



CHAPTER I

INTRODUCTION

1.1 Computer-Aided Learning (CAL)

Utilization of computer for learning and teaching has been described by many different words. The most common one is CAI: Computer-Assisted Instruction. But this work uses “learning” instead of “instruction” as CAL, Computer-Assisted Learning, because CAL refers to the use of instructional programs to perform instructional tasks, such as drills, practice exercises, tutorial sequences and tests. It emphasizes on activities initiated by the learner rather than on the instructional materials created by a instructors or authors.

Because of the progression in computer technology, to develop CAI software becomes easy and attractive to use, therefore there are many Science and Technology CAI software developed in many countries.

A simulation and modeling software for teaching Physics in undergraduate level has been developed by the Software Development Group in the Salford University (UK). Boardman, A.D. et al. (1988) suggested the important concepts and definitions in developing CAL software. For a brief example, they suggested that the CAL program must not be just a computerized text-book, but it also able to provide simulating functions.

The University of Bristol (UK) developed an interactive software for teaching experiment in materials sciences for mechanical engineering students. The laboratory experiment chosen was the uniaxial tensile testing of different engineering materials to obtain data on strengths, ductility, and modes of failure. The program contains all

of information previously included in laboratory handouts together with question and answer routines which is used for testing understanding and controlling the course progress. This interactive CAL gives students greater understanding of the experimental principles than laboratory manual does.

In USA, the University of California developed an interactive simulation software for teaching the appearance of bubble chamber tracks, the conservation laws at work in particle interaction, and the random nature of particle creation process. Students successfully used this program in learning. This package used the Alternate Reality Kit (ARK), a graphical animated environment implemented in the Smalltalk-80 language, for creating interactive simulation. (Scanlon and Smith, 1988)

A Computer-Aided Process Engineering (CAPE) program has been developed by Department of Chemical Engineering, Universiti Teknologi Malaysia (Malaysia). It is used as training material in unit operation and process control course. Multimedia was used to provide interactively, clarity and attractive visual and sound effects, which books cannot provide. The lecturers and students that used this computer-aided found that it was easier to learn by this package. However, there are undoubtedly several improvements that can be made on the software and its implementation. (Yusof et al., 1995)

In Thailand, there are many CAI programs in Thai language for students from pre-primary school level to secondary school level, but there is only few works donated for the university level.

The CAL has many advantages as follows:

1. It makes the students actively in the learning process. A computer includes video screen, like a television, therefore it also provide interesting entertaining and informative visual images that help to keep students' attention. Furthermore, the computer requires action from the users before it can perform.

2. The computer can provide fast and systematic feedback to the students.
3. It does not get bored or frustrated with a slow students.
4. The computer facilitates and sometimes even manages remediation.
5. Learning with CAL will give students a computer literacy as well.

1.2 The Significance of This Work

According to Thailand's industrialization, demands of engineers, especially chemical engineers is increasing both quantitatively and qualitatively. Many organizations pay their attention to develop modern media to support in this branch.

This work set its aim on developing a CAL for Unit Operation, because this subject is one of the most important subjects for chemical engineers. This system uses a concept of Object-Oriented Programming to developed a prototype of Thai-version CAL for Unit Operation. Any users can use this system to help them learn this subject easily and effectively because it provides users with many Graphic User Interfaces (GUI).

1.3 The Objective

The objectives of this work are:

1. to develop a computer-aided learning system for chemical engineering unit operations by using a new technique, namely Object-Oriented Programming (OOP).
2. to study theory and basic calculations of chemical engineering unit operations, such as filtration, mixing, flow in pipe, and fluidization.
3. to study Object-Oriented Programming and hypertext utilization technique.

1.4 Scope of This Work

The main structure of this computer-aided learning system is based on unit operation laboratory course in Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University. Seven selected experimental unit operations are Filtration, Sedimentation, Sieve Analysis, Efflux Time of a Tank, Flow in Pipe, Fluidization, and Mixing.

This system developed by separating each experimental unit as a module. Each module has two main sections, calculation section and theory section, as shown in figure 1.4-1.

1) Calculation Section: It will show both numerical and graphical results after users input all correct data. This section is programmed using Turbo C++ for Windows as a compiler.

2) Theory Section: This section shows Thai text and pictures concerning with a selected experimental unit module. It applies hypertext technique to construct hot spots and keywords which are compiled by Help Compiler of Turbo C++ for Windows.

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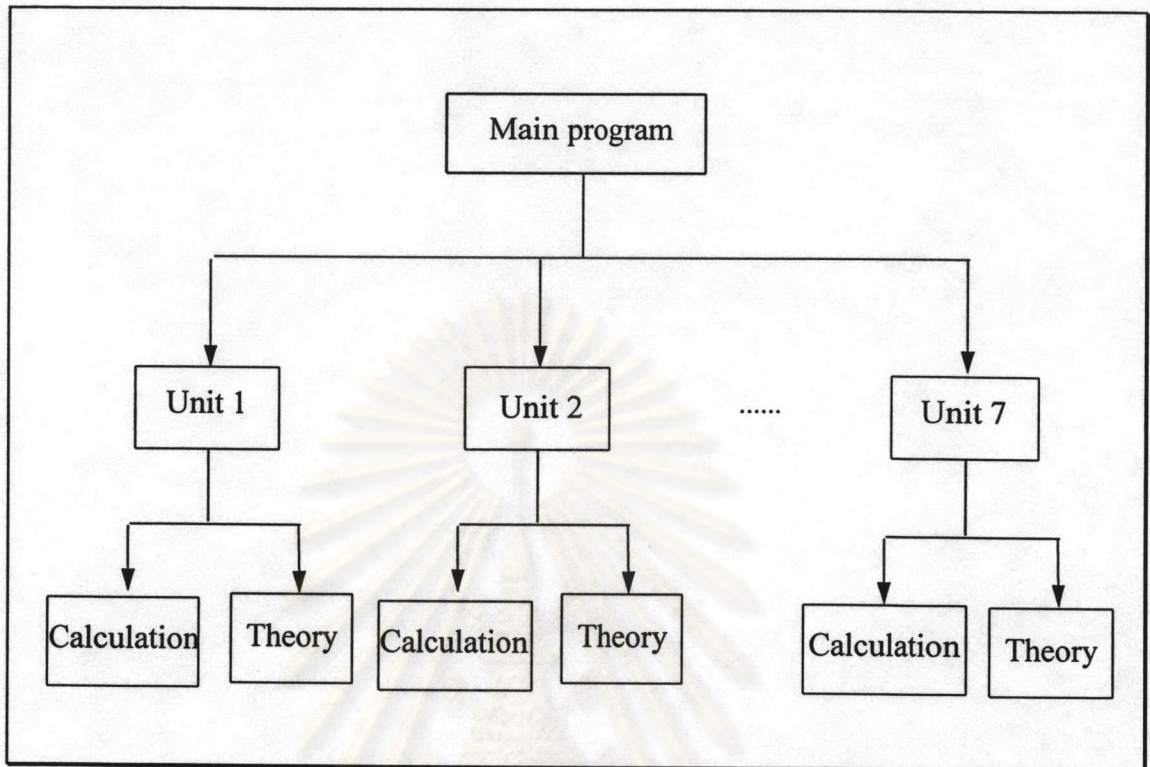


Figure 1.4-1 Main structure of developed CAL for unit operation.

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