroom into new environment like cyber classroom and each computer in the class will be connected to the internet. All the activities pertaining consist to teaching and learning will be carried out on the computer. This will create paperless environment.

CyberCPP will provide the lecture with C++ language syllabus. Thus, this will give the lecturer more focus on student's problem and study matter. Further, student will be more independent and easily trained.

An interactive multimedia learning tool, CyberCPP, will invigorate student to be more fervent in learning C++ programming languages. Therefore it is believed that CyberCPP will be able to contribute to the development and advancement of the community

1.6   PROJECT LIMITATIONS

There are certain criteria that will limit the full potential of this application. They are:

- **Limited Timeline**

  The available time to develop CyberCPP is limited to approximate 130 days

- **High Cost**

  The process to build up a multimedia application, requires a high speed

  processor, memory, disk space, data throughput, relevant software and plenty of

  time.

- **Slow**

  Even though a completed multimedia application only requires a minimum

  requirement to run smoothly, it still depends on the internet connection

  bandwidth. This is due to multimedia elements like sound, images or animation

  which involved with large file and the transfer time between internets will be

  slower

1.7   SCHEDULE.

- Preliminary Investigation
- Literature Review
- System Requirements Analysis
- System Analysis
- System Design
- System Implementation
- Evaluation and testing
- Documentation

	Task Name	Duration	Start	Finish	21 February	11 April	01 June	21 July	11 S
					16/02 08/03	29/03 19/04	10/05 31/05 21/06	12/07 02/08 23/08	13/
1	Preliminary Investigation	3 days	Thu 18/03/04	Mon 22/03/04	■				
2	Literature Review	7 days	Tue 23/03/04	Wed 31/03/04	▪				
3	System Requirements Analysis	4 days	Tue 30/03/04	Fri 02/04/04	▪				
4	System Analysis	10 days	Mon 05/04/04	Fri 16/04/04		▪			
5	System Design	50 days	Mon 12/04/04	Mon 21/06/04		▬▬▬			
6	System Implementation	70 days?	Thu 10/06/04	Thu 16/09/04			▬▬▬▬		
7	Evaluation and testing	55 days	Fri 02/07/04	Fri 17/09/04			▬▬▬		
8	Documentation	130 days	Thu 18/03/04	Fri 17/09/04	▬▬▬▬▬▬▬▬▬▬▬				

Figure 1.1 Grant Chart of CyberCPP project

1.8　Chapter Summary

Chapter one introduces the project in general view and justification of the project. It explains the definition of the proposal project, individuals that should be taken into consideration in making this project success, its objectives, its scope, its expected outcome, its motivation factors doing this project and its inherent limitations. The proposed project research and development will take about 8 months to complete. It starts in the middle of March 2004 and it will follow a series of development and process activities. A series of activities are show in Gantt chart to represent each task and activity for each time frame.

Chapter Two
Literature Review

Literature review is to gain about the knowledge and info needed to develop a system or project. It includes finds communication to the findings, analysis of the findings as well as the synthesis of the system proposed. It is also an important process in the system development [4].

Literature review will ensure the understanding of the system requirement that will be used to build or develop the system. Beside that, knowledge and info gained from literature reviews will enable the best and most suitable development tools to be chosen to develop a system to achieve its objectives.

The objectives of written literature review are for:

- Information seeking: the ability to scan the literature efficiently, using manual or computerized method, to identify a set of useful articles and books.

- Critical judgment: the ability to apply principles of analysis and to identify unbiased and valid studies.

- System understanding: feature a better understanding of the system that will be developed and to choose the best way to plan and organize work [4].

CHAPTER 2: LITERATURE REVIEW

2.1 LITERATURE REVIEW

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2.2   DOMAIN STUDIES

This chapter will explain about study on the concept and definition using multimedia as teaching tool for C++ programming language. It also included some of existing systems that have been developed. The purpose of this study to gain more information and understanding on the system that will be developed.

2.3   INTERNET

2.3.1 Introduction to Internet

Internet is a worldwide network of computer networks. It is an interconnection of large and small networks around the globe. The Internet began in 1962 as a computer network for the U.S. military and over time has grown into a global communication tool of many thousands of computer networks that share a common addressing scheme. Unlike online services, which are centrally controlled, the Internet is decentralized by design. Each Internet computer, called a host, is independent. Its operators can choose which Internet services to use and which local services to be made available to the global Internet community. Remarkably, this anarchy by design works exceedingly well. There are a variety of ways to access the Internet. Most online services, such as America Online, offer access to some Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP). [5]

Internet is a global network of networks connecting many millions of computers. Currently, the Internet has more than 30 million users world wide, and that number is growing rapidly. More than 100 countries are linked into exchanges of data, news and opinions on Web servers. Unlike online services, which are centrally controlled, the

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Internet is decentralized by design. Each Internet computer, called a host, is independent. Its operators can choose which Internet services to provide to its local users and which local services to be made available to the global Internet community. Remarkably, this by design works extremely well.

Internet is linking local area network (LAN) into a huge, distance-conquering network. In this network, every connected computer can directly exchange data with any other computers on the network. One is able to communicate with any others computer which support Transmission Control Protocol/Internet Protocol. One can connect to the network if the computer has a modem and a phone line. The LANs and computers, can be nested to the internet, are maintained by large organizations such as corporations and universities, as well as by internet service providers (ISPs), who sell internet subscriptions to the public. [6]

2.4   C++ PROGRAMMING LANGUAGES

2.4.1 History of C++

C++ was invented by Bjarne Stroustrup in 1979, at Bell Laboratories in Murray Hill, New Jersey. He initially called the new language "C with Classes". However, in 1983 the name was changed to C++.

Stroustrup built C++ on the foundation of C, including all of C's features, attributes, and benefits. He also adhered to C's underlying philosophy that the programmer, not the language, is in charge. At this point, it is critical to understand that Stroustrup did not create an entirely new programming language. Instead, he enhanced an already highly successful language.

Most of the features that Stroustrup added to C were designed to support object-oriented programming. In essence, C++ is the object-oriented version of C. by building upon the foundation of C, Stroustrup provided a smooth migration path to OOP. Instead of having to learn an entirely new language, a C programmer needed to learn only a few new features before reaping the benefits of the object-oriented methodology.

When creating C++, Stroustrup knew that is was important to maintain the original spirit of C, including its efficiency, flexibility, and philosophy, while at the same time adding support for object-oriented programming. Happily, his goal accomplished. C++ still provides the programmer with the freedom and control of C, coupled with the power of objects.

Although C++ was initially designed to aid in the management of very large programs, it is in no way limited to this use. In fact, the object-oriented attributes of C++ can be effectively applied to virtually any programming task. It is not uncommon to see C++ used for projects such as editors, databases, personal file systems, networking utilities and communication programs. Because C++ shared C's efficiency, much high-performance systems software is constructed using C++. Also, C++ is frequently the language of choice for Windows programming. [7]

2.4.2 The Evolution of C++

Since C++ first invented, it has undergone three major revisions, with each revision adding to and altering the language. The first revision was in 1985 and the second in 1990. The third occurred during the C++ standardization process several years ago. Several years ago, work began on a standard for C++. Towards that end, a joint

ANSI (American National Standards Institute) and ISO (International Standards Organization) standardization committee was formed. The first draft of the proposed standard was created on January 25, 1994. In that draft, the ANSI/ISO C++ committee kept the features first defined by Stroustrup and added some new ones. But, in general, this initial draft reflected the state of C++ at the time.

After the completion of the first draft of the C++ standard event occurred that caused the standard to be greatly expanded: the creation of the Standard Template Library (STL) by Alexander Stepanov. The STL is a set of generic routines that one can use to manipulate data. It is both powerful and elegant. But it is also quite large. Subsequent to the first draft, the committee voted to include the STL in the specification for C++. The addition of the STL expanded the scope of C++ well beyond its original definition. While important the inclusion of the STL, among other things, slowed the standardization of C++.

The standardization of C++ took far longer time than anyone had expected. In the process, many new features were added to the language, ANSI/ISO C++ committee is much larger and more complex than Stroustrup's original design. The final draft was passed out of committee on November 14, specification for C++ that is usually referred to as Standard C++.[5]7

2.4.3 Objected-Oriented Programming

C++ is objected-oriented programming (OOP) as just explained, was the impetus for the creation of C++.

Objected-oriented programming took the best ideas of structured programming and combined them with several new concepts. The result was a different and better way of organizing a program. In the most general sense, a program can be organized in one of two ways: around its code or around its data. Using only structure programming techniques, programs are typically organized around the code.

Object-oriented programs work the other way around. They are organized around data, with the key principle being "data controlling access to code." In an objected-oriented language, you can define the data and the routines that are permitted to act on the data. Thus, a data type defined precisely what sort of operation can be applied to that data.

To support the principle of objected-oriented programming, all OOP language including C++, have three traits in common: encapsulation, polymorphism, and inheritance.[7]

2.5 INTELLIGENT TUTORING SYSTEMS

Intelligent Tutoring Systems (ITSs) are computer-based training systems that incorporate techniques for communicating/transferring knowledge and skills to students. These systems emerged from the combination of Computer-Aided Instruction (CAI) and Artificial Intelligence (AI) technology. [8]

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2.5.1 Abstraction of the learning environment

Many systems attempt to provide instruction by simulating a realistic working environment in which the student can learn the task. There are many reasons for developing such systems, including the exposure to danger in using the actual equipment too early in the training and shortage domain experts who can devote their expensive time to train novices. Therefore, a realistic simulated learning environment can reduce both the cost and the risks of training.

An example of a simulation-based ITS is the Advanced Cardiac Life Support (ACLS) Tutor in which a student takes the role of team leader in providing emergency life support for patients who have had heart attacks. The system not only monitors student actions, but runs a realistic simulation of the patient's condition and maintains an environment that is reasonably faithful to the ``real life" situation. Thus, the goal is not only to test the student's knowledge about the correct emergency procedures, but also to allow him to experience practicing those procedures in a more realistic manner than is possible in a traditional classroom.

Some systems take a less rigorous approach to representing the environment; the situations presented are similar to the real world scenarios in which the knowledge could be applied, but they are not exact simulations. Smithtown takes this approach by providing a simulated setting for students to test hypotheses in economics. However, the underlying model of the environment is not an exact simulation of how the laws of economics would be applied in the real world.

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At the opposite extreme of the simulation based tutors are those that teach knowledge in a decontextualized manner without attempting to simulate the real world. Many systems throughout the history of ITS research fall into this category. These systems provide problems for the learners to solve without trying to connect those problems to a real world situation and are designed to teach abstract knowledge that can be transferred to multiple problem solving situations.[8]

2.5.2 Evolution of Computer Assisted Instruction

Research in Computer-Aided Instruction began in the 1950's as a means to provide automated individualized instruction to students. However, early systems did little more than incrementally replay canned text while waiting for a response from a student. As CAI evolved, instructional systems then made use of a student's responses throughout an instructional session to determine the material to present during the remainder of the session. Advances in CAI technology later allowed systems to automatically generate teaching materials. However, even with advances in CAI technology, sophisticated computer programs still did not approach the skill of human instructors. One reason for this shortcoming was that CAI systems lacked the means to accurately model a student's knowledge, i.e., they lacked a model of the student's cognitive processes, and therefore could not provide a robust individualized training environment.

ITSs emerged in the 1970's to address the deficiencies of CAI. By making use of the results of research work in AI, ITSs were able to employ knowledge representation strategies to model a student's cognitive processes. Using an accurate models of the student's and expert's knowledge, an ITS is able to provide instruction at the appropriate pace and level of abstraction for the student. [9]

2.5.3 Software Components of Intelligent Tutoring Systems

Although there is no standard architecture for an ITS, four software components emerge from the literature as part of an ITS ([Burns & Capps], [Gott & Pokorny], [Massey]). These are the Expert Model, the Student Model, the Curriculum Manager, and the Instructional Environment. These four software components and their interactions are illustrated in Figure 2.1.
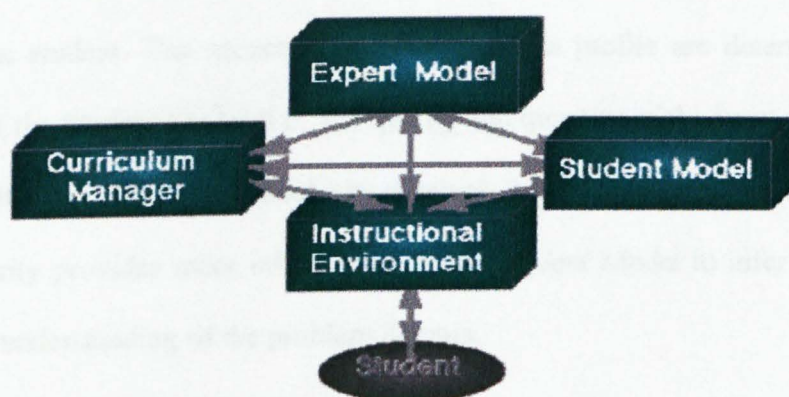
Figure 2.1: Intelligent Tutoring Systems Model

Like a human expert, the Expert Model in an ITS has knowledge about a particular domain. The type of knowledge maintained by the Expert Model is referred to as domain or content knowledge. Typically, this knowledge is both factual and procedural, and is maintained in databases by an expert system. A factual database stores pieces of information about the problem domain, while a procedural database contains knowledge of procedures and rules that an expert uses to solve problems within that domain. Although factual and procedural databases may adequately model knowledge in an expert system, a method of knowledge encoding known as cognitive, or qualitative, modeling provides for a closer simulation of the human expert's reasoning process. The Expert Model in an ITS may employ cognitive modeling by using structured knowledge of causality and human-like inference mechanisms.

While the Expert Model captures the knowledge that an expert uses in problem solving, the student model contains measurements of the student's knowledge of the problem area. Ideally, the Student Model can be thought of as containing an advanced profile of the student. The accuracy and detail of this profile are determined by the bandwidth of the Student Model (i.e., the quality and quantity of the input to the model). The bandwidth determines the granularity at which the student's actions can be tracked. Fine granularity provides more information to the Student Model to infer details about the student's understanding of the problem domain.

An ITS would not be a tutoring system if it did not contain facilities for teaching. Problems, or exercises, are the vehicle that an ITS uses to instruct the student. By solving problems, the student builds upon concepts already mastered. The facility in the ITS for sequencing and selecting problems is the Curriculum Manager. To select the appropriate problems for the student, the Curriculum Manager extracts performance measurements from the profile stored in the Student Model.

Teaching however, involves more than presenting material to the student. An effective instructor monitors a student's progress and provides coaching when the student requests assistance or is struggling. Like a human instructor, an ITS coaches the student through the use of an Instructional Environment. It is the Instructional Environment that provides the student with tools for proceeding through a tutorial session and providing help when needed. The Instructional Environment also determines when the student needs unsolicited advice and triggers its display.

These four components, the Expert Model, the Student Model, the Curriculum Manager, and the Instructional Environment interact to provide the individualized educational experience promised by ITS technology. [9]

2.6   MULTIMEDIA

"Multimedia is the seamless integration of text, sound, images of all kinds and controls software within a single digital information environment" Tony Feldman, Multimedia Consultant

2.6.1 Introduction to Multimedia

Multimedia is a presentation that involves any combination of two or more of the following elements: text, image, sound, interactive, video, and animation. These mediums are digitally controlled by a computer. [10]

Multimedia enhances the information for better communication and understanding. The combination of sounds and speech are used on radio, newspapers use a combination of text and images, and television combines all these elements and uses it to relay a message to the viewer. Television doesn't allow users to assess the information at their own speed. The message is transmitted one-way via cables or radio waves to their television sets. The user doesn't have the option to interact with this type of multimedia presentation. [10]

With the use of computers, the user allowed to be involved and interactive with the multimedia presentation. This is interactive multimedia. The user has control over the flow of data. Each user can follow a uniquely "personal" trail through the information. This dynamic interaction allows the user to perceive the information with their speed and getting feedback was necessary. [10]

Multimedia is used in advertising, entertainment, public information, training and education. Educational computer programs which use multimedia and the

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interaction of the student allows the student to see their mistakes immediately and guide them to learn a concept more quickly. The student can also move at their own speed, by reviewing or skipping material that they are unfamiliar or familiar with. Multimedia enables us to simulate an environment allowing the user to feel like they are actually there.

The applications of multimedia are constantly growing. They are becoming more domestic and millions of people are going to be affected in the way they communicate with one another. [10]

2.6.2 Multimedia on the Internet

Multimedia via Internet is the presentation of text, graphics, audio and video in an interactive hypermedia-application within a WWW browser. Interactivity occurs via keyboard, mouse and other input devices. Interactivity has helped make the World Wide Web so popular. [11] Most Web pages include graphics along with text and many also offer animations, videos and sounds. The Web navigation method, called hypertext, enables users to browse as they please. By blending multimedia with the Web, hypermedia becomes possible. In many web pages, for instance, user can click parts of a graphic to access a different page. In hypermedia, media other than text becomes the vehicle for navigating to new material. [12]

Since the introduction of the WWW, click-able navigation introduced the concept of hypertext and hypermedia to many computer users all over the world.

2.6.3 Why Use Multimedia

• Multi sensory experience: learning aids, multiple stimuli

• Interactivity: flexible pace/manner, input/ feedback

• Enhanced Communication: multiple avenues for information exchange

• Memory aid: Information association for knowledge input and retrieval [11]

2.6.4 Advantage of Multimedia

The following is the advantage of multimedia:

• Cost effective (less travel, repeat use, instructor, safety)

• Higher quality of data transmission

• Noise free – 2 states of signal representation

• Ease of manipulation – edit sound, color, transition

• Error correction/detection [11]

2.6.5 Interactivity

Interaction is based on the principle that the users decide where to go when given a series of options. Interaction implies the basic concept of immersion, navigation and manipulation.

Immersion: The presentation must be interesting in order to attract the users'
              attention

Navigation: User can choose to go any place in the presentation.

Manipulation: The presentation must give different options to interact with in
              addition to navigation [11]

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2.7　E-LEARNING

According to the Cisco Systems e-Learning can be defined as Internet-enabled learning. Components can include content delivery in multiple formats, management of the learning experience, and a networked community of learners, content developers and experts. E-Learning provides faster learning at reduced costs, increased access to learning, and clear accountability for all participants in the learning process. In today's fast-paced culture, organizations that implement e-Learning provide their work force with the ability to turn change into an advantage.

