Development of Civil Engineering Laboratory Professional Program (CivilLabPro)

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Abstract

This research was to develop the computer application program which was called CivilLabPro for civil engineering laboratory. It consists of analytical part and educational part. Both are designed to use database together and they can use either personal computer or internet system. The analytical part is composed of 15 soil mechanics laboratory and 16 materials testing laboratory that it was written by using visual basic language and it could report not only numerical formats but also graphical results. The results of calculation were stored with database system which wrote by using SQL language. The educational part comprises self study and self exam that it was written by using HTML language and SQL language. The effectiveness of this application was evaluated by questionnaire and opinion in items as follows: easiness of usability, accuracy of results and rightness of subject matter. From the evaluated results found that most people are satisfied with this application and the results were accuracy. This evaluation was summarized that it was good standard and it was capable to use in electronic teaching and working.

Keywords: civil engineering laboratory, database system, internet system, computer program

1. Introduction

Generally, the practice of civil engineering must concern about construction materials that need to have suitable properties for construction work. Consequently, a material testing has necessarily to verify properties before apply to be construction materials. In order to realize about safety of construction, materials testing laboratory and soil mechanics laboratory are the subject of civil engineering discipline to make the behavior understanding for students. In education, students can learn once only for each testing that sometimes they maybe still don't understand actually and have no chance to learn repeated. There are some research works [1]-[5] on computer visualization and virtual laboratory done by researchers.

According to this reason, we get idea to develop an instruction media for self learning, calculation and review a lesson. This software can be used for both instructors and students. Moreover, this development can reduce the software which import from foreign country and can improve easily in the future.

2. Methodology

An idea of this development used database to store data from input operation. In this development is divided into 2 parts that are analyzer and web browser. This software called civil engineering laboratory professional (CivilLabPro) has a concept in both civil engineers and civil engineering students. The conceptual model is displayed in figure1.
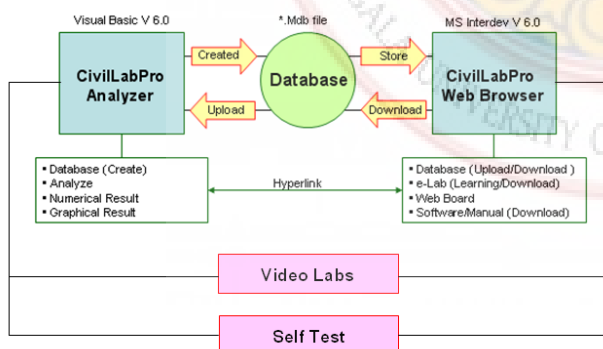

Fig. 1 Conceptual model of development

Figure 1 depicts description and relationship of analyzer and web browser that can use the database together.

The analyzer was developed to be computer program that comprises 16 materials testing laboratory and 15 soil mechanics laboratory. This software was written by using Microsoft visual basic 6.0 and SQL language. It can evaluate properties of civil engineering materials that were brick, wood, steel, concrete and soil.

The web browser was designed to be a learning source of civil engineering testing that comprises soil mechanics and materials testing laboratory. It performed under internet system which was used as server. This server connects to client via Internet Information Services (IIS). Microsoft Interdev was the program which was used for connecting to the database. Users can access this part via web browser such as Internet Explorer etc. User can open the learning part by means of choosing menu Utility/Instruction Online in CivilLabPro analyzer or access directly via www.CivilLabPro.com as shown in figure 2.
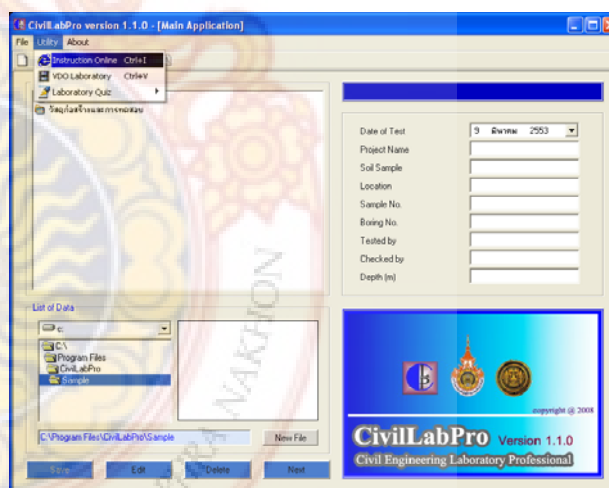

Fig. 2 Connection to CivilLabPro web browser

Both parts can transfer database file as shown in figure 1. The analyzer was used to create a database file, while the web browser was used to store this file in the server. Users can download and upload the database file of testing via internet system. In addition, they can study a procedure of testing from VDO file not only CivilLabPro analyzer but also

CivilLabPro web browser and can take exam the knowledge of each laboratory by self test.

