Improving Engineering Education—The Development of CAI Software of Hydrology Education

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Abstract: CAI (Computer Assisted Instruction) is a useful tool for the improvement of learning motivation. Student can learn things (course materials) through CAI without limitations. There are many CAI softwares used in various fields of education except in engineering education. Hydrology is a very important field in engineering education, which is studying water phenomenon and use. To be hydrological researchers and educators, we are concerned with this area which could be learned easily by any student. Therefore, we attempted to develop CAI software of hydrology education in this study. The literature concerned two general fields: hydrology and the system of constructing CAI. The literature review could provide a comprehensive picture of theory and practice concerning these two fields. After that, we selected the topics of hydrological textbooks at college level, which were major contents developed by computer language of VB (Visual Basic) 5.0 into CAI software. VB is the most popular software of computer language, which can work in many fields such as Office, Network. The hydrologic CAI software developed in this study covered four topics: Precipitation, Runoff, Flood routing, and Frequency analysis. Each topic contains several learning units. Precipitation topic, as an example, is composed of the following units: Introduction, precipitation type, precipitation data, infiltration formula, infiltration index..etc. Each unit includes both theories and practicing examples. In the further study, authors will try to add multimedia, like animations and sounds, and compute programs to the software. In addition, a test program will be added to the further software, in which the students can do self-evaluation and get feedback quickly. In order to increase learning motivation, the software will cover different topics and levels, which student can make a choice based on their interests and learning ability.

Keywords Computer Assistant Instruction, Improving Engineering Education, Hydrology Education Software, Visual Basic

1. Introduction

Water is necessary to life. Hydrology is a kind of science to water research, the purpose of it is to analyze the characteristic of water, to estimate water resources. Hydrology is applied in many areas like engineering, agriculture, commercial pursuits and livelihood [1,2]. The population density in Taiwan is very high, especially in the urban area where extreme damages on human being and properties often occur when big storm comes. Therefore, the hydrology education is very important, for every one to understand it, to avoid water damage and to enjoy the use of water. For example, when the Typhoon Hubboll came in 1996, a 12-floor building named Lincoln in Taipei City was completely destroyed. Had the structural designer and the residents understood hydrology more, they would have judged the danger and made early prevention. Currently, the most common tools used in hydrology education are the blackboard and projector; the classroom teaching is often limited by the time and space. Therefore, a more convenient and personal ways of learning using computer aided teaching are developed by several researchers [3,4]. In this study, we try to take the precipitation analysis as an example by applying CAI and then expand the research to other areas to understand its applicability. In this fast-growing computer technology time, window glide software user interface is the trend for application in all fields. In this research we try to use VB5.0 software to develop hydrology-teaching materials. VB5.0 is presently one of the most popular programming language, it also provides links over general application system, office suit package software and Internet vision speed application develop tools. The most important thing is that VB is very easy to learn and use. Any personal computer user can develop

his/her own software by VB without any difficulty. There are two basic steps in using VB: First you can use your mouse to drag items from a suitable control panel, for the purpose to establish a figure user interface. Then in the event window inserts basic language.

Due to the extensive scope of hydrology, one can not expected to learn everything from the class. One of the main purpose in this study is trying to provide learning alternatives to the interested students, and enable students for self-learning. Since most of the hydrology textbooks give more theoretical explaining than examples. The purpose of this study is to provide an appropriate learning tool suitable for Taiwanese people.

2. The characteristic of VB software

The characteristics of VB software are the "Object Oriented Programming" and the "Event Execute Mode".

2.1 Object Oriented Programming

We imagine the software as an well-organized company. It usually has divided enterprise areas known as different divisions, each division has its owns resources.

2.2 Event Execute Mode

For window's software, it is in a slumber situation most of time. Unless user did some certain actions, it will proceed certain work, when this work end, it recovers the slumber situation until another call wakes it up again, or user closes it.

3. Establishes CAI software system –Hydrology Education Software (HES)

3.1 Introduction of software system design function

In this research we try to put hydrology education software(HES) on Chinese windows operation system (Microsoft Windows 98). First we use Visual Basic 5.0 'tool box', to build a user interface and uses its 'Property windows' to change the 'Property' of the 'Object', and then edit software program to substantial the application program. A portion of VB5.0 edits windows functions is shows in Fig. 1. Function table includes the function of files, edits, explain, etc. Toolbox includes the function of standard execution file, opens files …etc.