E-Learning is the convergence of the Internet and learning. The learning can be on any level, elementary school, college, or corporate. E-Learning gives companies and individuals an advantage on the competitive market. This is because the learning that is provided electronically is cost-effective, available anywhere-anytime, and gives flexibility to the learner in terms of timings and pace of learning.

E-Learning is not just studying on the Internet but it is made up of several components. These components of learning are enhanced or facilitated by technology. Web-based learning or online learning is a component of E-Learning and is the fastest growing method for providing training and education.[15]

E-learning can be CD-ROM-based, Network-based, Intranet-based or Internet-based. It can include text, video, audio, animation and virtual environments. It can be a very rich learning experience that can even surpass the level of training you might experience in a crowded classroom. Indeed, it is self-paced, hands-on learning. [14]

E-learning can suffer from many of the same pitfalls as classroom training, such as boring slides, monotonous speech, and little opportunity for interaction. The beauty of E-learning, however, is that new software allows the creation of very effective learning environments that can engulf the user in the material. [14]

2.7.1 The Benefit of E-Learning

Benefits	Descriptions
Anywhere, anytime, anyone	Learning is made available to people 24 hours a day, seven days a week around the globe. This makes E-Learning convenient for students since they can be accessed at any time, any place.
Just-in-time access to timely information	E-Learning makes learning easy for busy students because they can have access to interactive, self-paced, multimedia training, anytime, and anywhere - whether at work, home or even while traveling.
Self-paced learning	E-Learning fosters self-paced learning whereby students can learn at a speed that suits them. Students can also take up studies and practice tests as many times as

	needed to perform better in examinations.
Substantial cost and time savings	E-Learning eliminates the need for students to travel to specific locations for the purpose of education. This brings about savings on the time and cost of travel that would otherwise have been incurred in conventional learning models.
Innovative and interactive learning	E-Learning allows different learning styles of different students, and fosters cognitive learning through a variety of interactive exercises. Cognitive learning leads to better understanding and recall of knowledge.
Uniformity of content	Instructional quality in E-Learning is consistent to all learners irrespective of their location anywhere in the world, thus eliminating disparities arising from different teaching standards that are commonplace in conventional learning.

Table 2.1 Benefit of E-Learning [15]

2.8   CURRENT AVAILABLE SERVICES

Study had been done on various existing C++ learning packages.

a) The Cplusplus.com tutorial

URL: http://www.cplusplus.com/doc/

Date Accessed: 8 April 2004
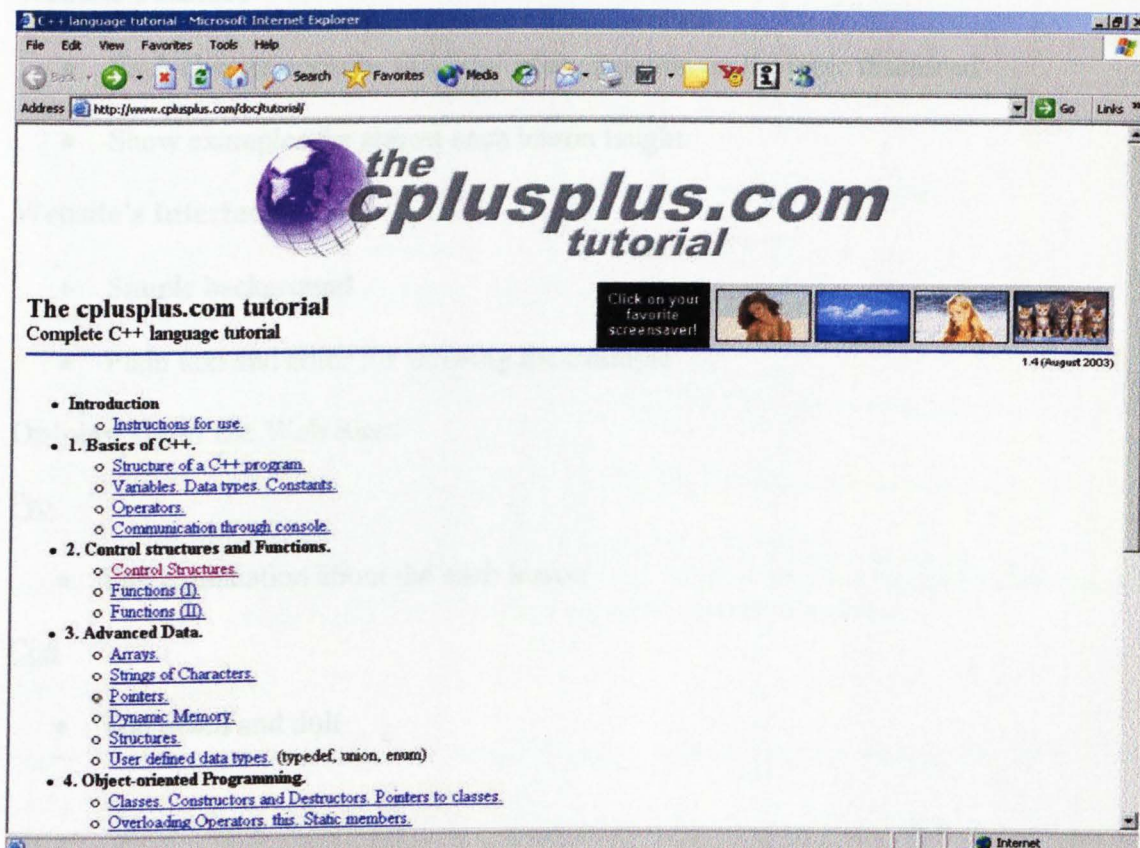
Figure 2.2 The Cplusplus.com Tutorial Interface

About the website

The Cplusplus.com Tutorial website is a free E-learning website for C++. This websites

is managed by C++ recourse network. It covers all major topics in C++. It divided into a

few chapters which consists the introduction to C++, basic C++, control and Functions,

advanced data, Objected-Oriented Programming, advanced topics, and C++ standard
library.

Course's main contents

- Topic cover by the course

Website's feature

- Each chapter contains full brief of explanation on the topic discussed

- Show examples for almost each lesson taught

Website's Interface

- Simple background

- Plain text and color for showing the example

Opinion about the Web Site:

Pro

- Full explanation about the each lesson

Con

- Too detail and dull

b) The C++ programming Tutorial

URL: http://cplus.about.com/cs/ctutorial1/

Date Accessed: 8 April 2004
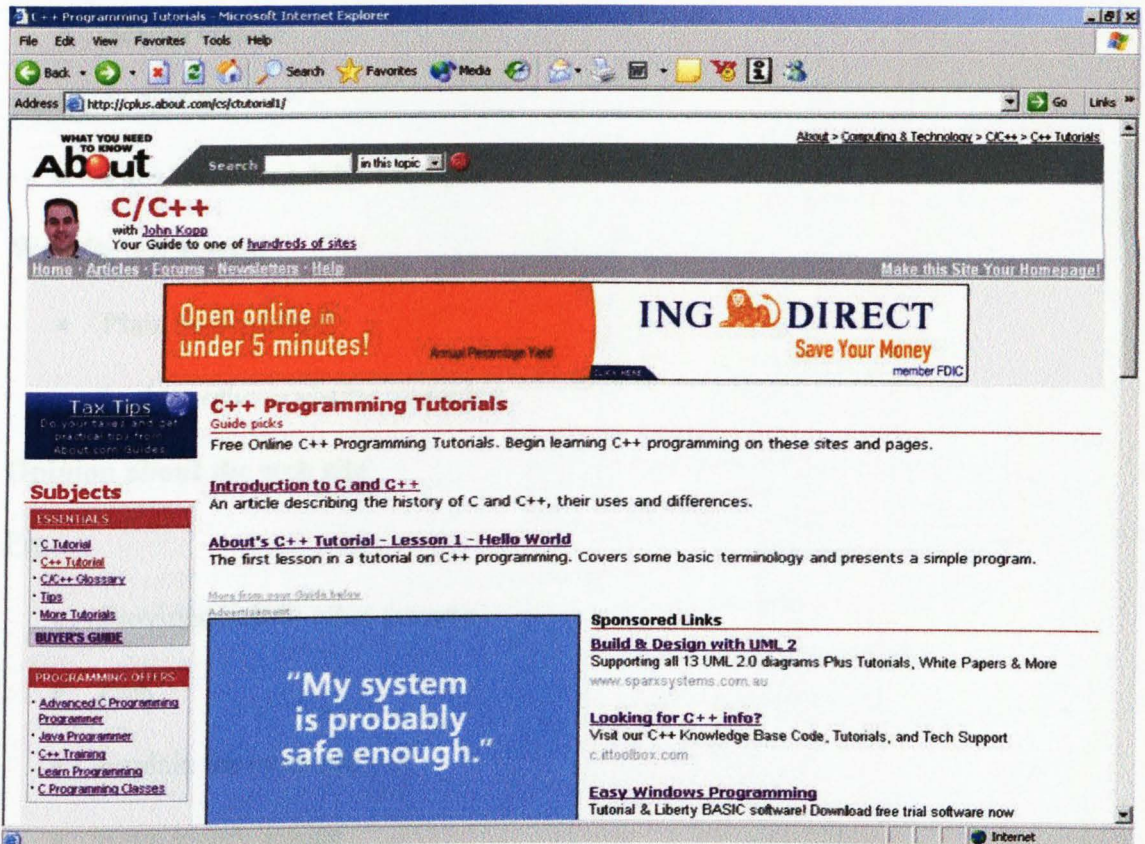
Figure 2.3 C++ Programming Tutorial Interfaces

About the Website:

The C++ Programming Tutorial website is also a free E-learning website for C++. The author John Kopp is the author of the site and has 15 years experience programming and developing applications and solutions in C, C++, C#, Java, Perl, Fortran, assembly language, Shell Scripts and SQL.

Website's main contents:

- Have 35 lessons covered in the tutorials

- Related links provided

- Search engine

Course's feature

- Each lesson teach by example

Website's features:

- Plain background

- Link to other websites provided

Opinion about the web site

<u>Pro</u>

- Provided link to other resource

- Free

- Explain the example

- Have search engine

<u>Con</u>

- No tutorial

- Objectives of the lesson not stated

c) C++ in hypertext

URL: http://cs.nmhu.edu/personal/curtis/cs1htmlfiles/Cs1text.htm

Date Accessed: 8 April 2004
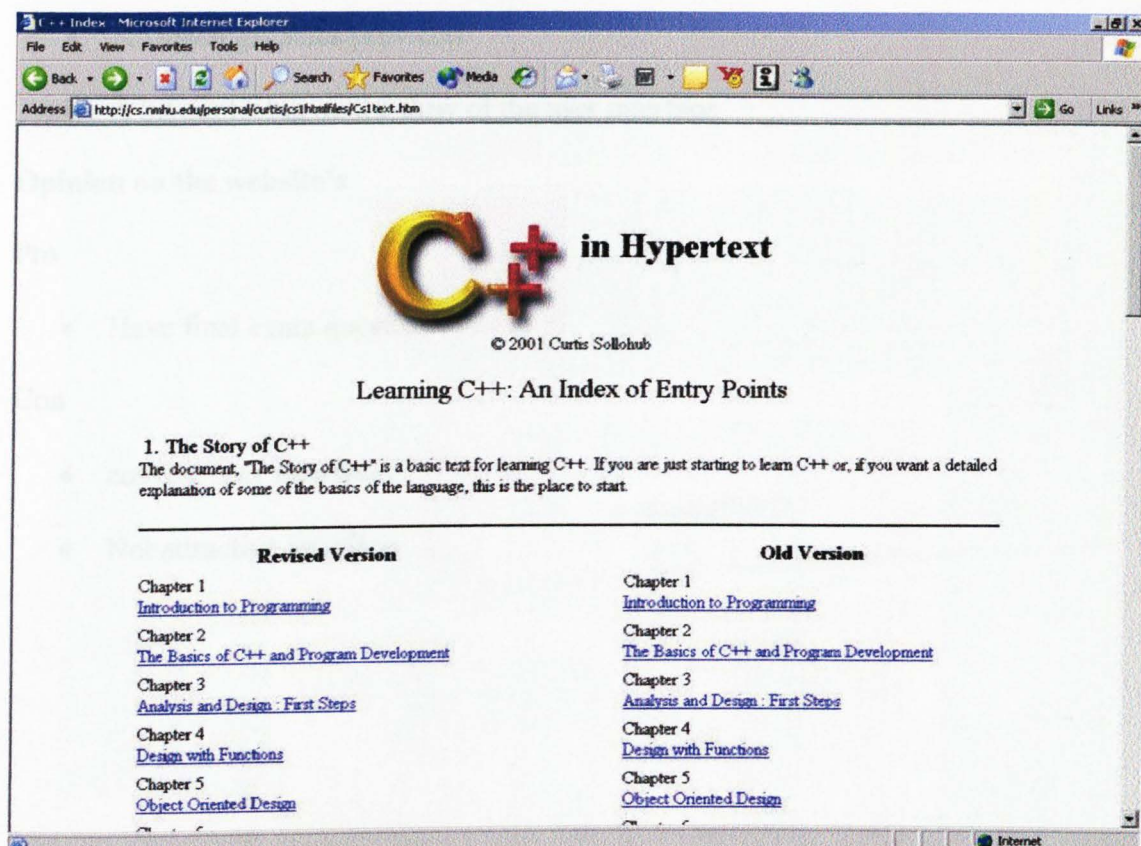
Figure 2.4 C++ in Hypertext Interfaces

About this website:

Website's main content:

- Topic area

- Links

- Quizzes

Course's feature

- Index provided

- Quizzes

Website's interface

- Plain interface
- Not attractive
- No much graphics provided
- A bit confusing on the flow of the user interface

Opinion on the website's

Pro

- Have final exam question

Con

- confuse user interface
- Not attractive interface

d)FunctionX Tutorial

URL: http://www.functionx.com/cpp/index.htm

Date Accessed: 8 April 2004
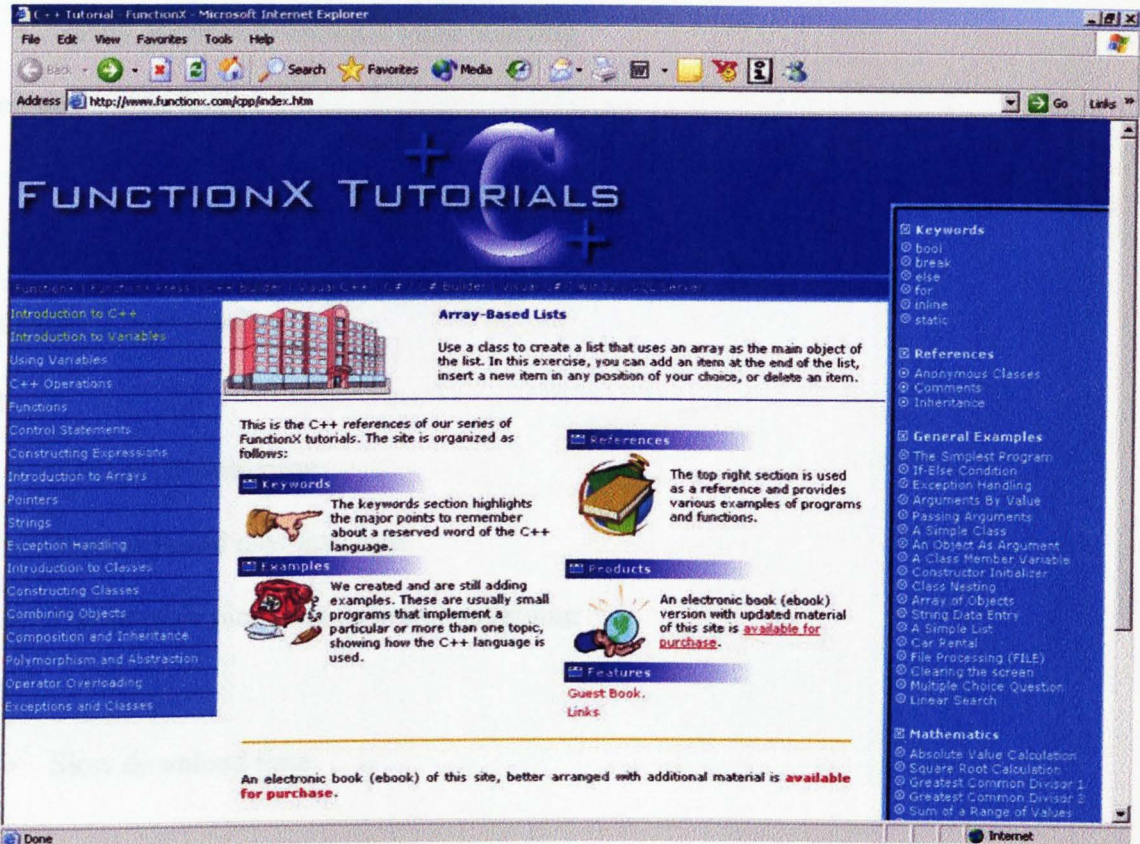
Figure 2.5 FunctionX Tutorial interfaces

About this website:

FunctionX Tutorial website is one of the free online training courses that are available

on the internet. It also provided e-book for $20.