3. Results and Discussion

The developed program was design to have usability like Microsoft office. The description of this program can explain as follows:

3.1 Creation of Database File

After the main program was performed as shown in figure 2, users can choose laboratory testing then click a desire testing name from the list. They must choose a path for storing database file before, after that, click the new file button and name the database file. When they click the save button, then the database file is appeared as shown in figure 3.
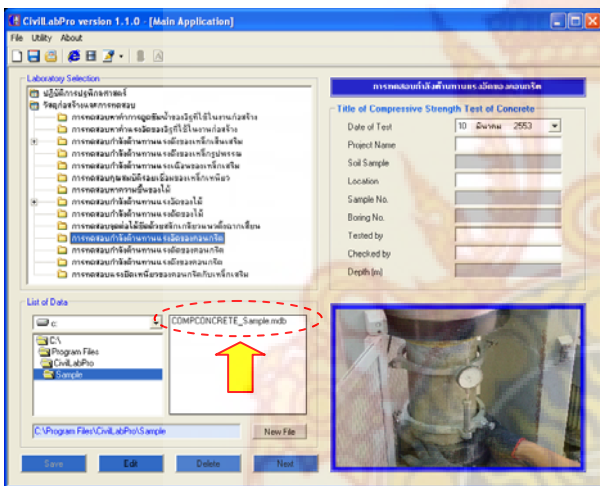
Fig. 3 Creation of database file

3.2 CivilLabPro Analyzer

After created the database file already, users can double click at the database file which wanted to be usable then the sub-program would appear as shown in figure 4. They have to input data that need for evaluation. In case of the calculation must read data from graph, when the program had plotted graph already, users could draw the line by mouse in the graph. At the same time, users can see the position obviously in the graph from the expand monitor as shown in figure 5. Moreover, users can print out the
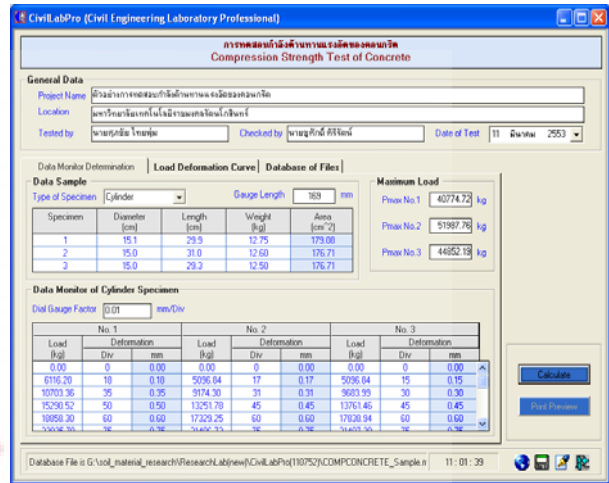
results after evaluation completely as shown in figure 6.
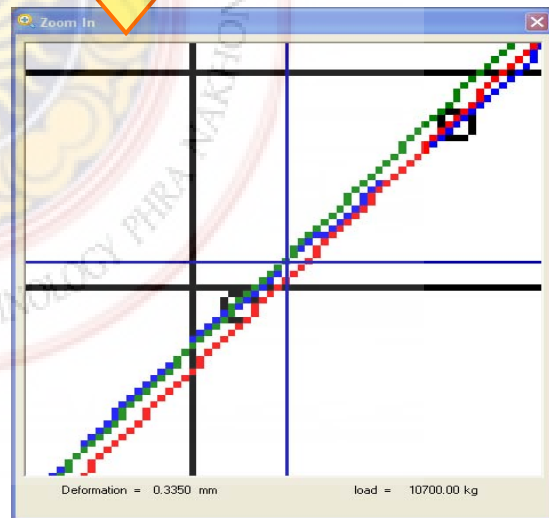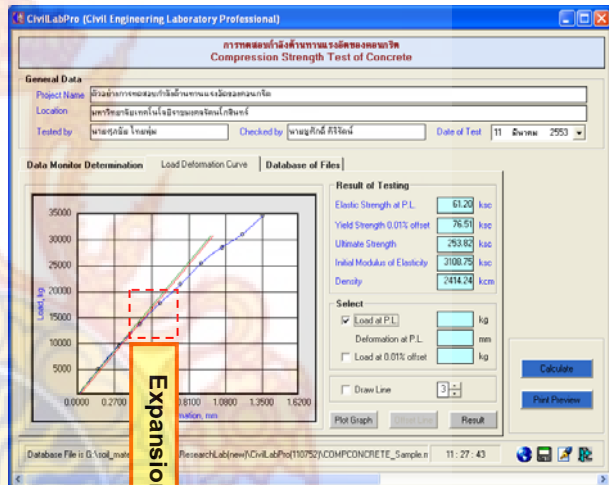