Function.   ToolRow.   Form File.
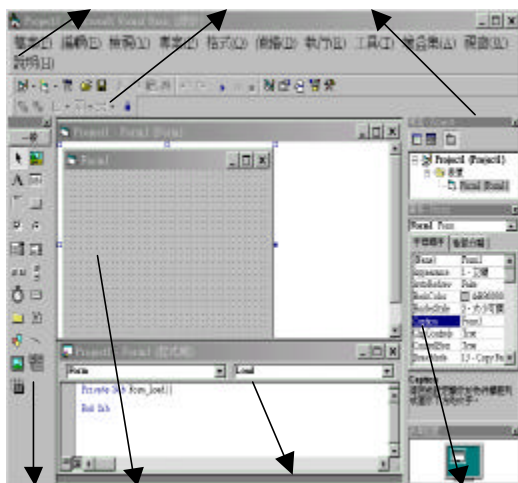
ToolBox. Form Design. Formula Edit. Property.
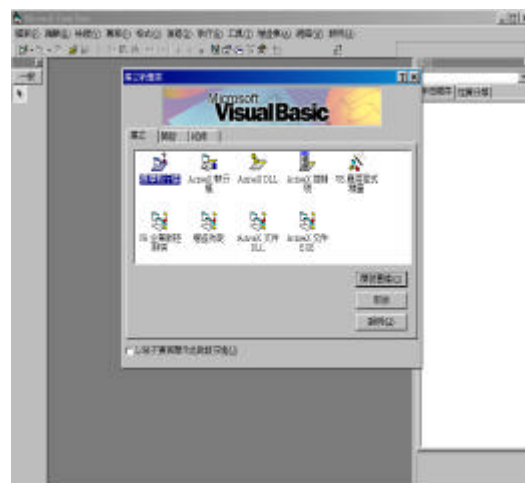Fig.1. VB5.0 software window glide   Fig. 2. Execute VB 5.0.

3.2 Design cover and secret code

For the reason of distinguish different software and user, we design cover and secret code. There are 4 steps, explain as following:

Step 1: Execute VB5.0. Which is show in Fig. 2.

Step 2: Beginning design. Which is shown in Fig. 3. Click "standard execution file", start to design this "form", for example: cover, secret code…
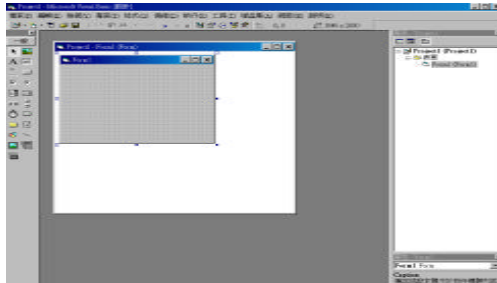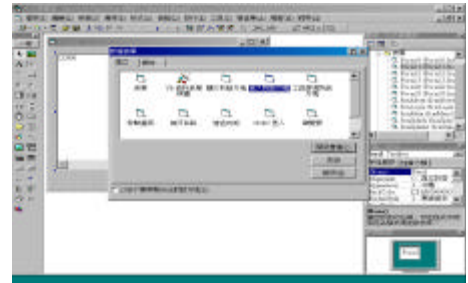

Fig. 3. Beginning design.

Fig. 4. "new form" screen

Step 3: Setting secret code. At "files manager" click "new form", then appears screen which is show in Fig. 4. In Fig. 4. click "Enter the dialogue box", then appears screen which is show in Fig. 5., it can setting secret code.

Step 4. Design the cover. Similar to step 3, click "new form", then screen show in Fig. 4. appears. Click "Start to open screen" on this screen to design cover, the final design is shown in Fig. 6.
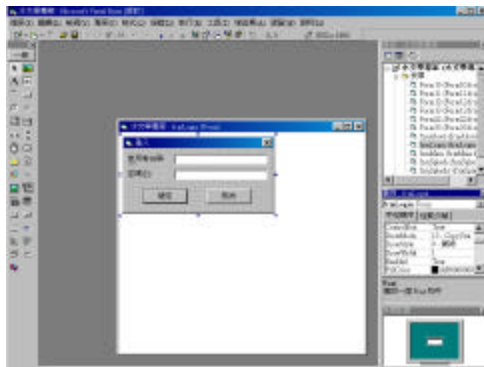
Fig. 5. Setting secret code

Fig. 6. Design the cover

3.3 Design form And the Contents

The prepare of input hydrology data, we design form and the contents. 8 steps to shows designs process