Website's main content:

- Topic area

- Reference

- Keyword

- General Example

- Example

Course's features:

- Depth explanation

- Many graphics to enhance understanding

Web site's interface:

- Using bright color

- Informative

Opinion on the website:

<u>Pro</u>

- Attractive main page

- Well adjusted user interface

- Use graphic picture to help understanding

<u>Con</u>

- Slow download time

e) GurukulOnline Learning Solution (Demo System)

URL : http://www.gurukulonline.com/elearning_introduction.asp

Date Accessed : 8 April 2004
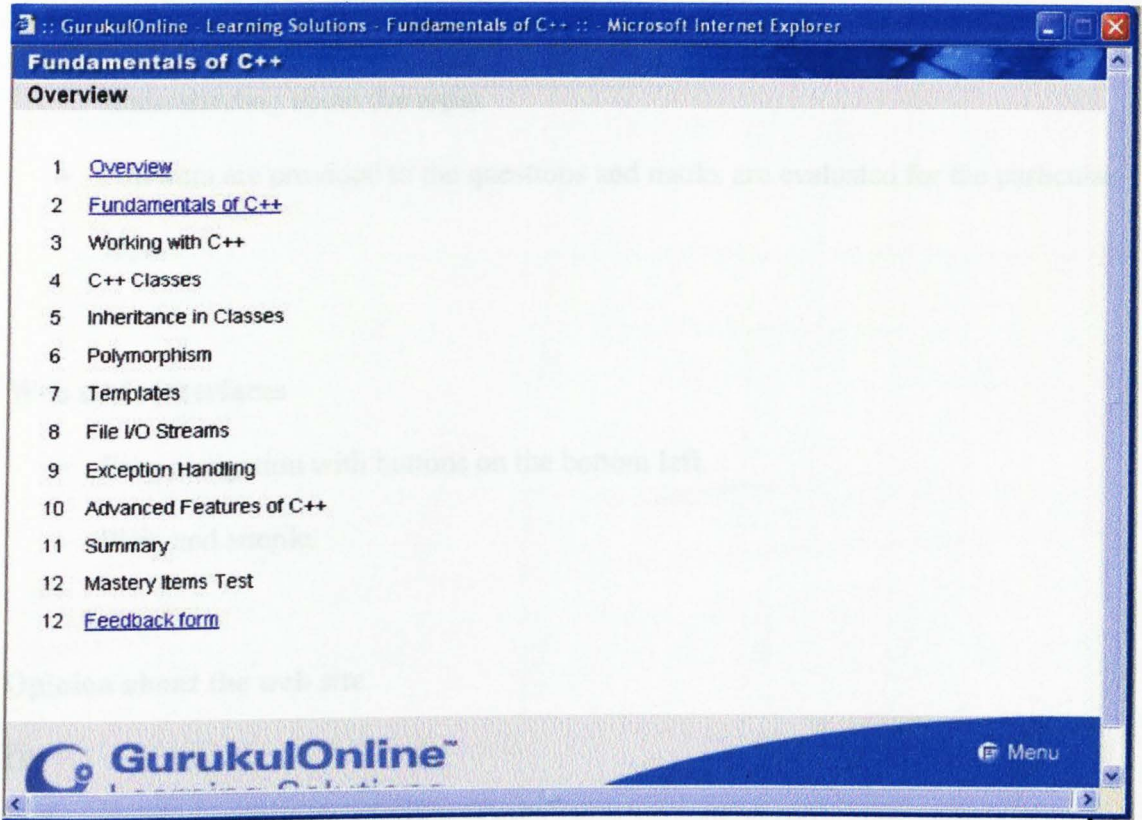
Figure 2.6 GurukulOnline E-learning in C++ Programming Interface

About the web site

The GurukulOnline Learning Solutions is a payable learning center. This version is the demo system. It provides a lot of learning topics. Due to the proposed system, C++ programming is chosen for the demo proposed.

Course's main contents

- Table contents of the course.

- Exit from the course.

Course's features

- Objectives of the topic are given

- Step by step learning with pictures.

- Exercises are given in several patterns after every topic to access student

  understanding about the topic.

- Answers are provided to the questions and marks are evaluated for the particular

  topics.

Web site's interfaces

- Easy navigation with buttons on the bottom left.

- Plain and simple.

Opinion about the web site

Pro

- Every topic has objectives.

Con

- It is not in full screen window

- The text in the course is not attractive

- The interface is not attractive enough to attract reader attention

2.9 SUMMARIES OF THE EXISTING SYSTEM OF E-LEARNING

All the existing systems that study can be summarize as follow:

E-learning center	The Cplusplus.com	The C++ programming Tutorial	C++ in hypertext	FunctionX	GurukulOnline
Objectives of the chapter provided	Yes	No	Yes	Yes	Yes
Exercises provided	No	No	Yes	Yes	Yes
References	No	Yes	No	Yes	No
Download time	Average	Average	Average	Slow	Average
Fonts size	Formal	Formal	Formal	Formal	Formal
Colour	Plain	Plain	Plain	Colorful	Plain
Multimedia presentation	No	No	No	No	No

Table 2.2 Summaries on existing C++ tutoring system

2.10 QUESTIONNAIRES

A survey was conducted in Faculty Computer Science and Information Technology (FCSIT). Questionnaires were distributed to 60 students which comprised of 90% of 67 undergraduates that currently undergoing C++ programming language. The total number of students presently taking C programming language subject was obtained from the FCSIT's office. The objective of this survey was to find out student's perception towards learning C++ in Faculty Computer and Information Technology. The following were the questions asked and the results obtained from the survey conducted in the brackets.

1.   What do you think of C++?

        a) Interesting (26) b) Moderate (28) c) Boring (6)

2.   How do you rate C++ Programming language's importance?

        a) Very important (16)

        b) Important (38)

        c) Less important (4)

        d) Not important (2)

3.   Why do you take this class?

        a) This is my major subject (38)

        b) I repeat this subject (18)

        c) Interested to know more about C++ (4)

4. How do you rate C++ Programming difficulties?

    a) Easy to learn (8)   b) Moderate (30)   c) Confusing (22)

5. How many hours you spent on C++ books a week?

    a) < 3 hours (30)

    b) 3-4 hours (22)

    c) 4-5 hours (8)

    d) > 5 hours (0)

6. Please check the problems that were face during process of learning C++

    programming language?

    a) Insufficient study material (22)

    b) Lack of quality lecturers (16)

    c) Insufficient information from reference (28)

    d) Scope of studies irrelevant to daily applications (20)

    e) Lack of practical exercises (46)

    f) Do not understand the concepts (42)

    g) Others (2)

7. Which is the best source for C++ Programming language?

    a) Online websites (16)

    b) Lecturers (24)

    c) Books (18)

    d) Peers (2)

8.　　How would you rate learning C++ programming language by
visualization/multimedia?

　　a) Eases memorization (14)

　　b) Increase understanding (22)

　　c) Interesting (24)

　　d) A waste of time (0)

Information gained from the survey is as follow:
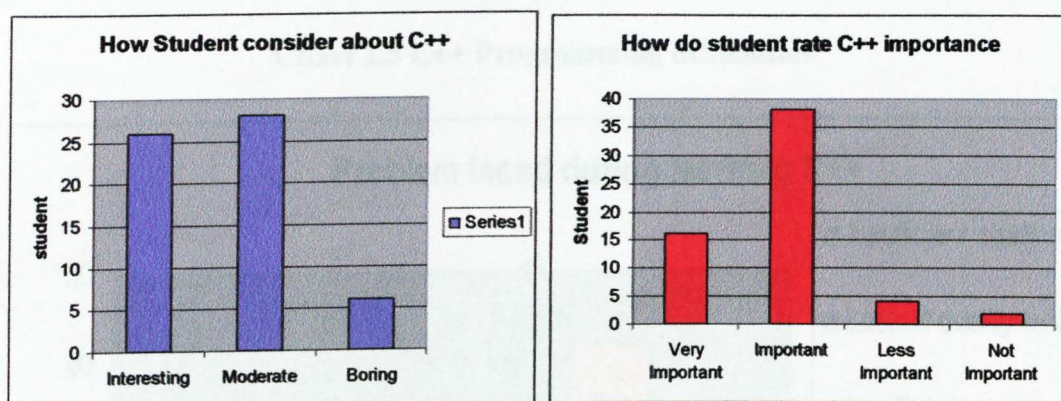
Chart 2.1 How student Consider C++　Chart 2.2 Student rate C++ importance

Based on two charts above, it was found out that concluded that most of the students of FCSIT considered that C++ programming language was not a boring subject and also agreed (63%) that it was an important programming language. Others chose otherwise, perhaps maybe because there were others programming language available such as Java and C# that suited them better and widely used apart from C++ programming language.
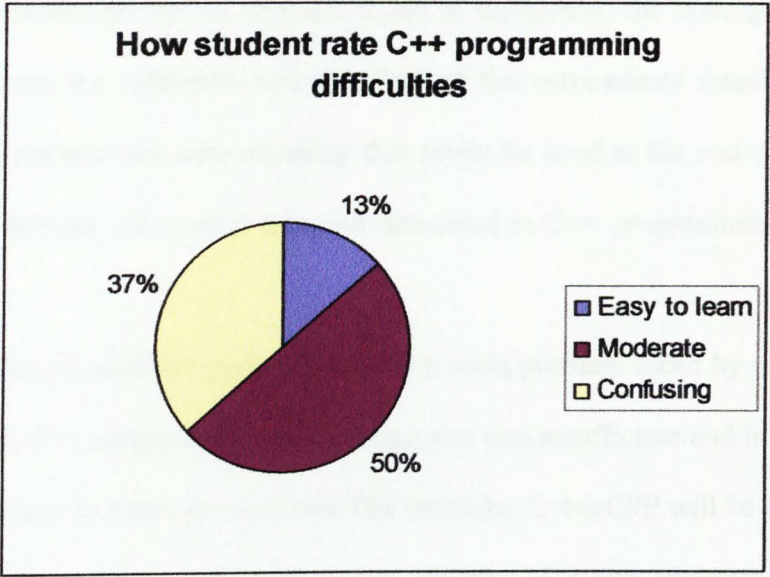
Chart 2.3 C++ Programming difficulties
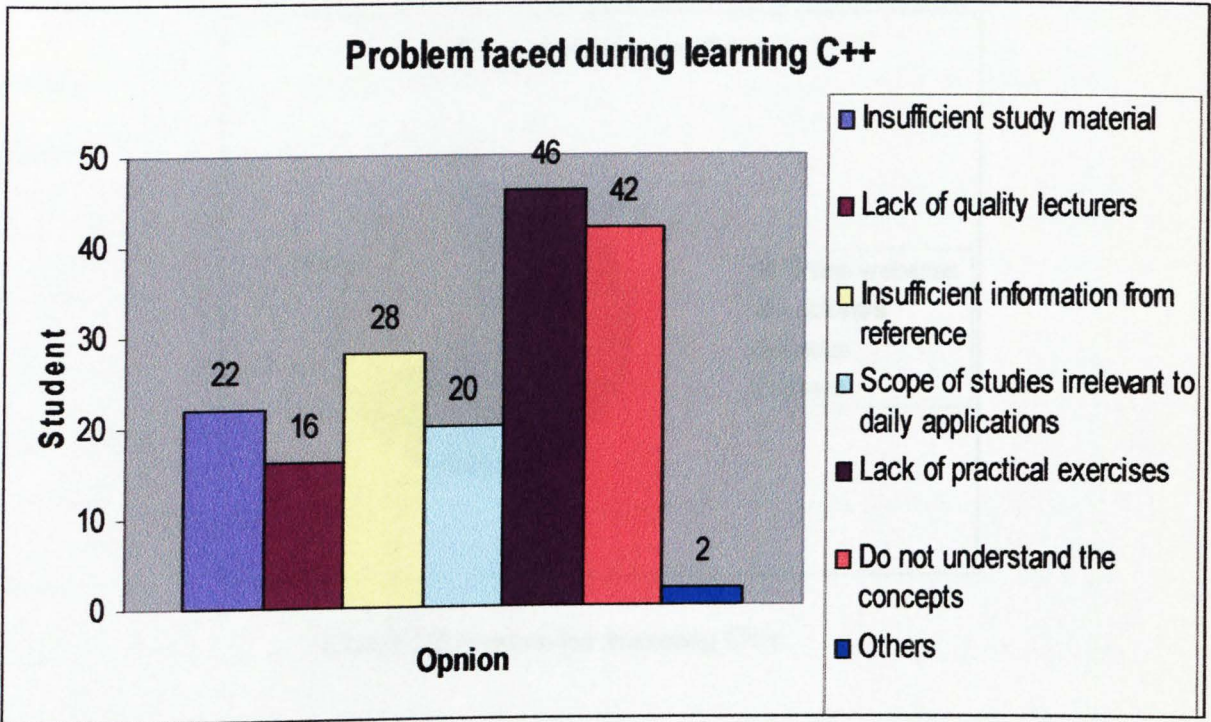
Chart 2.4 Problems of learning C++

Based on chart 2.3, a majority of 87% of the students agreed that C++ programming language were not easy to learn. This was due to lack of practical

exercises to practice on and so they did failed to understand the concepts, insufficient information from the reference and etc. One of the respondents found some of the exercises was not relevant with anything that might be used in the real world software industry; and another respondent was not interested in C++ programming language at all.

Therefore, it could be concluded that the main problem faced by undergraduates during learning C++ programming language course was insufficient and in need of more practical exercises. In order to overcome this problem, CyberCPP will be designed with much more quizzes and exercises to ensure increase of a user understanding of C++ programming language.
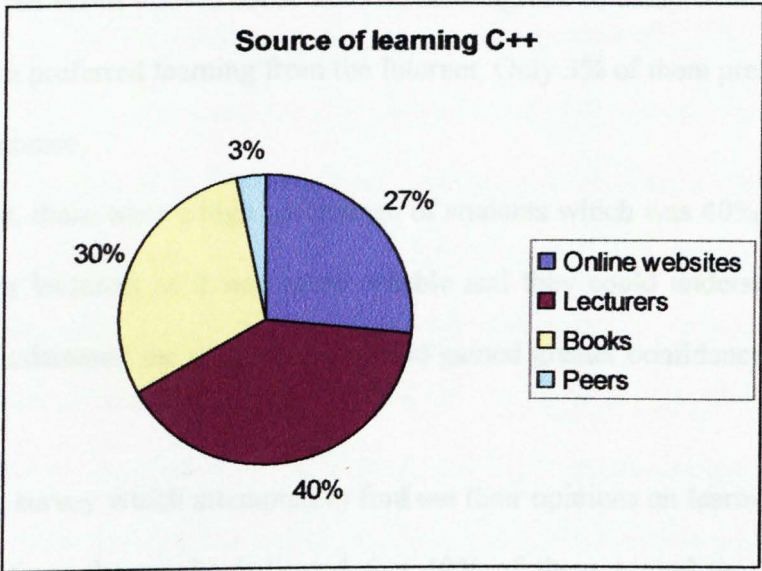
Chart 2.5 Source for learning C++

Learning C++ by Visualization/multimedia

0%
23%
40%
37%

- Eases memorization
- Increase understanding
- Interesting
- A waste of time
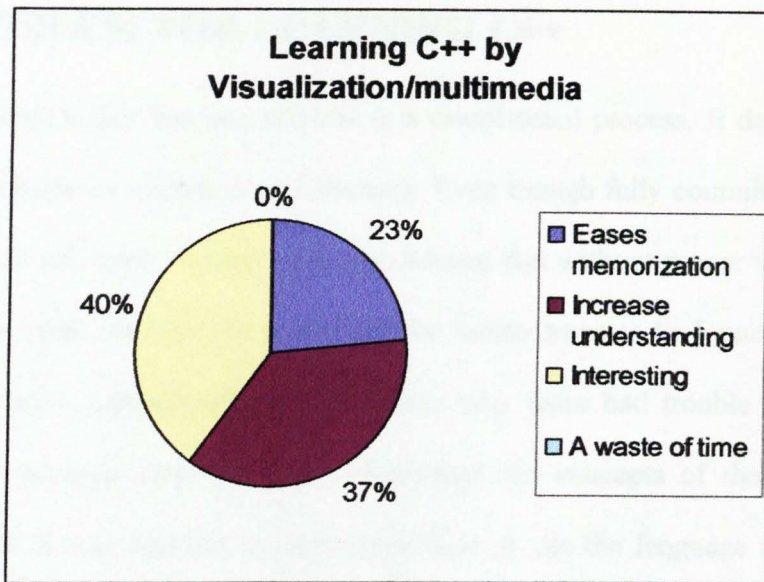
Chart 2.6 Learning by Visualization

Based on the result above, about 30% of them agreed to study from text books while 27% of them preferred learning from the Internet. Only 3% of them preferred their friend as their reference.

Beside that, there were a high percentage of students which was 40%, interested to learn from their lecturers as it was more reliable and they could understand faster. This made them understand the problem more, and gained greater confidence in how to solve problems.

This was a survey which attempted to find out their opinions on learning C++ by visualization and from the results indicated that 40% of them agreed that it was an interesting new way to learn C++ programming language; whilst, 37% of them agreed this that it would enhance their understanding. Then, 23% of them thought that it would ease memorization. Therefore, it could be concluded that most of the students would like a new method to help them learning C++ programming language.

2.11 PROBLEM FOR LEARNING C++

It is known that learning process is a complicated process. It demands various commitments between a lecturer and students. Even though fully commitment could be given problems still exist. Further, it is also known that without proper way to identify the problem at hand, the solution would still be further away to be found. If we look at from the student's perspective, one the reason why them had trouble to master this language was because they could not understand the concepts of the programming language itself. It was difficult to understand how to use the language if the students learned by themselves unaided. It would take a lot of imaginative thinking to understand the concepts programming but not all the students had those abilities.

However, there are alternatives to learn this language. One way is by asking the lecturer what they do not understand. But for some reasons, this is problematic. This is because of shortage of lecturers who are fully capable to teach. There were many of students taking C++ classes but only a few lecturers were available. Sometimes, a lab session consist only one lecturer and taught about 60 students. This was not good as because when a student faced a problem, the lecturer had to help each of the students individually to solve it. The ideal world of teacher with learning process is one teaching and one student. The teacher would know and familiar with his or her weakness and strengths. In this way the student would absorb more. But in reality, it would not happen because it is difficult to obtain enough numbers of lecturers.

After new technologies evolved, people invented internet and they used it to help solve those problems mentioned above. In this way students would have more access to resources, discuss online and improve their knowledge. Even though this would help

students to learn C++ more easily but actually it is no different from the traditional method. Often, students would have to read the information from textbooks. The difference is that students would gain same information from the internet, cheaply and accessible from anywhere around the world. It could be a different scenario if the system taught the students by visualization so that students would find it easy to understand it and at same time interactive where by students could decide how much they want to learn at a time.

This was where the idea of CyberCPP began. It is hoped that CyberCPP would reduce difficulties students faced by helping them understand more on C++ programming language. CyberCPP will use the problems faced by students as a guideline for its creation.