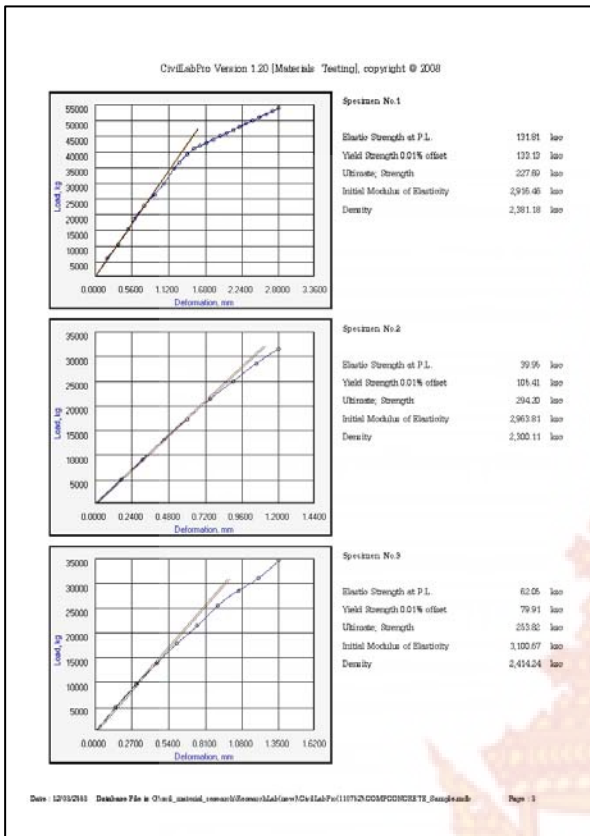Fig. 4 Input data interface

Fig. 5 Reading data from graph

Fig. 6 Example of print out of results

Fig. 7 Example of CivilLabPro word help

3.3 CivilLabPro Word Help

This program has the word help that consist of interface explanation, program manual and lab sheet as shown in figure 7. The description of the word help is shown in web page format that create by using Dreamweaver program.

3.4 CivilLabPro Self Test

This part is created to evaluate the understanding of the students. Each test has 10 choice questions as shown in figure 8. Every test can open in both analyzer and web browser. Users can click at the best choice within 5 minutes then they can check the score suddenly. If the scores are less than 8 points, they should get back to review the theory of laboratory again. In addition, instructors can use for evaluation in civil engineering education.
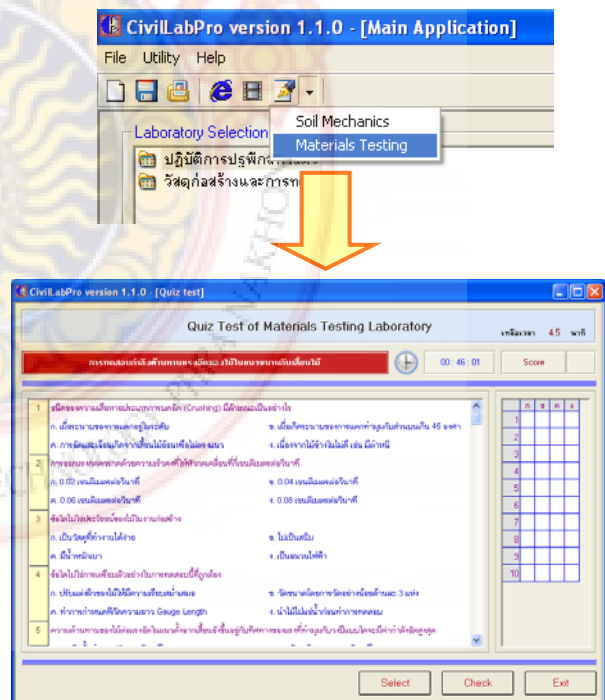

Fig. 8 Example of CivilLabPro self test

3.5 CivilLabPro VDO of Laboratory

This part shows the video of laboratory in both soil mechanics laboratory and materials testing laboratory. Users can choose desired laboratory from main menu, after that the interface is displayed as shown in figure 10. Consequently, users can choose a desire lab to learn the procedure of testing from list name on the right.