1. At the main screen select the "new form", as shown in Fig. 7

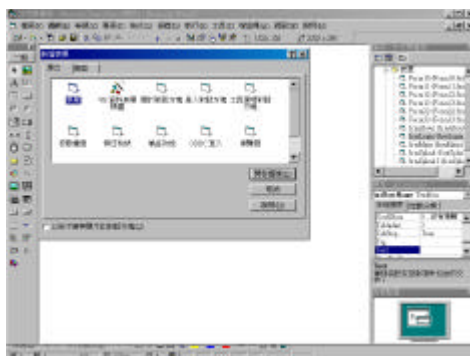2. Start to design each parts, as shown in Fig. 8

Fig. 7. "new form" screen

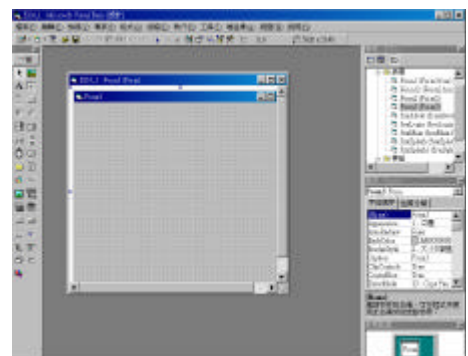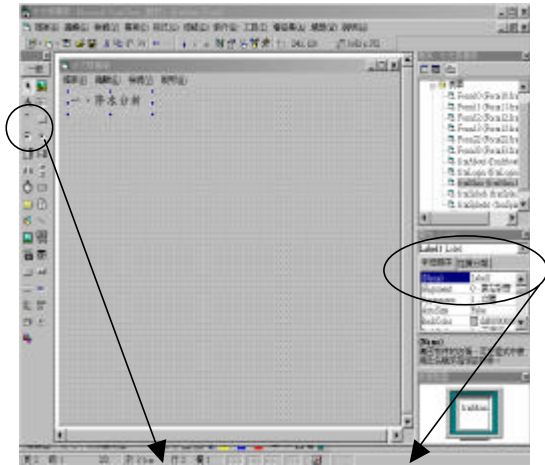Fig. 8. Start to designs each parts

◆   ◆   3
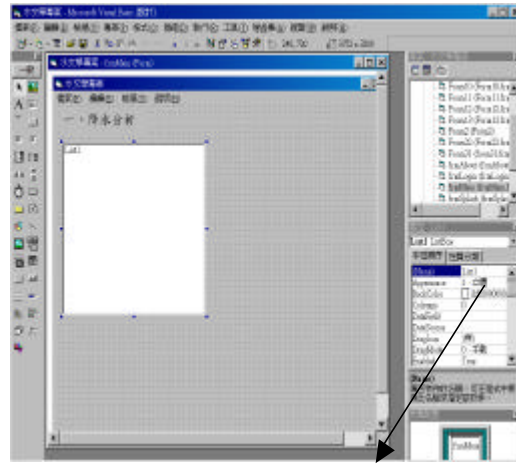
3. Establishes Main Tittles.
 To use edit tool and its 'Property' , as shows in Fig. 9
4. Establishes Subtitles, as shows in Fig. 10., Fig. 11.

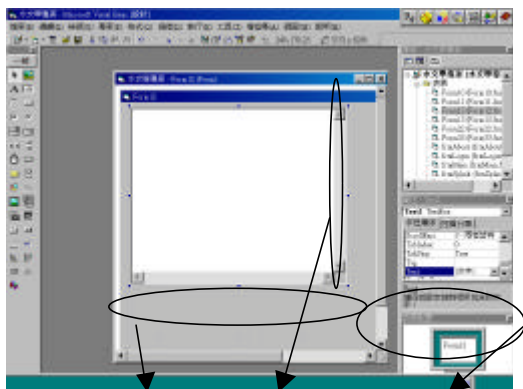(To use edit tool and its ' Property')

Fig. 9. Establishes Main Tittles

(Use the of ' Property's Caption' to input text word)

Fig. 10. Establishes Subtitles (1)

5. Establishes Subtitle' s contents, as shows in Fig. 12.

(Use Property "ScrollBars", it can put in more data ,
 MulitiLine must switch to "Ture" function)
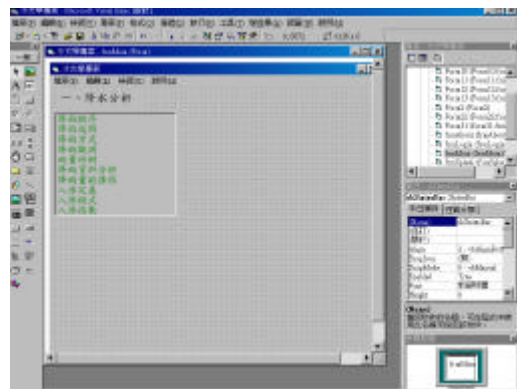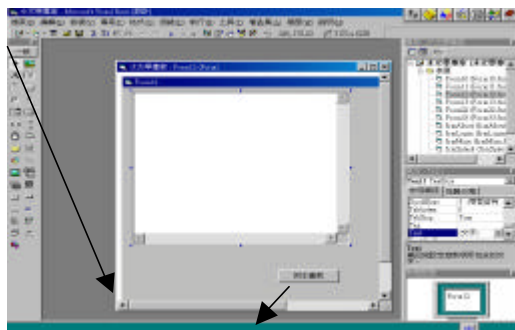 Fig. 12. Establishes Subtitle' s contents.
 6. Establishes "change screen" knob, as shows in Fig. 13.
 7. Returns to the main screen, as shows in Fig. 14.

