CHAPTER 7

SYSTEM IMPLEMENTATION AND TESTING

In this chapter, the implementation of the ARITHELP is discussed. Section 7.1 relates on the features of ARITHELP. Section 7.2 highlights the structure of the ARITHELP and section 7.3 covers the architecture of ARITHELP. Section 7.4 discusses the tools used to implement the system. Section 7.5 highlights the testing methods used to run the system.

7.1 ARITHELP FEATURES

ARITHELP implements several features in giving tutor and help to the student for arithmetic problem. Below are listed the features that had been implemented:-

1. Step by step interactive instructional techniques.
2. Search facilities which enables user to quickly find the information requested.
3. Help facilities which guide the users on how to solve the problem encounter during answering the question.
4. Carefully explained, using animation to explain the step by step solutions.

7.2 ARITHELP STRUCTURE

Following is shown the structure of the ARITHELP:-

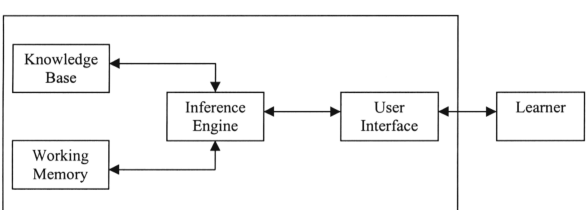

Figure 7.1: ARITHELP Problem Solving

7.2.1 Knowledge Base

An ARITHELP maintains the human domain knowledge in a module known as knowledge base. Domain knowledge is the knowledge of the human expert. Knowledge Base represents long-term model of human problem solving. It contains the problem solving knowledge of a particular problem. There are a number of strategies in representing knowledge base which are using if-then rules, if-then rules with uncertainty measures, semantic network representations and frame-based representation. The rule takes on the following form:-

IF condition(s) THEN conclusion(s)

If-then rules often called as production rules is a widely used method of representing domain knowledge in an expert system.

7.2.2 Working Memory

During a consultation with the system, the user enters information on a current problem into the working memory. The system will match this information with knowledge contained in the knowledge base to infer new facts. The system then enters these new facts into the working memory and the matching process continues.

7.2.3 Inference Engine

The inference engine is acted as an interpreter for the knowledge base where it produces results and provides explanation for problems presented by the users. It is a processor in the system that matches the facts contained in the working memory with the domain knowledge contained in the knowledge base.

7.2.4 Explanation Facility

Explanation facility is not shown in the figure 7.1 above. By using this facility, the system is capable of providing an explanation to the user about how it reached some conclusion.

- **Explaining How**

This capability explains how it solves the problem asked by the users. It shows through step by step instruction that provides the instruction on how to solve the problem. The user will be more confident in the result when they can see the rationale behind the solution.

7.2.5 User Interface

User interface provides smooth communication between the user and the system. The interaction between the system and the user is conducted using different interaction styles. A basic requirement of the interface is to ask the learner problem. In order to obtain reliable information from the user, closer attention need to be paid to the question and answer design. This system interface is designed using menus, push button and pop up screen.

7.3 ARITHELP ARCHITECTURE

ARITHELP is implemented as a standalone system. It consists of a standalone PC to run the system and a CD-ROM as a secondary storage to make the system available to the user anytime and anywhere.

Standalone PC

ARITHELP was running in a standalone PC to enable faster access by the user. It requires high-speed hard-disk capacity to allow faster access and less time to get the data. Following are shown the minimum hardware requirement for running the ARITHELP:-

- Processor : Pentium or greater. A greater processor speed is better in order to run systems with large capacity.
- Operating System : Microsoft Windows 95
- Memory : 32MB RAM available for application
- Display : Color monitor
- Peripherals : mouse, 3.5" disk drive, 7MB available hard drive space
- CD-ROM drive
- Sound card, speakers and printer.

CD-ROM

CD-ROM (Compact disk-read only memory) is an optical-disk format used to hold prerecorded text, graphics and sound. Read only means the disk cannot be written on or erased by the user. It has become an important medium in the following areas:-

- Entertainment and games
- Music, culture and films
- Encyclopedias, atlases and reference works
- Catalogs
- Education and training
- Books and magazines

Recently, more microcomputers are being made with built-in CD-ROM drives with only a single-speed drive. Now, there are double, triple and quadruple speed-drives abbreviated 2X, 3X and 4X. In addition, a 6X and 8X drives are becoming affordable. A single-speed drive can only access data at 150 kilobytes per second whereas a double-speed drive can access at 300 kilobytes per second. Therefore, the faster the drive spins, the more quickly it can deliver data to the processor.