2.17 Chapter Summary

The purpose of this chapter is to gain information for this project. Research on intelligent tutoring systems e-learning, multimedia and C++ programming language concepts is done to have a clear understanding on the requirements of this project.

The strengths and weakness of the existing system application were studied to get a better idea about this project.

Chapter Three
METHODOLOGY

CHAPTER 3: METHODOLOGY

3.1 METHODOLOGY CONSIDERATION

A methodology which is a collection of procedures, techniques, tools and documentation, helps system developers in their task of implementing a new information system. It consists of a set of phases which include an additional set of sub phases. This guides the developers to the choice of techniques at various stages in the project and helps them to plan, manage, control and eventually evaluate information system project. [16]

The main objective of a methodology is to make the development cycle as efficient as possible, to complete the development in the lowest cost possible, at the same time keeping the highest quality and to achieve the fastest turn around. Another important objective is to make future maintenance easier and faster. The developer cycle for each project is in some way unique, depending on the system requirements and their unique operating environment. Design and development methodology are various, depending on the software, hardware and technology chosen.

3.2 BENEFITS OF GOOD METHODOLOGY.

A good methodology is able to provide effective ways of the system development. It is best defined before the project starts and then becomes the framework to the development staffs.

Some benefits offered by a good methodology are:

i)   Provides a standard framework in which the developer does not have to reinvent the wheel for each project.

ii) Each method or tool in the methodology results in successful completion of each development task.

iii) Reviews procedures are available to identify errors inconsistencies and discrepancies during the software development.

iv) Increases the system quality by forcing the developer to produce flexible systems and adequate documents.

v) Provides better understanding of user needs and validation of user those needs. Provides the management with tools to review project progress and checklist to ascertain tasks which are deliverable.

vi) Improves communication among management analyst, programmers, users and other stakeholders by providing for communicator's base.

vii) Facilities planning and controlling the project.[17]

3.3 CONCLUSION ON THE DEVELOPMENT METHODOLOGY

On this particular project (C++ programming Tutoring Simulation), Rapid Application Development (RAD) is chosen.

Rapid Application Development is a methodology by compressing the analysis, design, build and test phases into a series of short, iterative development cycles. It initializes clear requirements and evolutionary construction of working prototypes of a system to accelerate its development process. RAD will use prototypes to accelerate requirements analysis and system design. A prototype is a smaller-scale, representative or working model of the user's requirements or a proposed design for an information

system. Thus, it is a technique for quick building of a functioning but incomplete model of the system. [17]

The following diagram gives a visual layout of the Rapid Application Development.

Figure 3.1 Rapid Application Developments [17]

3.3.1 RAPID APPLICATION DEVELOPMENT STAGES:

3.3.1.1 Preliminary Investigation

The main objective in this stage are to find out what are the main objectives, scope, constraint; and then plan a schedule for this particular project. At this stage, the detailed specifications of the project will be brief but adequate to make the project going. All project plans are carefully worked-out and presented to my supervisor, Puan Maizatul for consultation.

3.3.1.2 Problem Analysis

This stage consists of problem and requirement analysis for decision making. It involves an understanding on the content that will include in the proposed system and nature of initial requirement to determine system requirements.

This means that all the information that involved in this project will be collected and analyzed. Problem that will be faced throughout the project such as cost, facility, resource and timing will be fully considered. This phase focuses on information gathering and analysis on the project specifications. A series of study and research work are carried out through the internet, books, and survey is conducted to verify the needs of CyberCPP. The functional and non-functional of CyberCPP will be identified during this phase.

Prototyping Loop

This stage involves iterative process until it meets the final acceptance. This loop includes system design, system construction, system implementation and system analysis.

3.3.1.3 System Iterative Design

At this stage, a prototype design is built based upon the results of the analysis of the initial requirements. The prototype is used to identify and refine the requirements of CyberCPP. This phase will be repeated until the design of the system satisfies all the requirements.

3.3.1.4 Iterative Construction

This phase involves the actual coding of the prototype. The prototype will incorporate JavaScript and ActionScript to further enhance the functionality of CyberCPP. Therefore, this phase needs more time to work on the prototype.

3.3.1.5 Iterative Implementation

Prototype will be implemented by uploading to the internet using web hosting such as "Brinkster", in order to let users experience in the experimental prototype and give their feedback on CyberCPP. Based on the feedback, requirements will be clarified and new requirements will be introduced. Also, users provide feedback to the CyberCPP user interface design for the next cycle of iteration by looping back so as the system design to redesign or improve the system.

3.3.1.6 Iterative Analysis

This phase is revisited to the feedback of the prototype. This analysis tends to focus on revising requirements and concerns with the design. The analysis cycles then return to iterative design and continue with the prototyping loop.

3.3.1.7 System Implementation

The functional prototypes will be placed into operation at this phase. Addition at requirements will be released in next version of CyberCPP they may continue through the design-by-prototyping-loop.

3.3.2 TIME BOX

Technique that is used to limit the duration of prototyping loop is called time boxing and the duration of the prototyping loop is 60-120 days. This is important in order to meet the dateline of CyberCPP.

3.4 JUSTIFICATION OF METHODOLOGY

The reasons for chose Rapid Application Development are as follow:

3.4.1 Meet earlier schedule

Owning to the limited time available to build the system, this methodology deemed appropriate due to its short life cycle. By building CyberCPP on the prototype, it will take up the shortest development period and more importantly new requirements and problems would be detected early before it would be fully completed.

3.4.2 To reduce risk

Any faulty and omission tend to be detected early in prototype stage compared to the system models. This will reduce the possibility of doing the system all over again from start.

3.4.3 Visibility and progress demonstration

Prototype will show how far the system works and how far it will be accepted by user. In this survey, any problem could be detected earlier and changes on the requirements could be modified and improve to meet new requirements.

3.4.4 Save on maintenance

Acceptance testing is carried out all along the way to validate the requirements. Therefore, it reduces work redesign and saves time for maintenance due to early detection of problems.

3.5 Summary

This chapter explains the methodology used in CyberCPP development process. In this particular project, Rapid Application Development is chosen because of its many advantages that befit the project environment. On this chapter provides clarification of each stage regarding the methodology involves and the justifications of its development.

Chapter four
System Analysis and Designs

System analysis is a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose. It is a term that collectively describes the early phases of system development. [17] whereas, system analysis is an important phases that must go further before proceeding into subsequent phase by determine all the requirements of a system.

4.1 REQUIREMENT ANALYSIS

System requirement is the detailed description of what the system should do. [18] A requirement may describe functions, features or attributes and constraints. Requirement analysis analyses and determines functional requirements and nonfunctional requirements of e-learning in C++ programming. [19]

During the definition, it is necessary to have a mutual understanding between the user create and project developer about the needs for the systems. This is the first step for the most important part of all the proposed because it will determine whether the completed product will achieve and perform as the student owner wants to

CHAPTER 4: SYSTEM ANALYSIS AND DESIGNS

4.1   SYSTEM ANALYSIS

System analysis is a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose. It is a term that collectively describes the early phases of system development. [17] whence, system analysis is an important phases that must go through before proceedings into subsequent phase by determine all the requirements of a system.

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4.2.1 Functional requirement

Functional requirement are statements of service the system should provide, how the system should react to particular inputs and how the system should behave in particular situations. In some cases, the functional requirement may also explicitly state what the system should not do. [18]

For this CyberCPP system, there will be design of several modules which cover the function needed under online tutoring such as following in structured format:

1.0 User registration

This module will capture the user personal detail.

1.1 User has to register a username and a password according to their choice and the username which must be unique.

1.2 User will input all the personal details that are necessary into the system

1.3 User will have their username and password in order to log in into the system.

Rational: Registration is important in order to keep track who are using CyberCPP

2.0 User Login

2.1 To log in, user has to input heir username and password.

2.2 User will have unlimited access to the system

2.3 Only the register user can view the entire system.

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Rational: Login will tell the system who are the users and only submit the necessary information to the users.

3.0 Lesson module

3.1 It will contain 6 lesson

3.2 For each lesson, objectives will provided

3.3 There will be quizzes between each segment in the lesson before user proceeds to other segment.

Rational: This will ease the user to start from which lesson depends on their knowledge in C++ programming language.

4.0 Question and Case base problem

4.1 For each section of the lesson, quizzes and case base problem will be given to gave the user the chance to apply the technique their have learn before into the problem.

4.2 Quizzes will be generated and display to the user but it would not store in the database.

4.3 Case based problem answer will be provided and consideration output also included.

Rational: This will give the user chance to test their understanding after each subtopic in a lesson.

5.0   Exercise module

    5.1   There will be several exercises for user to test their knowledge about C++ programming language.

    5.2   The questions of a particular exercise will be giving in a several set so that the user could choose which set of questions they have not done yet.

    5.3   The answer for each exercise will be given to them. This included the proper output the user should do.

Rational: This will test the user understanding after finishing a lesson.

6.0   Reference Module

    6.1   Provide link to several C++ programming for further reference

Rational: This gives the user broader knowledge of C++ programming language.

7.0   Forum

User has difficulty in C++ programming language to submit their problems in the forum to get other user opinions and discuss the solutions.

    7.1   Only the registered user can gain access to the forum.

    7.2   User could post their questions.

    7.3   User could reply to posted questions.

    7.4   The administrator could erase unnecessary questions those which irrelevant such as personals chat, advertisements and etc.

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Rational: Difficulties that the user faces could be share to others so they could discuss and give opinions to each other about the difficultly. It also enhances the relationships among the user of CyberCPP.

8.0   Feedback Module

8.0   User could send any opinions, critics or difficulties to improve the system.

8.1   Feedback will be recorded.

8.2   Administrator will respond to each feedback they get from the user.

Rational: This section is to get feedback from the users about CyberCPP. The comments will be considered in the order to enhance the system.

9.0   Data Management

9.1   For administer to access only to manage

9.2   Administer could add/delete/upload quizzes and exercise module.

9.3   Filters the forum to ensure the user only posted relevant questions

9.4   Managed the user account and block any unauthorized user.

Rational: This is to maintain the system and keep CyberCPP contents clean and updated.

10.0   Help Module

10.1   Help topic will be provided to help the user to accomplish their task

Rational: This section is to assist the users when they face problem accessing the system.

4.2.2 Non-functional requirement

Non-functional requirements are constraints on the service or functions offered by the system which include timing constraints, constraints on the development process, standard, etc. Nonfunctional requirements are as important as the functional requirements [Software]. This section states the non-functional requirements for e-learning in C++ programming.

1.0 User friendliness

It is important to build this system as user friendly so as to encourage people to use this system even though they lack proper training. In this case, anyone who already knew how to use computer and surf the net could ride on to learn the language right away.

1.1 The system should use graphical user interface (GUI) approach in order to provide better understanding of how to use the system.

1.2 The system should provide simple menu so that the user could use the system easily without confusion.

Rational: This is help user understanding using this system without any trouble and thus provides better communication between users and the system.

2.0 Attractive Interfaces

Attractive interfaces will give the user what the direction do the system takes.

2.1 using comfortable color on the background that fit to the concept of the system

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Rational: As this is a learning site, thus it would attract people attention to access this site if this website looks attractive because nowadays most of the people not interested in study purposes.

3.0 Response Time

3.1 The system should interact instantly when the user access the websites.

Rational: This will eliminated the people from frustrate if the download is short and respond spontaneously.

4.0 Interactive

4.1 The system should react with response with every step of the user take.

Rational: This is to give the user respond when they using this system.

5.0 Reliability

5.1 Failure don't occur when the user use this system.

5.2 This system could be use in any kind of platform without give destruction to the user system.

5.3 The system could be used for a long time before it obsolete. Minimum of three years.

Rational: This is to ensure the user trust to the system.

6.0 Maintainability

6.1 The system should easily maintained

6.2 New module can be added or deleted later

6.3   Lesson, quizzes and exercise can be updated to the latest format to

current

education trends.

6.4   System fault could be fixing in shortest time.

Rational: The system could adapted in new situation if there will changes in the

requirement or enhance in the future.

7.0   Security

7.1   Users need to register before gain an access to the system

7.2   Could be accessed by proper username and password only

Rational: System can recognize the user and personal information and result of

the user shall not be seen by other user.

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4.3　DEVELOPMENT REQUIREMENT

4.3.1　Hardware Requirement

	Hardware required	Description
Processor	Pentium III 1 GHz or higher	The recommended requirement to run flash MX smoothly
Operating system	Microsoft XP Professional	Commonly use by other people especially in faculty of science computer and information technology
Memory	256 MB	Recommended requirement developed multimedia element using flash MX smoothly
Hard disk	1.6 Gigabytes	To store all the documents and files for the development of the system
External drive	- Printer - Speaker	- To print out the documents as needed for the system - To hear the sound
Sound card	Any type of soundcard	To hear and edit sound for the system using proper software.
Display	SVGA	To view all the graphics involved
Other	Internet connection	To upload the finalize system to the net.

Table 4.1 Hardware requirement for development side

4.3.2 Software requirement

	Software	Description
Document	Microsoft office XP	Needed to produced system documentation
Authoring tools	Dreamweaver MX Flash MX	To create and manage CyberCPP as an online application.
Graphic Authoring	Adobe Photoshop 7.0	To do graphic editing as needed in the system
Sound	Sound forge 5.0	This is used to record required audio and insert in the system
Web browser	Internet Explorer 6	This application is used enable users view online files including active server pages
Web server	Internet Information Server	Used to open the path way for clients to get access to web files
Web Technology	ASP.NET	A client side scripting language for provides interactivity with the server
Playback	Macromedia Flash Shockwave	This needed to play back movies in flash
Database Management System	Microsoft Access XP	This is used to create the databases

Table 4.1 Software requirement for development side

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4.4 USER SIDE REQUIREMENTS

User Side requirements will be much less than development side because they are needed just to view the systems and the output will be dependent on the users' processor speed and internet connection.

4.4.1 Hardware and Software Requirements:

For Hardware

Intel Pentium 200MHz processor or equivalent processor running

Windows 98/ME/ NT/2000/XP

32 MB RAM (128 MB is recommended)

20 MB of available disk space

Internet Connection

A 16-bit color monitor capable of 800 x 600 resolutions

For Software:

Microsoft Internet Explorer 4.4, Netscape Navigator 4.5 or later

Macromedia Flash player 5.0 or above

4.5 DEVELOPMENT TOOL ANALYSIS

4.5.1 Operating System

Windows technology is chosen as the development platform because it is easy to install using interface wizard and more user friendly compare to the other operating system. Microsoft Windows XP will be the chosen operating system for develop CyberCPP++. The other reason why Microsoft Windows XP is chosen as the development operating system is because most of the computers in Faculty of Computer Science and Information System of University Malaya are currently running with Microsoft Windows XP. Besides that, most of the home personal computers are installed with Microsoft Windows XP. It is among the latest operating system and this can ensure the system can continue to be used longer and would not outdate in the fourth coming few years.

4.5.2 Web Authoring Tools

Macromedia Flash MX

Macromedia Flash MX is chosen as animation developer for CyberCPP because it is easy to use with its user-friendly interface. All the motion graphics with synchronized sound can be creating in the shortest possible time. Besides that, it utilizes compact vector graphics that enable users download rapidly and scale to the users' screen size.

Macromedia Dreamweaver MX (XHTML editor)

Macromedia Dreamweaver MX is chosen as the management tool for CyberCPP++ because it is a professional visual editor for managing and creating web pages. It provides users two views for both codes and design in a screen which ease in design the page layout.

Macromedia Dreamweaver writes clean code without a lot of proprietary and self-serving tags. Further to that, Macromedia Dreamweaver can easily integrate with Macromedia Flash MX to make the web site more interesting.

4.5.3 Client-Side Scripting Language

XHTML will be chosen as client-side scripting language because it provides neat and clean coding than HTML. CyberCPP will be enhanced with JavaScript and ActionScript.

4.5.4 Server-Side Scripting Language

ASP.NET will be chosen as the server-side scripting language. The time that required familiarize with ASP.NET is shorter than CGI. Therefore, this can reduce the development time. The reasons why ASP.NET is chosen over ASP are:

Easy programming model

ASP.NET server controls enable an HTML-like style of declarative programming that let one builds great pages with far less code than with classic

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ASP. ASP.NET pages work in all browsers including Internet Explorer, Navigator Netscape, Opera and American Online.

Compiled Execution

ASP.NET is much faster than classic ASP. No explicit compile step is required. ASP.NET will automatically detect any changes, dynamically compile the files if needed and store the compiled results to reuse for subsequent requests. [MSDN Library, 2002]

4.5.5 Web Servers

Internet Information Server (IIS) is chosen as CyberCPP web server because it is easy to install and user-friendly rather than the Apache which has a complex configuration. Thus, the time that is needed to configure and manage IIS is shorter than the Apache. Since Microsoft Windows XP will be used as the platform for developing, CyberCPP and ASP.NET will be chosen as the server-side scripting language, IIS is the best choice. IIS is included in Microsoft Windows XP as optional function that leads to easy configurable on Windows XP which incorporate a broad range of administrative features for managing Web sites and Web server. With programmatic features like ASP.NET, flexible Web applications can be created.

4.5.6 Database Management System

Microsoft Access XP is chosen as the database management system. This version is chosen because it is suitable to run under Microsoft Windows XP which is chosen as operating system for CyberCPP's development. The main reason choosing Microsoft

Access as CyberCPP database management system is because it is suitable for use with medium sized databases which it only used to store users information, exercises, answers and forum posted. Microsoft Access XP is powerful and easy to use. It can design the database quickly due to its user-friendly interface. This can reduces the time needed to develop the database and one can concentrate more on the front-end of the system which is directly facing with users.

