A Visual Learning Tool for Database Operation

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ABSTRACT

In this paper we propose *sAccess*, a web-based learning tool for database education. It focuses on introductory computer science education for high school and college. *sAccess* has an easy-to-use query interface for manipulating databases. Using this tool, students can learn the fundamental knowledge of relational database practically. In this paper, we will explain the overview of design and implementation of *sAccess*.

Categories and Subject Descriptors

K.3.2 [**Computer and Information Science Education**]: Computer science education—*Database education*

General Terms

DESIGN, Experimentation, Human Factors

Keywords

database, web-based learning tool

1. INTRODUCTION

Database is now one of the most essential technologies used in various common information systems, such as POS systems and online search engines. Learning fundamental knowledge of databases is important not only for professionals but also for non-professinals who usually use such information systems in their daily life [1].

There are several learning support tools proposed for introductory database education [2][3], most of which set a goal to learn SQL for database operation. Learning SQL is useful for students to make use of major database management systems, but it is not always necessary for non-professionals, who want to understand how database store, manage, and retrieve large amount of data inside common information systems, but learning some query methods like SQL are not the essential learning topics.

We focused on database education for introductory database education, and developed a learning support tool which enables to manipulate database easily, which is suitable for practice classes.

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2. SYSTEM OVERVIEW

This section shows the overview of our proposing learning tool, "*sAccess*". *sAccess* is a web-based application for database education, which offers simple relational database (RDB) environment customized to be suitable for practice classes of introductory database education. With *sAccess*, students can do try-and-error database manipulations without mastering complex syntax of query language or worrying about destructing database environment.

Figure 1 shows the main interface of *sAccess*. The left side of the screen is "Command Area", on which users add and modify commands. When a user input one command in the text field of Command Area, it will be added on the command list as a block. The user can add any number of commands, and the command blocks are queued in order from top down.

The commands are executed one by one from top down to one current table, and the results are shown as a list of tables in the "Result Display Area" as shown in Figure 1. Each table shows the result of each command operation and the list of table shows the transition of operation results from right to left. When the user change the order of commands, modify the command statement or delete it, tables shown in Result Display Area changes in conjunction with each modification. Each user's database is independent from others, therefore one user's operation does not affect to others. With this feature, *sAccess* enables users to do try-and-error database operations and observation.

Table 1 shows the subset of database operation commands that *sAccess* supports. We selected the supported operations based on the survey of Japanese high-school textbooks of Information Study, in which they focused on the fundamental

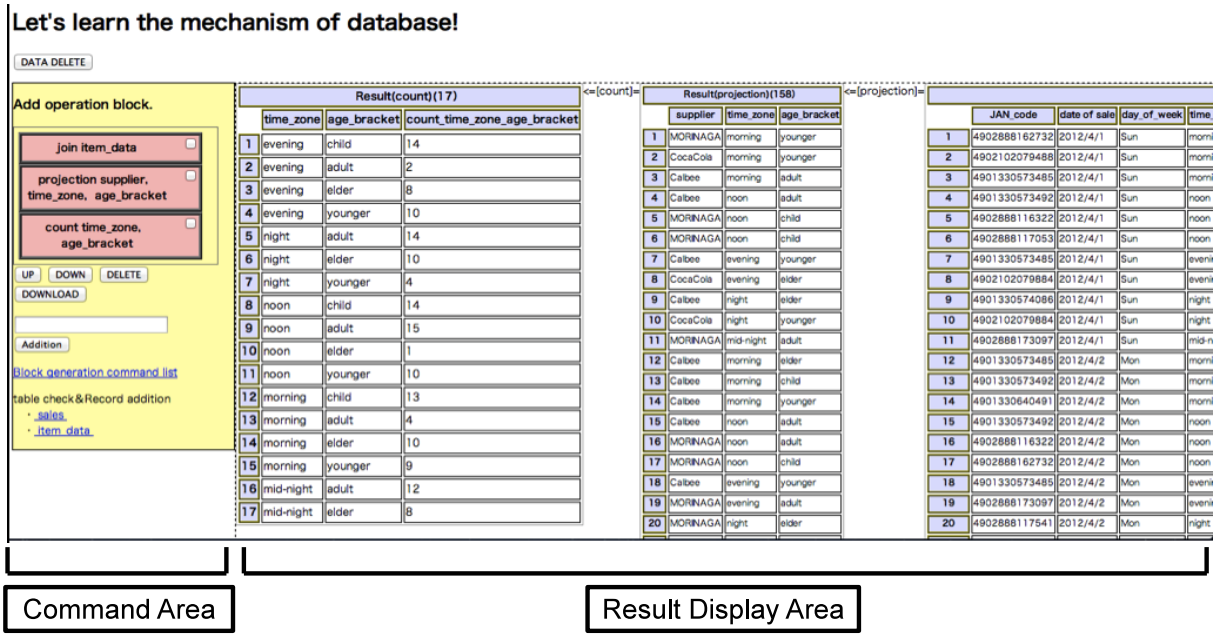

Figure 1: Main interface of sAccess

Table 1: Command List of sAccess (subset)

COMMAND	Description
SELECT	Choose records including the keyword [OPTION-2] in the field [OPTION-1]
REMOVE	Choose records without including keyword [OPTION-2] in the field [OPTION-1]
COMPARE	Choose records matching the condition [OPTION-2] in the field [OPTION-1]
PROJECTION	Extract the specified fields [OPTION-1]
JOIN	Natural join of current table and table [OPTION-1]
SORT	Sort records based on [OPTION-1] in ascendant/descendant order
CHANGE	Change main table to [OPTION-1]

(Command is followed by one or more options: "Command OPTION-1 OPTION-2 ...")

behavior of database systems and some basic query logic of RDB, but not on SQL.

sAccess is developed with PHP scripts, and it uses SQLite3 as a background database system. SQLite3 is bundled with PHP5 by default, so *sAccess* can run on many current web servers that can execute PHP5 programs, without installing another database systems.

For *sAccess* users, all they have to do is to run a web browser on PC and access the web site[1]. The web browser should support JavaScript and Cookie to run *sAccess*, but no other programs or plugins are needed.

[1] `http://saccess.eplang.jp/`

3. CURRENT SITUATION

sAccess has been used in real classes in at least 3 high schools and 2 universities in Japan. Several cases of them were that conducted by us for evaluation of learning effects by using *sAccess*, and others were the cases of voluntary use, in all of which teachers have struggled with introductory computer science classes within a restricted time (e.g. 2 lessons × 90 min for DB). Easy-to-use interface of *sAccess* enabled students to spend short time to learn how to operate it, and concentrate on try-and-error operations of RDB.

Now we are developing a new feature of "class management" mode to *sAccess*. In this feature multiple students share one database and teachers can manage the environment. With this feature *sAccess* can be used for learning "dead lock" or "concurrency", which are ones of important elements to understand database.

4. REFERENCES

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