(Knob from contents, data return to main screen)
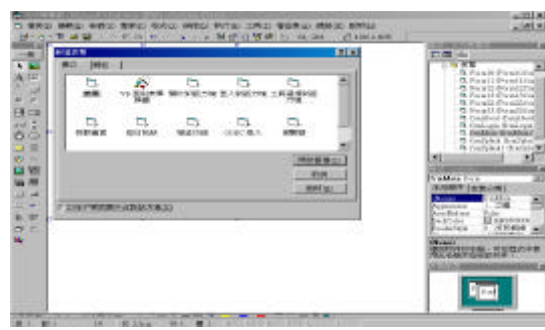 Fig. 13. Establishes "change screen" knob

Fig. 11. Establishes Subtitles (2)

Fig. 14. Returns to the main screen.

3.4 Input the hydrology data

Then import hydrology data to the VB5.0 software. Inputs steps as below

1. Beginning at the steps 5 of the 3.3, open new windows version shows as Fig. 12.
2. Enters to the program data: Follows steps 1, on the 'Object' click mouse left key 2 times, shows as Fig. 15.
3. Sticks up the data, shows as Fig. 16.
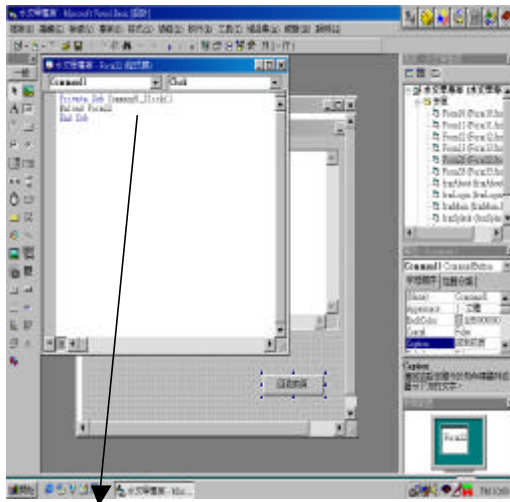
(This are "cancels Form   ", this may return to the main screen)

Fig. 15. Enters to the program data
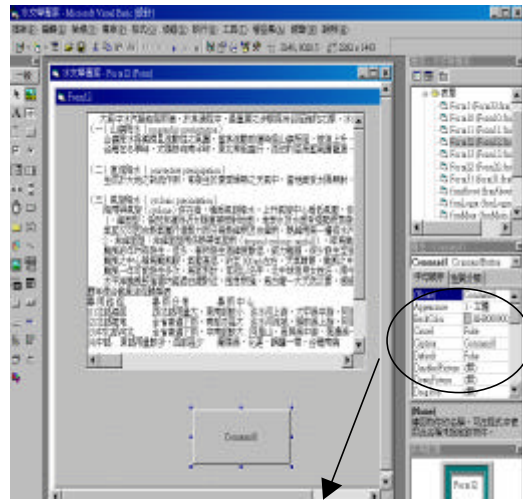
(Sticks text data on 'Property')

Fig. 16. Sticks up the data

4. Contents Arrangement

Each topic divides into three parts: "theoretical description", "calculating procedures", and "examples of calculation". The "theoretical description" explains the basic principle, The "calculating procedures" describe the steps to finding another unknown hydrology quantity by some known data. For "examples of calculation" calculating with data and case study. According to calculating steps, progressively resulting to the answer. Student can choose any interesting unit to learn and study by themselves.

5. Conclusions

Hydrology is an important course in many civil-related regions. In the school, hydrology is often taught through using the blackboard or projector, which is limited by the time and space. In this study, we try to develop windows-based hydrology education software (HES). By which student can study more convenient and independent. The students can arbitrarily chooses his suitable time, place. He can choose any unit of the materials he wants, and then study it repeatedly until he is well familiarizes with the subject. This CAI software is very helpful for student to study hydrology analysis.

6.References

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