4.6 INFORMATION GATHERING METHODS

Collecting information from various sources is necessary to seek further understanding towards this proposed system. The information collected assists in both the system and requirements analysis. Several techniques have been adapted in order to elicit all the information required such as Internet surfing, referring to printed documents, analyzing pass year's thesis, analyzing existing systems, discussion with lecturer and questionnaires distribution.

a) Internet Surfing

Internet surfing is the major source for fact finding in the development of CyberCPP. It is due to its high speed, convenience and up to date information. Needed information about C++ programming can easily be accessed by search engines and there is a lot of information available from different sources. Besides, uncertainty question can be questioned and discuss over the internet friends in a forum. Indirectly, opinions can be obtained from people all over the world. Information on existing C++ programming learning package is collected from the World Wide Web as well.

b) Printed Documents

Reference books available from the University Malaya's main library provide ample information for clear understanding about the concept of development tool such as Macromedia Flash and Dreamweaver that are needed in CyberCPP development.

c) Pass Years Thesis

Several past years theses documentations had been studied in order to get a better idea on software development skills. This can provide a guideline in producing CyberCPP report. Those theses are reached from the Faculty of Computer Science and Information Technology, University Malaya's documentation room.

d) Analyzing Existing Systems

By observing the existing systems one can generate ideas that help in CyberCPP development. However, most existing systems available on the Internet such as "GurukulOnline" require payment in order to use the system. Only demo systems can be view without any charges. Therefore, only a small part of the existing system can be accessed. Existing systems such as "C++ Programming Tutorial System" can be viewed without any payment in the internet. However they are usually in plain text without much multimedia elements.

e) Discussion with Supervisor

Useful advices had been obtained from discussions with the supervisor of project via personal meetings or emails. Theses formats had been my provided by supervisor in order to complete CyberCPP project plan in a correct proper manner.

f) Questionnaires distributions

A survey conduct through questionnaires is carried out to collect information and opinions from respondents. The questionnaires are distributed to respondents, who can then complete them on their own time. Questionnaires allow facts to be collected from a large number of people while maintaining uniform responses. Fixed-format questionnaire is used to conduct the survey. The respondent is given several answers to the given questions and they must choose from the available answers. This makes the result much easier to tabulate.

4.7 SYSTEM DESIGN

System design is a complementary problem-solving technique that reassembles a system's component pieces back into complete system. [17] Design is a creative process for transforming a problem into a solution and the description of its solution. Requirements that are found in analysis stage are actually translate into design specification. System design describes in detail of how this system will meet the requirement identified during system analysis.

4.8 DATABASE DESIGN

CyberCPP use database to store all the important information such as user information, forum posted, forum reply, questions, exercises, the answer and result if the exercise that had been taken by the users. It will also include all the feedbacks that users give to the administrator for enhancing sthe CyberCPP.

4.8.1 Data Dictionary

The function of data dictionary is to store the metadata a business information system such as business entities and their relationship with one another, attribute of entities, primary and validation rules and triggers. A metadata is data about data. [sellapa]

a) Table Name: User

Description: This table stores the login information of users for validation of logging into the system

Column Name	Data Type	Length	Description
UserID	Text	20	Identification of the user
Password	Text	20	Password to logging validation into the system
Name	Text	50	User's Full name
Level	Number	1	Level of access- administer or user
Email	Text	50	User's email
Country	Text	50	User's country
Gender	Text	50	User's gander
Age	Number	3	User's age
Address	Memo	2000	User's address
DateRegister	Date/Time	17	Date and time user register to the system

Table 4.3 User login table

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b)   Table Name: Exercise

Description: To store the answer for each question of the exercises in CyberCPP.

Column Name	Data Type	Length	Description
UserID	Text	20	Identification of the user
ExerciseID	Text	20	Identification of the exercise
Question	Text	2500	The question
Answer_A	Text	100	One of the objective answers of the question
Answer_B	Text	100	One of the objective answers of the question
Answer_C	Text	100	One of the objective answers of the question
Answer_D	Text	100	One of the objective answers of the question

Table 4.4 Exercise Table

c)   Table Name: ViewTopic

Description: To store the topic available in the forum

Column Name	Data Type	Length	Description
TopicID	Autonumber	10	Identification of the topic
Name	Text	50	Name of the topic

Table 4.5 Forum's Topic Table

d) Table Name: Thread

Description: To store the thread for each topic posted in the forum

Column Name	Data Type	Length	Description
ThreadID	Autonumber	10	Special ID for the thread
Name	Text	50	Name of the thread
TopicID	Number	10	The special ID of the topic

Table 4.6 Forum's Thread Table

e) Table Name: Message

Description: To store the message posted by the user in the forum

Column Name	Data Type	Length	Description
MessageID	Autonumber	50	Autogenerated for the message
Subject	Text	50	Subject of the message
Message	Text	20000	To store the message posted to the forum
Author	Text	10	Idetifition of the user
ThreadID	Text	10	Special ID for the thread
Posted	Date/Time	17	To store the date the message submitted

Table 4.7 Forum's Message Table

4.8.2 Entity Relationship (ER) Diagram

Entity Relationship Diagram used organize and document CyberCPP data. The following diagram represents the CyberCPP database relationship.
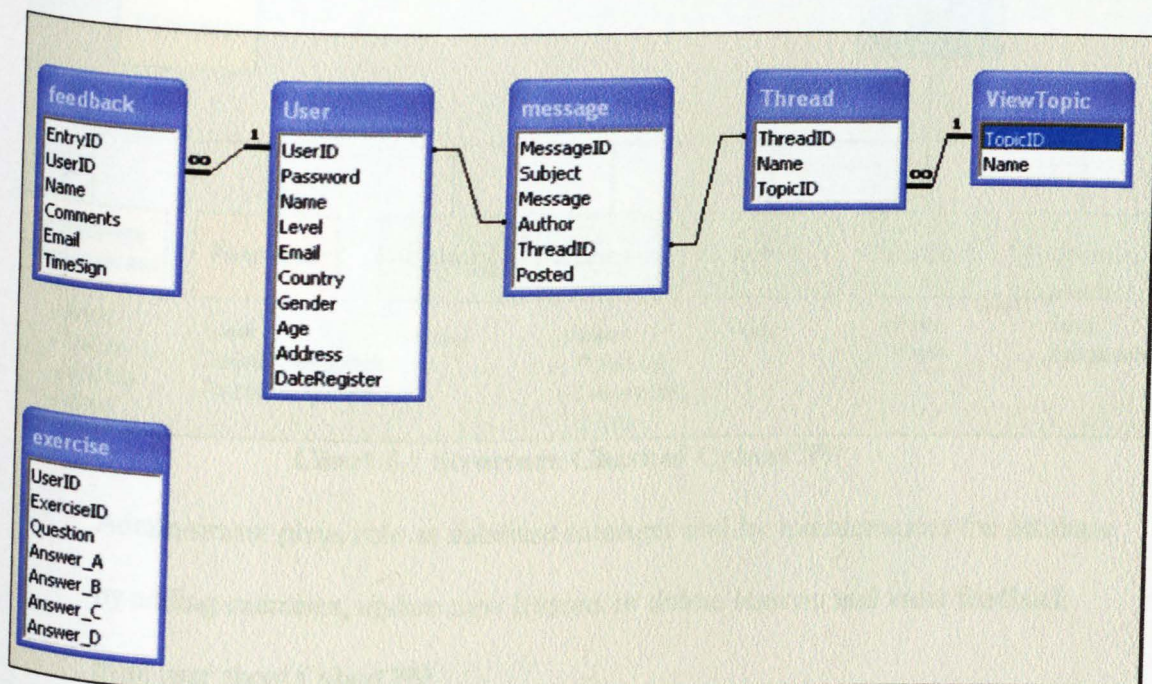

Figure 4.1 CyberCPP ER-Diagram

4.9   PROGRAM DESIGN

Design of the system is based on the system requirement stated in System Analysis. It translates system requirements into system functionality. This design focus on the system structure design, flow chart and data flow designs. The main structure of CyberCPP is divided into two main categories which are administrator and users. Figure 4 shows the overview structure chart of the system.
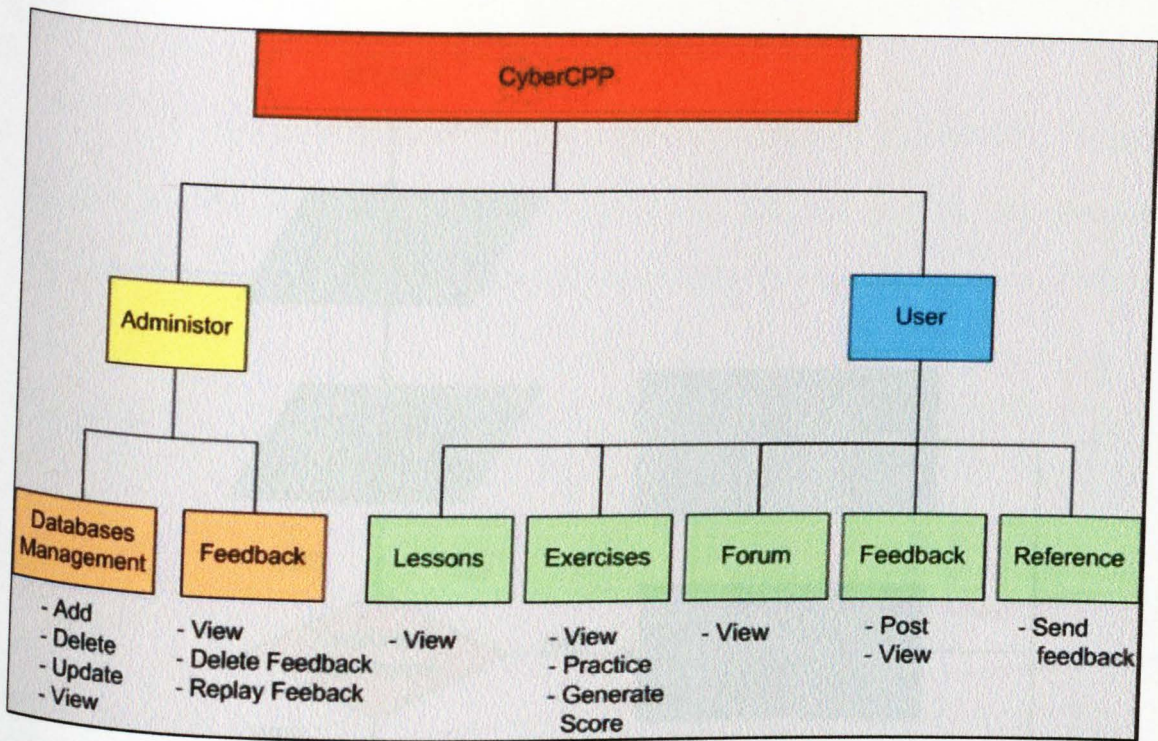
Chart 4.1 Structure Chart of CyberCPP

i) Administrator plays role as database manager and by maintenances the database by adding exercises, update new lessons or delete lessons and view feedback from user about CyberCPP.

ii) User can view lessons, do exercises, involve in forum and view the reference about C++ programming language and then send feedback to the administrator.

4.9.1 FLOW CHARTS

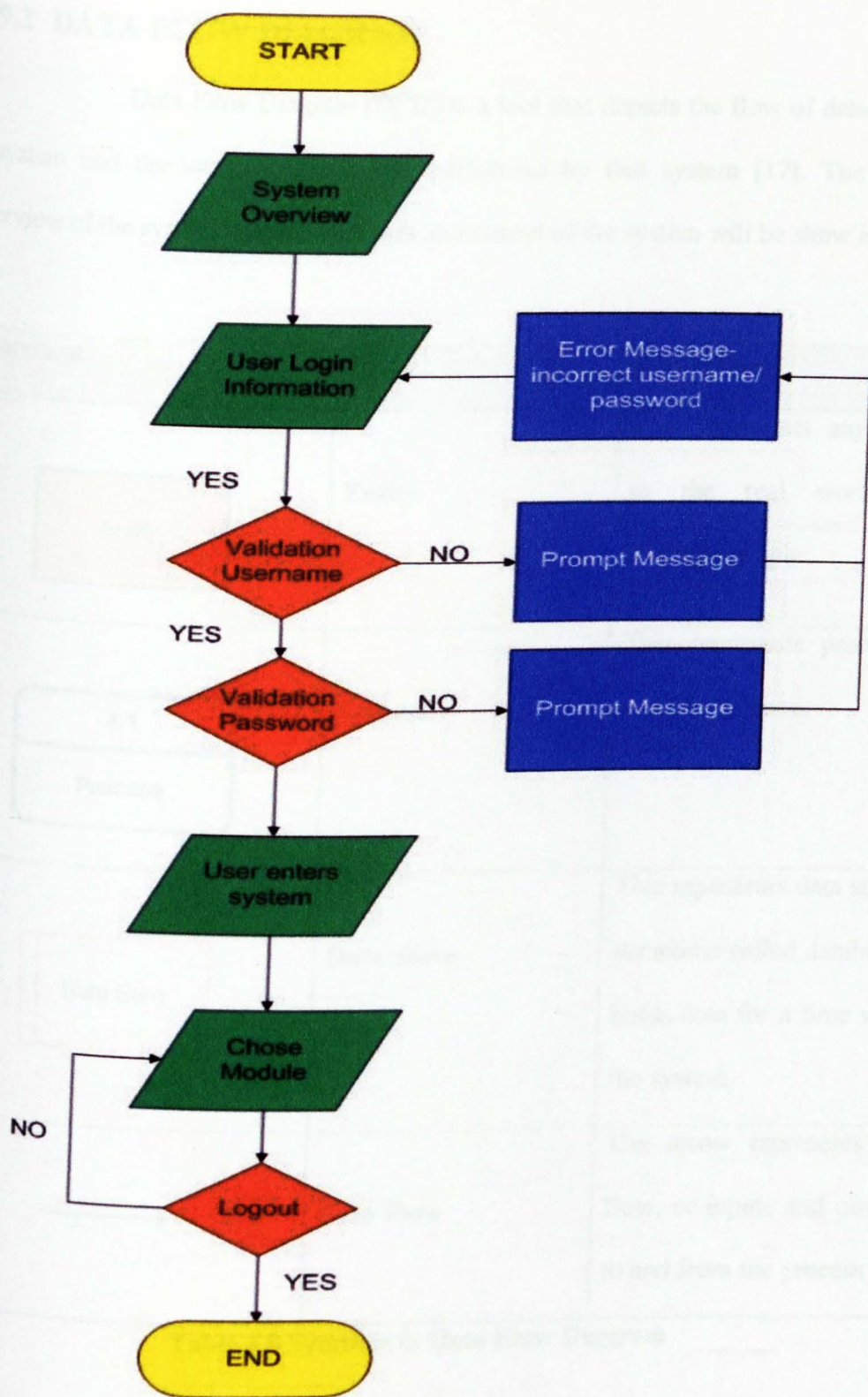Below is the flowchart that determines the sequence of process involved in CyberCPP.

Chart 4.2 General data flow for user of CyberCPP

4.9.2 DATA FLOW DIAGRAM

Data Flow Diagram (DFD) is a tool that depicts the flow of data through a system and the work or processing performed by that system [17]. The general overview of the system inputs, processes and output of the system will be show in DFD.
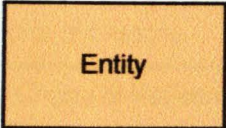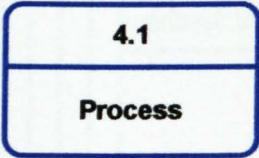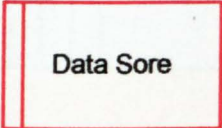
Component	Name	Description
Entity	**Entity**	This represents any object in the real world, for example people.
4.1 Process	**Process**	This represents process or work to be done.
Data Sore	**Data Store**	This represents data store or sometime called database. It holds data for a time within the system.
→	**Data Flow**	The arrow represents data flow, or inputs and outputs, to and from the process