ARITHELP is an interactive program and multimedia programs that require machines and storage hardware that can handle and store enormous amounts of data. For this reason, the high secondary storage hardware capacities is required to store program permanently and *allow it to be used by everybody at anytime and anywhere. Thus, ARITHELP was chosen the* CD-ROM as its secondary storage because of its capability to handle large amount of data.

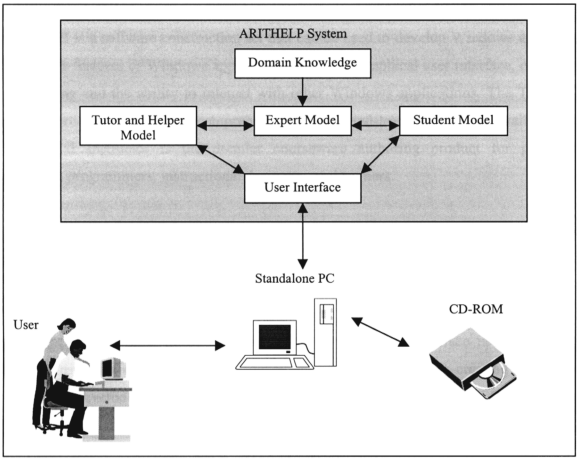

Figure 7.2 : ARITHELP Architecture

7.4 TOOLS FOR IMPLEMENTING ARITHELP

System implementation is the process of creating the programs needed to satisfy an information system's processing requirement. The intelligent multimedia help system is implemented by using various tools. ARITHELP is developed by using a modular approach where each module is coded separately. The aim of this approach is to enable the future enhancement and error detection can be made easily.

There are two software tools included in the development of the ARITHELP. The system is developed using ToolBook II Instructor as a major software and PaintBrush as minor software to support the system.

7.4.1 ToolBook II Instructor

ToolBook II is a software construction set that can be used to develop Windows applications. It has all the features of Windows applications such as a graphical user interface, event driven programming and the ability to interact with other Windows applications. The ToolBook II family of products is the most comprehensive, distributed-learning solution available today. ToolBook II Instructor is the premier courseware authoring product for professional developers, programmers, instructional designers, and trainers.

It is a courseware authoring system designed for broad spectrum of course creators. It provides features and information to get quickly up-to-speed producing high quality interactive courseware. It also provides a combining of easy-to-use templates, wizards, and preprogrammed Catalog objects with the full-featured OpenScript programming language. OpenScript programming allow the creation of an interactive interface in ARITHELP. In addition, Instructor offers a powerful development environment for creating sophisticated courseware delivered over the Internet, an intranet, a local area network, or CD-ROM.

7.4.2 Paint Brush

Paint Brush is one of the most popular and highly acclaimed image editing programs ever available which delivers professional-quality graphics and photo-editing tools with unrivaled ease of use, speed and affordable functionality. It quickly integrates into any work environment, making it easy for business users and home hobbyists alike to enhance digital photographs and create better-looking graphics for both presentations and the Web. PaintBrush is used in ARITHELP to edit the graphics before it can be transferred to ToolBook II Instructor. There is lot of features provided by PaintBrush which is suitable for system design in ARITHELP. The following is shown the features:-

- Retouch and edit photos and images
- Import photos from scanners and digital cameras
- Design great graphics

7.5 SYSTEM TESTING

The system is thoroughly tested to ensure it functions correctly before the program processes actual data and produces information that people will rely on. The aim of testing is to identify errors such as syntax errors which are language violation caused by data entry mistakes, inconsistencies in the program and language grammar errors. The program is tested using several steps which are unit testing, integration testing and system testing.

7.5.1 Unit testing

The program is tested separately in order to uncover errors in each module. The objective of unit testing is to identify and eliminate both execution errors which are errors that cause the program to abnormally terminate and logic errors which are errors in the accuracy and completeness of a program's processing.

7.5.2 Integration testing

Testing two or more modules together that depend on one another is called integration testing. Modules are typically integrated in a top down, incremental fashion. For ARITHELP, each modules of the top level of the system hierarchy are tested individually. After the first test, the next module is added. This procedure is doing repeatedly until all modules are included in the testing.

7.5.3 System testing

System testing is a similar process, but instead of integrating modules into programs for testing, it is integrate programs into systems. This is overall testing of the system to detect an error that may occur.