3.6 CivilLabPro Web Browsers

This part is created to be a source of civil engineering laboratory knowledge on internet system for instructor, student and involved person. It can access not only CivilLabPro analyzer but also address named www.civillabpro.com. When users access this web site, a home page will display as shown in figure 10. This home page consists of 4 topics as follows: E-learning, video labs, lab manual and self test.
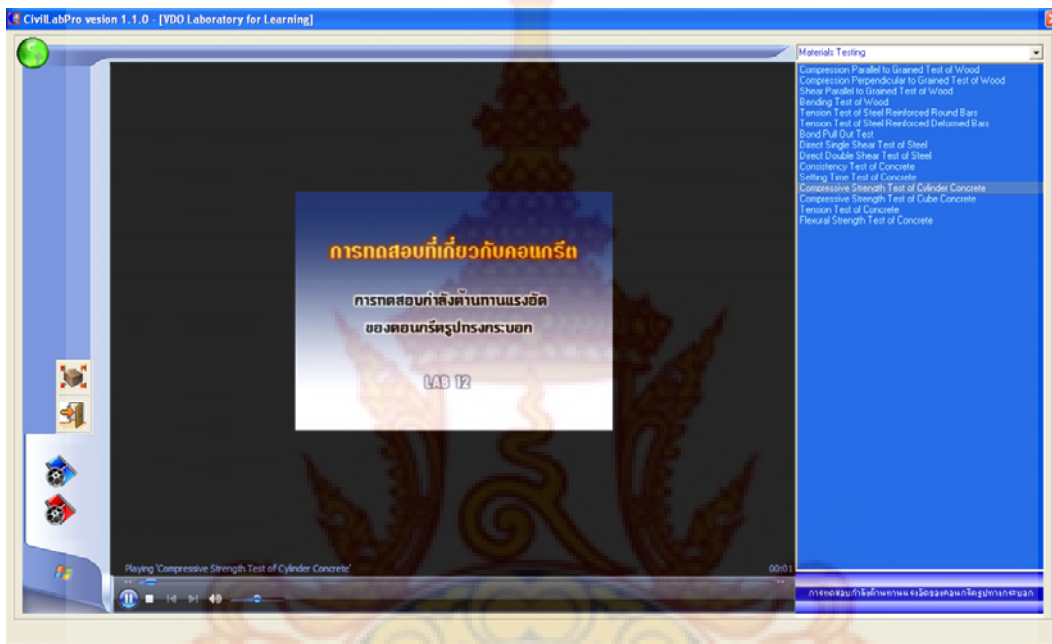

Fig. 9 Example of video labs from analyzer

Fig. 10 Home page of CivilLabPro

A example of E-learning displayed in figure 11 and a example of video labs as shown in figure 12.
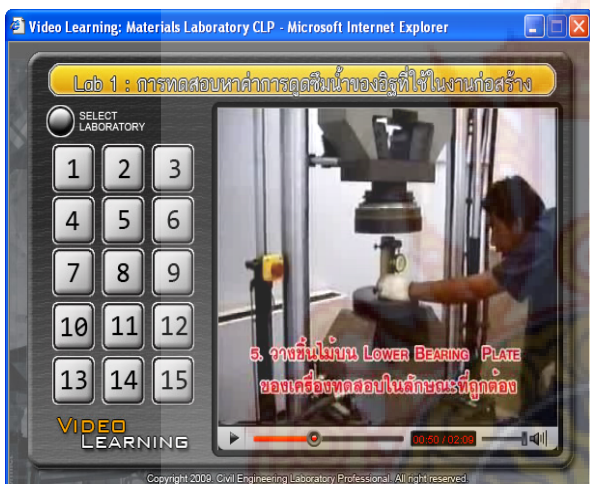

Fig. 11 Example of E-learning

Fig. 12 Example of video labs from web

4. Conclusions

The evaluation of this research (CivilLabPro) can conclude as follows:

4.1 Development of CivilLabPro

The development of CivilLabPro analyzer can conclude that database file storage, calculated processing and test report have been in line with conceptual model. The results of calculation are correct, accurate and fast. It can perform easily and decrease human error.

The development of CivilLabPro web browser can conclude that it can be used as the source of testing knowledge. It can help to improve the effectiveness and efficiency of the self-learning process.

4.2 Evaluation of CivilLabPro

From the results of evaluation that investigate by questionnaire and opinion of 30 users found that the scores of observation are 4.23 from 5 points. It shows that the information feedback has been positive in that they see it as being the useful self directed learning software.

5. Acknowledgements

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