Table 4.8 Symbols in Data Flow Diagram

a)   The Context Level Diagram of CyberCPP

Chart 4.3 Context Diagram of CyberCPP

Chart 4.4 Data Flow Diagram of Combining Exercise and Lesson Module

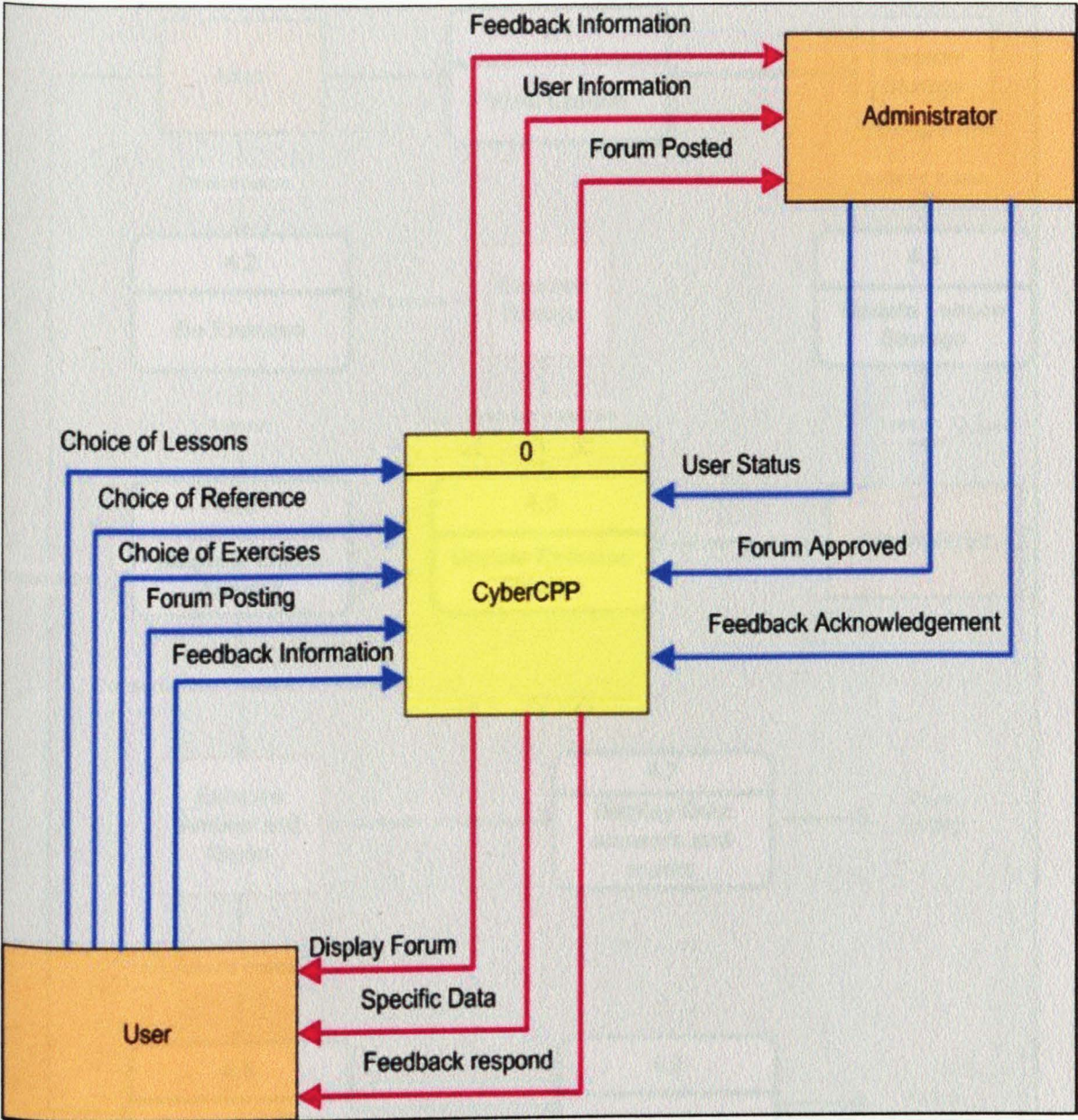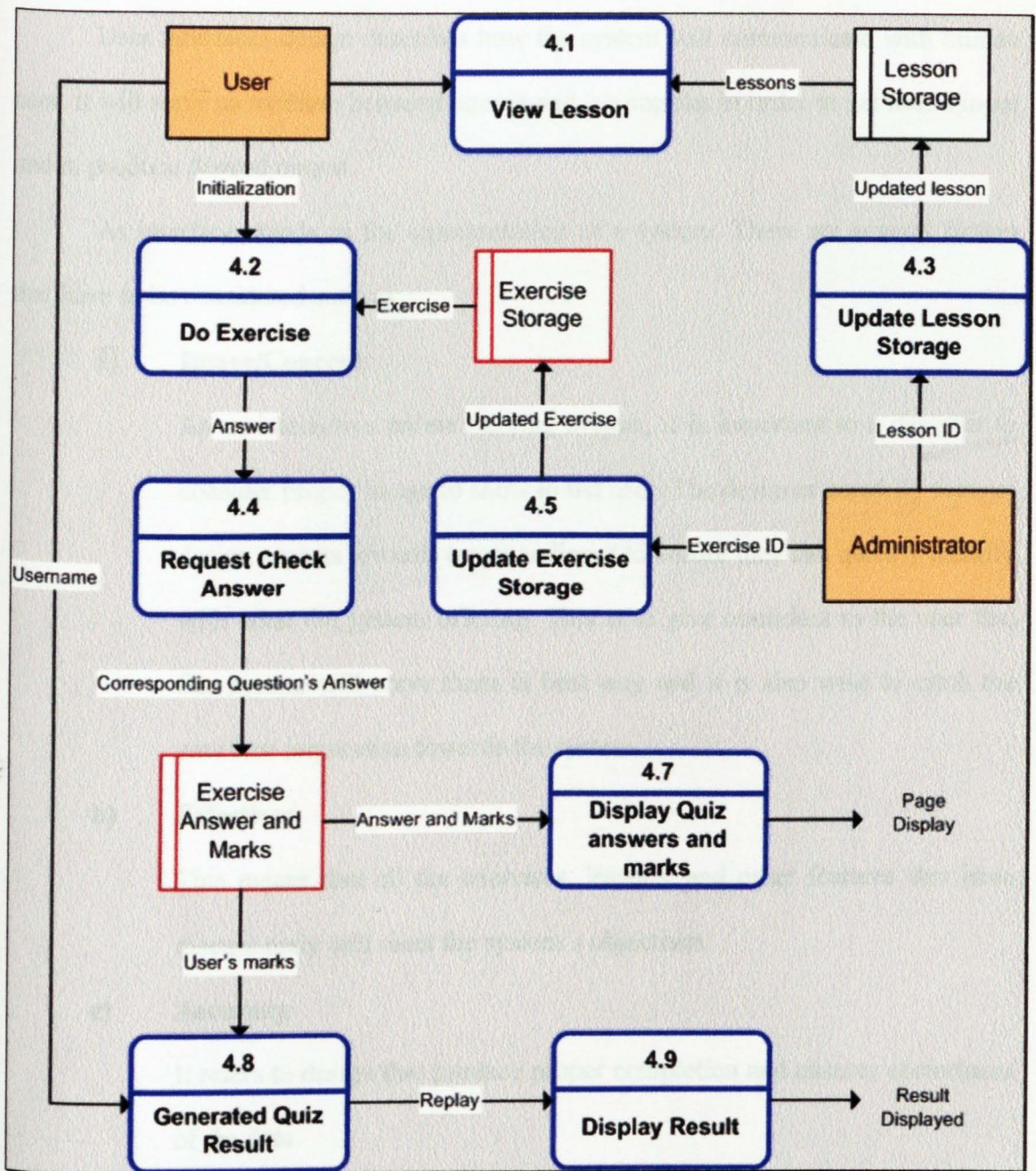## 4.10   USER INTERFACE DESIGN

User interfaces design describes how the system will communicate with human user. It will serve as medium between human and a computer in order to get user's input and to produce desired output.

As interface stands as the representation of a system. There are several factors that have to be considered such as:

a) **Image/Concept**

As an interactive online tutoring system, it is important to a designer to consider proper image to show to the user. The designer carefully focuses design aspects towards target audience to ensure they can quickly identify with what the system offering. This is to give confident to the user that this system will serve them in best way and it is also wise to catch the user first impression towards the system.

b) **Effectives**

This means that all the exercises, lessons, and other features that have discuss early will meet the system's objectives.

c) **Accuracy**

It refers to design that produce proper completion and ensures correctness of the data.

d) **Simplicity and Attractive**

Simplicity refers to maintain each page with same design without confusing to the user. Attractive implies the user will enjoy using CyberCPP.

4.11 Chapter Summary

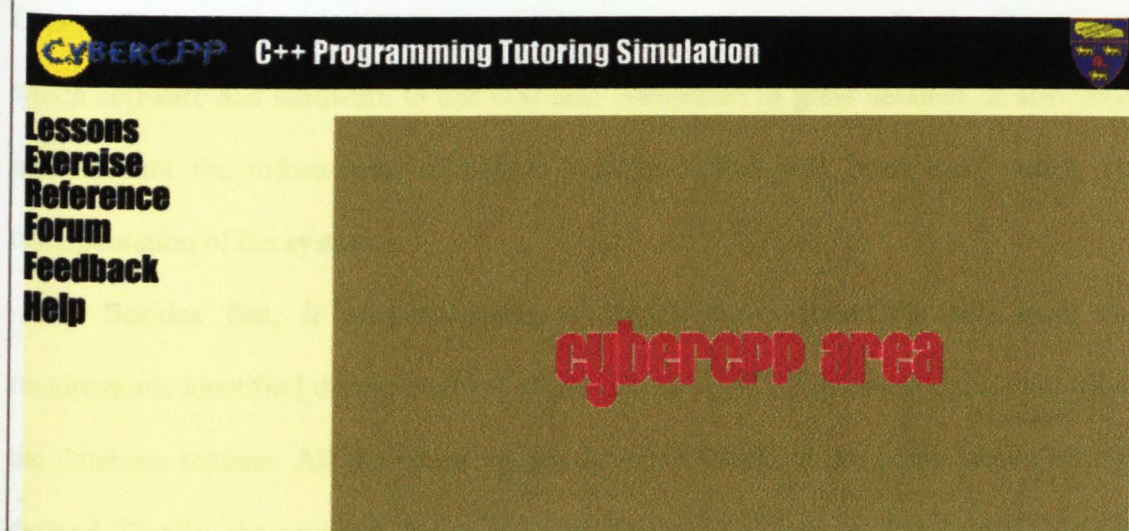This chapter clearly stated the functional and non-functional requirements of

Figure 4.2 Prototype of CyberCPP

4.11 Chapter Summary

This chapter clearly stated the functional and non-functional requirements of CyberCPP in order to build an operable and successful system. The justification of which software and hardware to use was also elaborated in great detailed. It also takes into account the information collection techniques that was been used during the documentation of the system

Besides that, it also describes in details how CyberCPP will meet the requirements identified during analysis phase. The CyberCPP database design describes the database schema. All the related fields for the CyberCPP are being identified and defined. Finally, the program design is being decomposed into smaller identifiable sub system. The ER-Diagram and Data Flow Diagram of CyberCPP are created. The ER-Diagram used to model the system raw data before the creation of Data Flow Diagram. The DFD shows the creation, reading, deletion, or updating of data in CyberCPP database.

Chapter five
System implementation

CHAPTER 5: SYSTEM IMPLEMENTATION

5.1 INTRODUCTION

This chapter will explain the coding methods, techniques, important scripts used in the development of CyberCPP as well as other the functions or effects that are produced by these methods or scripts. System Implementation is a phase that reviews the specification of the system requirements and then transforms it into an operational system through coding or animations. It will integrate the designed modules or functions to develop a system based on the given requirements. It includes system development environment, program coding, and animation and database development. In order to achieve that, appropriate tools and languages are required to be chosen in a careful manner to avoid wastage of time and cost.

5.2 DEVELOPMENT ENVIRONMENT

Development environment has certain impacts on the development of a system. Choosing the suitable tool could speed up system development.

5.2.1 DEVELOPMENT TOOL

Tools used for development include:

a. Operating System: Microsoft Windows XP

b. Application Environment and Web development: Macromedia

Dreamweaver MX

c. Web Server: Microsoft Internet Server 5.1,

Microsoft .NET Framework 1.1

d. Program Coding: ASP.NET

e. Animation Generation: Macromedia Flash MX

f. Database Development: Microsoft Access 2000

g. Graphic creation: Adobe Photoshop 7.0

h.: Macromedia Dreamweaver MX

5.2.1.1 OPERATING SYSTEM

Microsoft Windows XP is used to initial the development when using Macromedia Dreamweaver MX, Macromedia Flash MX and other tools in the development.

5.2.1.2 APPLICATION ENVIRONMENT AND WEB DEVELOPMENT TOOL

Macromedia Dreamweaver MX is used in both application environment and web development of the CyberCPP. While it is used to be the platform for CyberCPP application, it is also used to develop CyberCPP interface. JavaScript is used in Macromedia Dreamweaver to create Web behaviors.

5.2.1.3 WEB SERVER

Microsoft Internet Information Services with a support of Microsoft .NET Framework 1.1 is chosen because it supports the execution of client and server side programming.

5.2.1.4 PROGRAM CODING

ASP.NET which is used to build the websites for CyberCPP ASP.NET could be integrated with other programming code such as HTML code, ADO.NET and scripting languages.

5.2.1.5 ANIMTATION GENERATION

For animation, Macromedia Flash MX is to be used to develop the animation file within CyberCPP. The advantage is, it can be used with ActionScript to enhance the animation such as rollover, insert sound when certain button is being click to play background music. Macromedia Flash MX used to development the introduction page of CyberCPP, lessons' section and the help section.

5.2.1.6 DATABASE DEVELOPMENT TOOL

Microsoft Access XP is chosen to build the database structure for CyberCPP. It is used to store the users' as well as administers' information, view and edit tables created in the database.

5.2.1.7 GRAPHIC CREATION TOOL

Adobe Photoshop 7.0 is used to create and for setting graphic needed in the CyberCPP such as buttons, background and text. It also used to setting the graphic resolution.

5.3 ANIMATION AND MULTIMEDIA APPROACHES

Animation contains in CyberCPP is created using Macromedia Flash MX. Macromedia Flash MX which is the professional standard authoring tool for producing high impact Web experiences. It provides a room for flexibility in creating animation.

5.3.1 ANIMATION CREATION

All graphics created in Macromedia Flash MX are vector graphics. Most of the object and graphic that used in the animation for CyberCPP have to be created in Flash MX itself using the authoring tool provided. Only certain graphic such as the background image and logo are edited using Adobe Photoshop 7.0; then imported into flash MX. The animation is done on separate layer before it is being group together to form a meaningful object. A group of layer forms either a movie clip or part of the movie clip. Those layers consists keyframe that moves along with the timeline. A keyframe is a frame, which defines a change in an animation .The order in which frames and keyframes appear in the Timeline, determines the order in which they are displayed in the movie. The keyframes are arranged in the Timeline to edit the sequence of events in the movie. Dragging a keyframe in the Timeline can change the length of an animation. Figure 5.1 is a part of Timeline in CyberCPP introduction page and Figure 5.2 is part of the animation created using Flash MX.
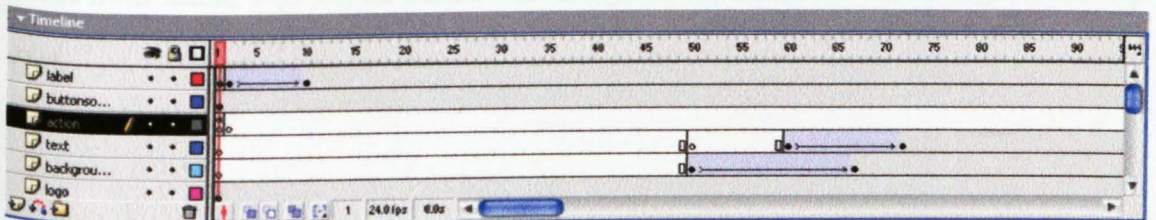

Figure 5.1 Screenshot of Timeline in CyberCPP introduction page

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Figure 5.2 Screenshot of animation created using Flash MX

5.3.2 SCRIPTING

ActionScript is the scripting language of Macromedia Flash MX. It is used with the animation creation to enhance the animation itself. ActionScript works by controlling the behaviors of the elements or objects it handles in Flash. It will behave by telling what Flash has to do and to ask for. This leads to interactive in movies creation. Frame actions are used to modify the movie flow. To make a movie perform an action when the *playhead* reaches a frame in the Timeline, a frame action is assigned to it. For an example, using an ActionSricpt command such as *gotoAndPlay*, will move an event from frame 1 to 10, an action will assign to the frame 1, which is *gotoAndPlay (10);*.

5.3.3 BUTTON CREATION

Buttons created in Adobe PhotoShop 7.0 and then combine it in flash with ActionScript are used to control the movie flow. ActionScript is used to make the movie perform an action assigned to the button when a button is clicked or rolled over.

Figure 5.3 shows an example of button created in Adobe PhotoShop 7.0 and Flash and used in CyberCPP lessons section.
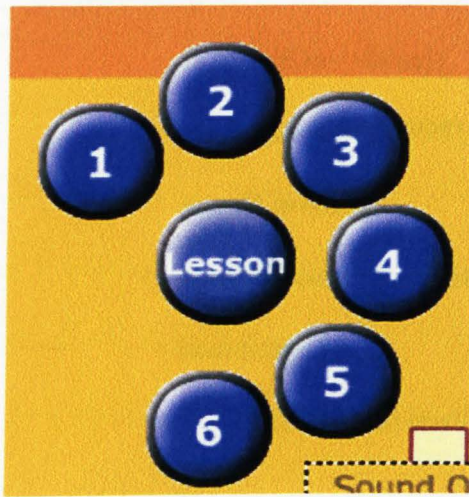
Figure 5.3 Button created using Flash MX

5.3.4 LOAD SOUND INTO MOVIE

Sounds are imported into flash and edited using the sound-editing controls provided in Flash MX. After editing the sound to the desired result, it is loaded into the movie dynamically using ActionScript. Adding sounds could make CyberCPP more interactive. Figure 5.4 show the ActionScript used to play background music in flash

At keyframe frame 1:

```
thisSound = new Sound();

thisSound.attachSound("mySound");

soundOn = true;
```

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```
At keyframe frame 2:

                    thisSound.start();

                    playButton.onRelease =

                    function() {

                            if(soundOn==false){

                            thisSound.start(0,999);

                            soundOn=true;

                            song.onSoundComplete =

                            function() {

                                    thisSound.start(0,999);

                            }

                    }else{

                            thisSound.stop();

                            soundOn=false;

                            }

                    }
```

Figure 5.4 ActionScript to play background music

5.3.5 PUBLISH THE FLASH

Flash documents, which have the .fla filename extension, contain all the information required to develop and design the interactive content including the timeline

of the animation. Flash documents are not the movies the Flash Player displays. Instead, FLA documents will be publishing as Flash movies, which have the .swf filename extension and contain only the information needed to display the movie and it is standalone with small size.

5.4 CODING APPROACH

CyberCPP was developed modularly, mainly by using the bottom-up approach. This approach develops functions and procedures before proceeding to the higher-level modules.

5.5 CODING PRINCIPLE

When development this project, several programming principles are applied in the coding program to ensure the system consistency, maintainability and readability.

- Indenting, formatting and commenting the code help to increase the program code's readability.
- Using a variable naming conversion consistently increase the program's consistency and maintainability.

5.6 DEVELOPMENT OF CYBERCPP

Most of the codes in CyberCPP are HTML tags and ASP.NET Scripts. HTML (Hypertext Markup Language) and JavaScript are used to create the user interface and design for the system. Besides that, JavaScript is used to handle all interactive effects in CyberCPP. In order to make the web pages more dynamically able to process or execute the request from the user, as well as validation of user input, ASP.NET is the script that used mostly in CyberCPP; especially when building the websites. The main functions produced by ASP.NET scripts are as follows:

- ✓ Store the temporary information of a session, for an example, storing a UserID in a cookies variable then store in user computer to keep track which user is signing, provide a dynamic page that cater for that user.

- ✓ Enables authorized and registered users to submit input information for storage, for an example, storing message posted in forum in a database.

- ✓ Enable admin to view and manage users, forum and guestbook sections in CyberCPP.

- ✓ To retrieve the data from the database and display the information in the table form; for example, to view guestbook and forum sections.

- ✓ Enables users to change their password and verify their current password before changing the password.

- ✓ Provide email link to admin so the user could communicate with admin all regarding CyberCPP website.

5.6.1 FORM CREATION

Forms are created using ASP.NET for users to input and pass the data to the server. In the Registration Module, users are allowed to register themselves using to form provided. The forms are done using ASP.NET's form tag because ASP.NET form can hold the data of the user and pass it to the ADO.NET code to process them into the database.

5.6.2 PROCESSING OF FORM USING ASP.NET IN DREAWEAVER MX

After designing and creating form for the user to enter the input, the next stage is to insert ASP.NET code inside the processing page so that the data entered can be processed by the server and updated in the database. Figure 5.5 shows how the form is processed.

```
<MM:Insert
runat="server"
CommandText='<%#       "INSERT      INTO      tbl_user      (User_age,      User_country,
User_education, User_Email, User_gender, User_name, User_pwd, User_username)
VALUES (?, ?, ?, ?, ?, ?, ?, ?)" %>'
ConnectionString='<%#
System.Configuration.ConfigurationSettings.AppSettings("MM_CONNECTION_STRIN
G_datasource") %>'
DatabaseType='<%#
System.Configuration.ConfigurationSettings.AppSettings("MM_CONNECTION_DATAB
ASETYPE_datasource") %>'
Expression='<%# Request.Form("MM_insert") = "form1" %>'
CreateDataSet="false"
SuccessURL='<%# "userregistersucess.aspx" %>'
FailureURL='<%# "userregisterfail.aspx" %>'
>
<Parameters>
      <Parameter Name="@User_age" Value='<%#
      IIf((Request.Form("User_age")
              <> Nothing), Request.Form("User_age"), "") %>' Type="WChar" />
      <Parameter Name="@User_country" Value='<%#
      If((Request.Form("User_country")
              <> Nothing), Request.Form("User_country"), "") %>' Type="WChar"
      />
```

```
        <Parameter Name="@User_education" Value='<%#
            IIf((Request.Form("User_education") <> Nothing),
            Request.Form("User_education"), "") %>' Type="WChar" />
        <Parameter Name="@User_Email" Value='<%#
            IIf((Request.Form("User_Email") <>
            Nothing), Request.Form("User_Email"), "") %>' Type="WChar" />
        <Parameter Name="@User_gender" Value='<%#
            IIf((Request.Form("User_gender")
            <> Nothing), Request.Form("User_gender"), "") %>' Type="WChar"
        />
        <Parameter Name="@User_name" Value='<%#
            IIf((Request.Form("User_name") <>
            Nothing), Request.Form("User_name"), "") %>' Type="WChar" />
        <Parameter Name="@User_pwd" Value='<%#
            IIf((Request.Form("User_pwd") <>
            Nothing), Request.Form("User_pwd"), "") %>' Type="WChar" />
        <Parameter Name="@User_username" Value='<%#
            IIf((Request.Form("User_username") <> Nothing),
            Request.Form("User_username"), "") %>' Type="WChar" />
    </Parameters>
</MM:Insert>
<MM:PageBind runat="server" PostBackBind="true" />
<script language="VB" runat="server">
```

Figure 5.5 Processing of Registration Form by ASP.NET coding in Dreamweaver MX

5.8 SUMMARY

This chapter stated the System Implementation in CyberCPP from the creation of animation to the usage of form for user input using ASP.NET in the back end. The development flow of CyberCPP is well layout in this chapter. Each and every process involved is also explained.

Chapter six
System testing
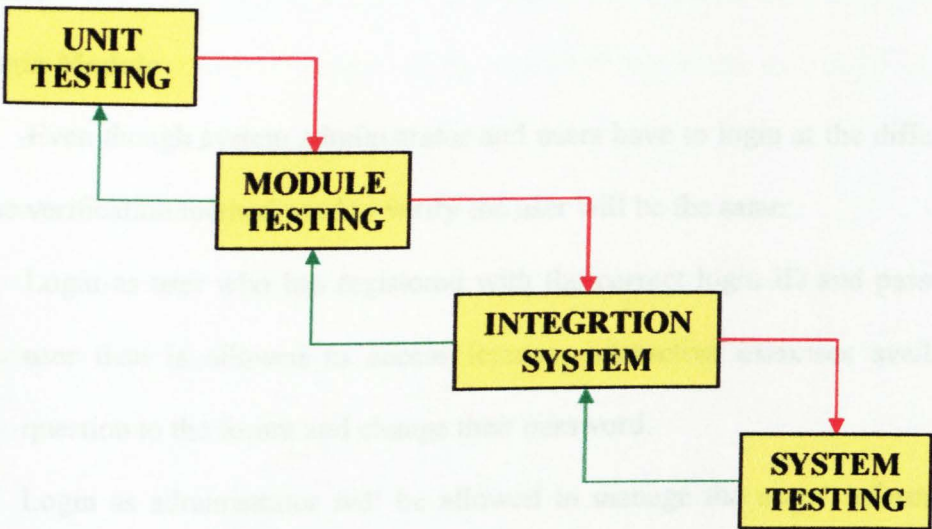
CHAPTER 6: SYSTEM TESTING

6.1 INTRODUCTION

Testing is a process of verification and validation of a system. It is one of the important parts in system development to measure quality control. When a system is still in the building process, it is always important for developer to conduct proper tests on it. This is because to test whether or not the system can do it task swiftly. Another reason is, because it needs to be well presentable to the users.

Testing of the systems can be conducted at various stages of the development process. By testing the developer could detect any coding error or bugs and fix it. Beside that, testing also means the steps or actions to ensure the system is able to fulfill all the requirements specified.

6.2 TYPES OF TESTING

Testing can be classified into various categories. In the development of CyberCPP, tests conducted are according to the flow chart as shown of below:

Figure 6.1 Testing Process

```
UNIT
TESTING
        →  MODULE
           TESTING
                    →  INTEGRTION
                       SYSTEM
                                →  SYSTEM
                                   TESTING
```

6.3 UNIT TESING

Unit testing concentrates on the smallest unit of software design. Each component is treated as a stand-alone entity and tested individually to ensure that they operate correctly. At the beginning of the development, test data is loaded into the database in order to allow tests to be conducted. This test data include mock data that is input into the tables in the database, such as users, exercises, messages for forum and much more.

6.4 MODULE TESTING

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A module is a collection of components, which are interdependent. In fact, it is a stage higher than the unit testing. It tests the combination of several units. The module by itself still cannot represent the whole system but it offers one of the many features among those on CyberCPP. The following section discusses some of the modules testing in detail.

a) Login Module

Even though system administrator and users have to login at the different place, but the verification method used to verify the user will be the same:

i.   Login as user who has registered with the correct login ID and password. The user then is allowed to access lessons, interactive exercises available, post question to the forum and change their password.

ii.   Login as administrator will be allowed to manage the users' information, add new administrator, manage guestbook that posted to CyberCPP, manage messages, add topic to forum, add question for exercises and upload new set of questions for quiz and change their password.

b) Registration Module

i.   The program will check and validate every required fields of the form whether or not the user has filled it.

ii.   The program will not proceed to process the user registration unless the form is completed and validated.

iii.   The program will check whether other user has registered the login ID that new user wants to register. If it is so, it will prompt the user with a notification of fail registration and ask the user to re-register again.

iv.   If the registration is successful, it will send a message to the user that the registration has completed.

c) **Guestbook Module**

Any user who wants to send feedback form regarding CyberCPP has to fill in the comment field. A message will be prompt the user to fill in the field. And if the user left any field blank, another message will be prompted to tell the user to fill in the blank field

d) **Exercises Module**

Any new set of question added to the system can be edited or deleted. When users test the exercises, the system will retrieve all the questions randomly from the database.

6.5 INTEGRATION TESTING

Integration testing involves several modules at the same time to stimulate the entire system. In certain cases, module that tested well during module testing may not give a same result after it is integrated. This is may be because the modules face variable collision. Such collision will cause the program to report error and proper steps are taken to overcome this problem. In this case, a unique keyname should be use to avoid this problem.

6.6 SYSTEM TESTING

After finish integrating several modules together in integration testing process, we must now integrate the systems to obtain the entire system. System testing is

concerned with finding errors, which result from unanticipated interaction between modules and system components. It is also concerned with ensuring that the system meets its functional and non-functional requirements. System testing verifies that elements are functioning properly, and the overall system performance and objectives are achieved. System testing itself can be divided into few more parts that are like:

a) Performance Test

Performance test is conducted to detect the runtime errors. Performance test not only test on the scripting and coding but it also test on the system's hardware performance and stability.

b) Endurance Test

Endurance test is conducted to test whether the system can handle a large amount of data in the database. This includes the loading time when the data are retrieved from the database.

c) Usability Test

Usability test refers to the completeness of the system and its fulfillment towards the functionalities specified during the proposal of the system. This includes comparing the features provided within the system and the list of functionalities requirements produced.

d) Reliability

Reliability test refer to the security of the data in the database. This is to make sure that only certain action can be taken to alter the database.

6.7 SUMMARY

This chapter documented all the system's testing methods approached involved. All the tests selected and conducted are recorded within this chapter. These entire tests are conducted accordingly to the sequence stated.

Chapter seven
System evaluation

CHAPTER 7: SYSTEM EVALUATION

7.1 INTRODUCTION

System evaluation is considered as the last phase of system development life cycle. Many problems and errors were detected and corrected since the beginning of CyberCPP development. Throughout this chapter, all the problems faced will be revealed and discuss. Evaluations and comments on the system will also be highlighted in order to identify the strengths and limitations. It also will include the necessity for future enhancements.

7.2 PROBLEMS AND SOLUTIONS

a) Lack of Knowledge in Web Development

CyberCPP is developed as Web-based system. Therefore, knowledge on web development system must be gained to understand how the system works. To accomplish that, I have take lot of efforts to equip myself with the necessary knowledge on web development through internet. Browse all kind of expert's forums and discussion related to web development. Beside that, I also browse some collection of book in the library and bookstore to know more about this topic.

b) Lack of Knowledge using Multimedia Software's

As the lesson in CyberCPP is in multimedia, it is essential to learn all necessary software's to build a multimedia project. Thus, before I could do anything I have to learn and understand lot of thing how to use the software. For example, the building lessons module, I used Macromedia flash MX. It is quite difficult to use the software when you

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have never experienced to use it before. Therefore, I have to take time to learn the techniques use the software itself before I could use it. To sharpen my skill, I learn through reading by books and internet. I learned mostly from the internet because there were many tutorials and discussions could be found from the discussion room and experts forums. Creativity also an important part in multimedia, therefore, I have spent plenty of time research on books, magazines and art material to find a fresh idea for the overall concepts of the lesson module.

c) Time Constraint

The development duration for CyberCPP is rather short. Besides that, the development period also comes at the same time within a study semester. Therefore there is a need to juggle the time spent on each activity. A smart time management and planning is required to accommodate all these activities in order to fully equip myself with the knowledge requirements.

7.3 EVALUATION BY ENDUSERS

Numerous users were invited to try out the system. User selected involved in this test were first years student from Science Computer and Information Technologic, University Malaya. They are currently taking a C++ programming course currently. Comment and critics from these users are evaluated and proper change has been made.

7.4 SYSTEM STRENGTHS

Below are the strengths of CyberCPP: -

a) Interactive Learning Experience for Users

User will gained an interactive learning experience of CyberCPP. User will be able to have fun and thrills of learning C++ in new style or form.

b) Availability to the World.

As CyberCPP is a web-based system, user can access the system from anywhere around the globe anytime. All that they need is just a computer with Internet connection.

c) Simple, interesting and user- friendly interfaces

The fact that CyberCPP will be using by people from all range of age. The interface was built in simple and easy to use but interesting at the same time.

d) Management of Users

CyberCPP allows administrators of the system to actually have much control over the users of the system. Administrators can add in new questions and quizzes, filter the signing of guest books and forum postings. Administrator could also modify the website by uploading the new page.

f) Random Generation of Questions in Exercises

Questions are loaded randomly from the database to avoid users from feeling dull and boring. Such random questions will provide them new challenges every time they pursue into that particular quiz.

g) Quiz questions

Quiz question in the lesson can be updated regularly by upload the new set of quiz on the website. In this way users can have new questions to test their knowledge.

7.5 FUTURE ENHANCEMENTS

a) Allows questions in lesson could take from the database.

Currently all the questions in lesson module, were taken from XML file wrote by the Administrator. For future enhancement, the questions could be taken straight from the database. This will let the administrator update the set of questions more easily.

b) Downloading of Lessons for Offline Viewing

In the future, the users should be allowed to download the lessons files to their computer so that it can be shared easily and viewed at computers without Internet connection.

c) Keep track on user progress.

In the future, it is a good if this system can store all the user exercises and quizzes score. In this way, user can see how much progress they made so far.

7.6 KNOWLEDGE AND EXPERIENCE GAINED

Knowledge and experience gained from the development of CyberCPP are invaluable. There are new thing I have learned and I could use in the future. In using multimedia element in the development has taught me there is different approach to handle this project in comparison to non-multimedia web system. Knowledge and experience on web development as well as web programming was very much practiced throughout this duration of time. Beside, I gained problem solving and decision-making skills during the development.

7.7 CONCLUSION

CyberCPP has managed to accomplish the specified system objectives and fulfilled all the requirements stated regardless of whether or not it is functional or non-functional. The knowledge gained will be extremely useful for future usage. My time spent to master languages like ASP.NET, HTML, JavaScript, VBScript and more will not be a waste, as these languages are very highly demanded out there in Information Technologies Industries. The application of knowledge learnt from subjects taught throughout my 3 and the half years in Bachelor of Computer Science is also widen my knowledge in the process of CyberCPP development. CyberCPP that developed has been fully tested and is a reliable system. Each and every procedure selected, including for those form software engineering, concepts, principles, techniques are picked after through studies on it. Its suitability is analyzed before it is decided to be used. All these experiences gained will be especially useful in my future involvements of either software or web development.

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Appendix
CyberCPP   User Guide

CONTENTS OF THE CYBERC USER GUIDE

CHAPTER 1: HARDWARE AND SOFTWARE REQUIREMENTS

1.1 Minimum Hardware Requirements:

Intel Pentium 200Mhz processor or higher

32 MB Ram

Internet Connection

Monitor capable display a resolution of 1024 x 768

1.2 Software Requirements:

Windows 98, Windows ME, Windows NT, Windows 2000, Windows XP

Microsoft Internet Explorer 4.4, Netscape Navigator 4.5 or later

Macromedia Flash payer 6.0 or above

CHAPTER 2: NAVIGATING MAP OF CYBERCPP

Introduction

Main Page

User Page's

Lessons

Exercises

Labs

Forum

Guestbook

Help

Change Password

Sign Out

Register

C++ Overview

Syllabus

Guestbook

View Guestbook

Administration

Administration Page's

Manage Member

Edit Exercises

Upload Quiz

Edit Guestbook

Forum

Change Password

Sign Out
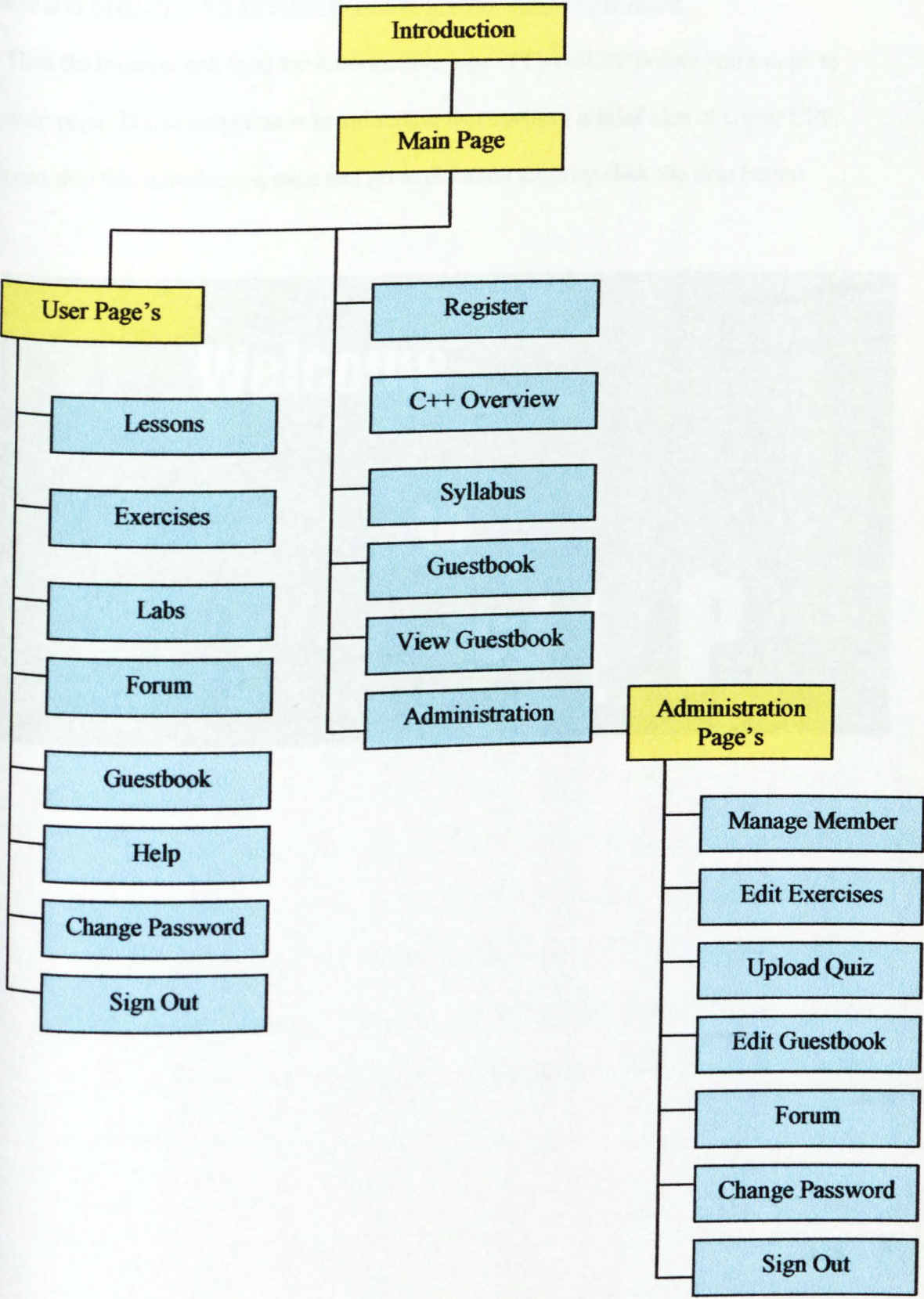
CHAPTER 3: STARTING CYBERCPP

You can start accessing the websites by using your Internet Explorer. CyberCPP can

be access at http://ww3.brinkster.com/CyberCPP/intro.aspx.

Then the browser will load the introduction page of CyberCPP before you can go to

the main page. The introduction is in animation that contains a brief idea of Cyber CPP.

You can skip this introduction page and go to the main page by click the skip button.

CHAPTER 4: USING CYBERCPP FOR USER

4.1   MAIN PAGE

The screen below shows the main pages of CyberCPP.
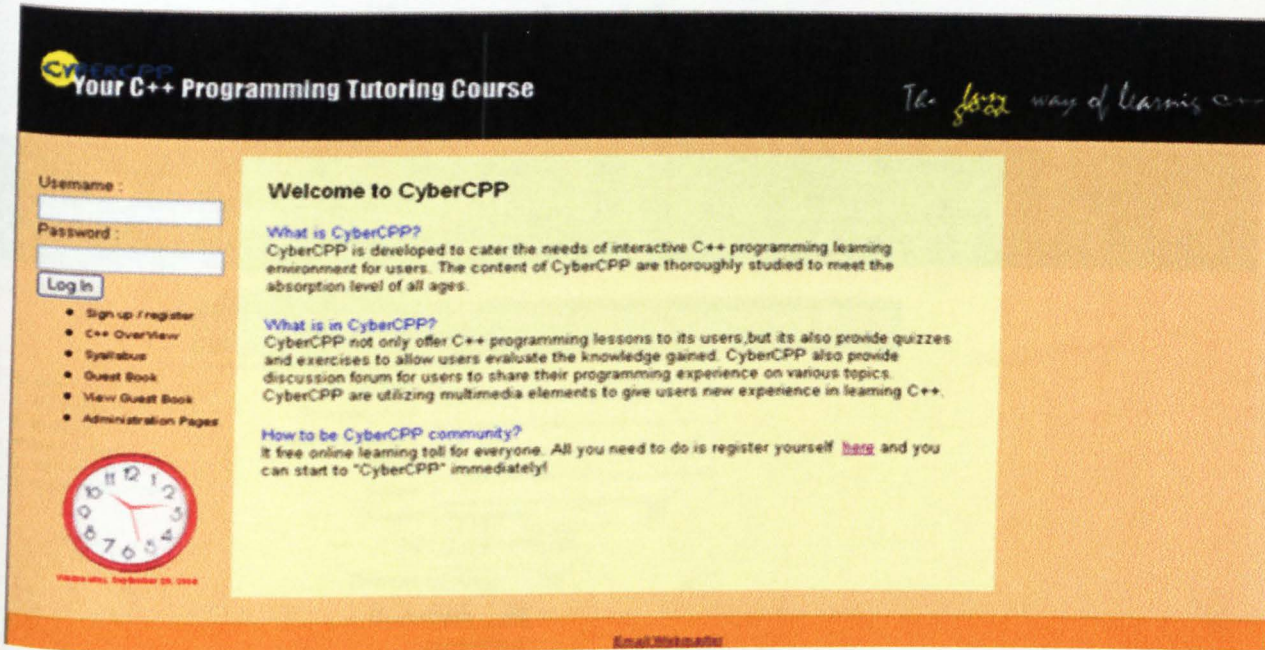
All visitor have to enter this page before proceed to other pages. Existing user may

sign in to process User page for CyberCPP and unregistered user must register first

before he or she can enter User page.

4.2 LOGIN

To log in to CyberCPP, users must enter their username and password. Then click

the "Log In" button to allow the system to verify the user. If entered username and

password are correct, it will proceed to the user page but if unmatched or not existed

from the system databases. It will prompt a message "Invalid username of password

please try again" and users need to enter their correct username and password again or

register.

4.3 NEW USER REGISTRATION

To register, click the "sign up/register" button on the left side the screen. Then the registration form will appear as shown below.

Users have to fill up all the necessary information before continue. All the field mark with * must be filled up. If any the required field is left blank. A message will be prompt to inform the user to fill the regarding field. After all the information filled up, users need to click register button to process. The system will check whether the username are already being use by other user or not. If there is no one use the user name, the system process to the main page. But if there already other user uses the username, it will prompt a message telling the user to register with other username.

4.4 USER PAGE

This is the main page for users. On this page, user can access through all the
available service the system provided. If the user wants to log off, user can click button
sign out at the bottom left screen.
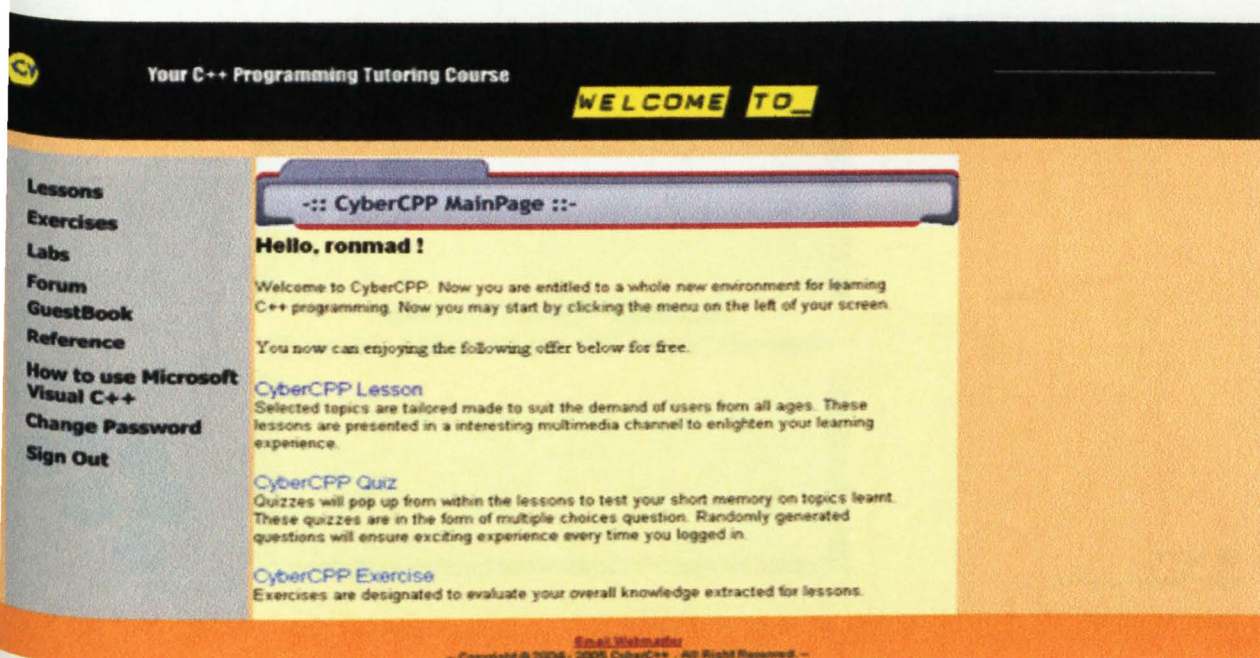
4.4.1 LESSONS

To start the lesson, users have to click lesson button on the user page.
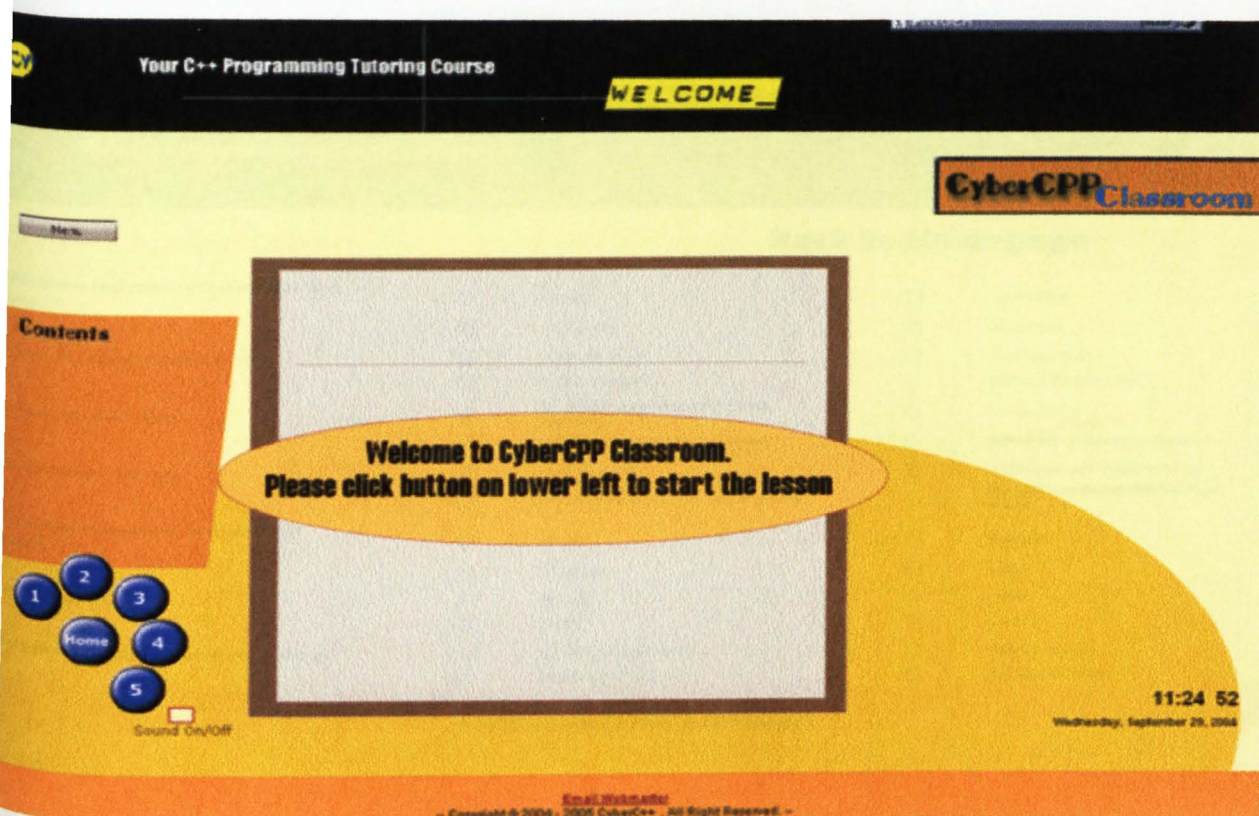
User can go through each lesson by start click the five buttons on the lower left

screen.

4.4.2 EXERCISES

Users can access the Cyber exercises section and try out the entire question
and check out the right answer.

Your C++ Programming Tutoring Course				*The easy way of learning C*
Exercise 1 (Introduction)			**Back to Homepage**	

Question				
1) The statement that correctly defines an integer called sum is...	○	int sum	○	Csum;integer
	○	integer sum	○	integer:sum
2) Identify the formatted console I/O functions.	○	cin>> and cout<<	○	cin << and cout >>
	○	fgets() and fputs()	○	getchar() and putchar()
3) The function cout<< returns...	○	the acutal values displayed for each argument	○	no value (void)
	○	ASCII values of the characters read	○	the number of characters displayed
4) The function cin>> returns...	○	no value (void)	○	ASCII values of the characters read
	○	the actual value reads for each argument	○	the number of successfully read input values
5) What is the only function all C++ programs must contain?	○	start()	○	system()
	○	program()	○	main()
6) Identify the valid identifier.	○	@sushi	○	_ilTTle
	○	#Hello	○	money$
7) Identify the character-oriented console I/O functions.	○	getchar() and putchar()	○	gets() and puts()
	○	fgets() and fputs()	○	scanf() and printf()

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4.4.3 LABS

Below is the screen shot for lab section.

Your C++ Programming Tutoring Course

The easy way of learning C++

Question 3:

Given the lengths x, y, z of sides of a triangle, writes a program to compute the area of the triangle.

The formula for computing area is given by

area = $\sqrt{s(s-x)(s-y)(s-z)}$

where s is the semi-perimeter of the triangle

$s = (x + y + z) / 2$

Write a program to get values for x, y, and zand to compute area.

The program should print area x, yand z.

Attempt   **Posibble Answer for Question 3**   **Download Output Question 3**

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If the user want to try out the question right away by online. User can click on attempt link button to access online web compiler. If users want to see the answer for each lab question, click the middle button or want to see the output. User can click on the right button to download the output.

4.4.4 CHANGE PASSWORD

Below is another screen shoot of CyberCPP change password page. To change password, user must insert old password and then insert the new one. If the old password is unmatched, it will prompt a message "invalid old password, please try again."

Lessons
Exercises
Labs
Forum
GuestBook
Reference
How to use Microsoft
Visual C++
Change Password
Sign Out

-:: Change User Password ::-

Username: ronmad
Old password: [   ]
New password: [   ]
Confirm password: [   ]
Name: [Muhammad Nor]
Email: [ronmad82@hotmail.com]

[Updated]

4.4.5 SIGN OUT

Click "Sign Out" to exit CyberCPP

CHAPTER 5: USING CYBERCPP FOR ADMINISTRATOR

5.1 ADMINISTTRATOR PAGE

Before administrator can access the site, they have to access their own username

and password
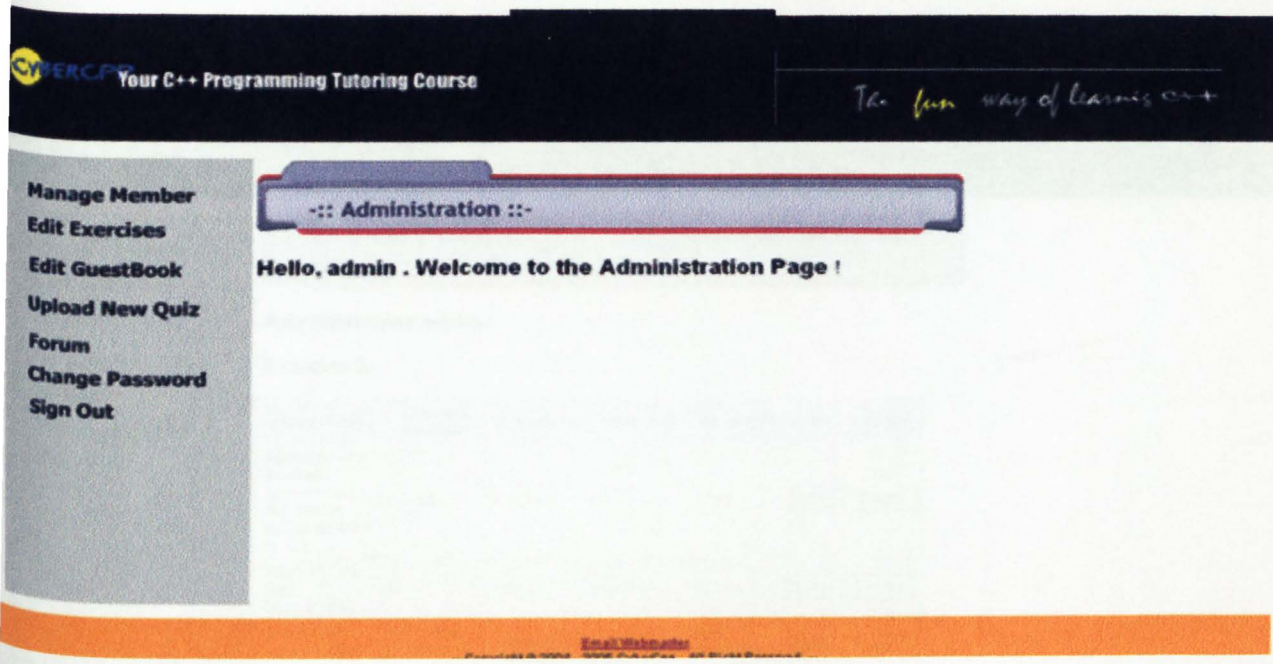

Your C++ Programming Tutoring Course

Welcome to CyberCPP Administration Page.
Please login before continue.

Username: admin
Password:
Login

Administrators allow managing the members of CyberCPP, adding new administrator, managing guestbook, managing forum, uploading new quiz and editing question to the exercises.

Your C++ Programming Tutoring Course

The fun way of learning c++

Manage Member
Edit Exercises
Edit GuestBook
Upload New Quiz
Forum
Change Password
Sign Out

-:: Administration ::-

Hello, admin . Welcome to the Administration Page !

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MANAGE EXERCISE

Administrator could add, edit or delete the exercises store in the database. To edit

the question click on edit button, click on delete button to delete the question or click on

add question button to add new question that locate at the bottom of the screen.

Your C++ Programming Tutoring Course

Manage Member
Edit Exercises
Edit GuestBook
Upload New Quiz
Forum
Change Password
Sign Out

-:: Admin Management Page ::-

Administrator admin !

Exercise 3

Question	Correct Answer	Answer2	Answer3	Answer4	Edit	Delete
Identify the invalid expression for given register int r = 10;	r + 15	r = 20	&r	r/10	Edit	Delete
Identify the valid expression	&r	&255	&(a+b)	&(r=20)	Edit	Delete
A pointer value refers to	any valid address in memory	an integer constant	a float value	any ordinary variable	Edit	Delete
Identify the invalid expression for given float x = 2.14, *y = &xx;	(*&)x	&y	**&y	*&y	Edit	Delete
The address of operator	the address of its		I value and address of		Edit	Delete

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MANAGE GUESTBOOK

Administrator could also manage the guestbook. The functionality on this page as same as

before but administrator can only delete undesired comment from the guestbook list.

Your C++ Programming Tutoring Course
The easy way of learning C++

Manage Member
Edit Exercises
Edit GuestBook
Upload New Quiz
Forum
Change Password
Sign Out

-:: Add New Administrator ::-

Registration Success!

Guestname	Comment	Email	Delete
Ronmad	Good sites!	ronmad82@hotmail.com	Delete
Steve	Good laa..	caigali@yahoos.com	Delete
Yanti	boleh tahan	yan333@yahoo.com	Delete
1			

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5.4   UPLOAD NEW QUIZ

To update quiz in lesson section, the administrator upload the file using this page. All the upload file must in xml type file and named according listed in this page or else it can't read by the flash file use to build the lesson.

5.4   SIGN OUT

Administrator can sign out by clicking the sign out button on the left.