A Learning Environment to Create Data-aware Programs

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Overview

- Computer Science Education research has focused on studying block-based programming environments where programs are created by connecting blocks.
- Most of these environments support conventional (imperative) programming instructions.
- While some systems have been proposed to enable the specification of database queries, there is significantly less work on the development of integrated systems to build full data-aware programs.
- This poster introduces DBSnap++, a web-based environment that enables the specification of programs that integrate conventional programming instructions and database queries.

Creating a Data-aware Program

A Learning Environment to Create Data-aware Programs

• Importing a dataset
• Specifying the query
• Generating a DBList

Supported Query Blocks

- Selection: \( \sigma_{\theta}(R) \). This operator selects all the records of relation \( R \) that satisfy the predicate \( \theta \).
- Projection: \( \pi_{a_1, \ldots, a_n}(R) \). This operator removes all the attributes of \( R \) not contained in \( a_1, \ldots, a_n \).
- Rename: \( \rho_{\theta_1 = \phi_1, \ldots, \theta_n = \phi_n}(R) \). This operator changes the name of relation \( R \) to \( S \) and the name of the attribute at position \( i \) to \( \phi_i \).
- Cross Product: \( R \times S \). This binary operator pairs each record of \( R \) with each record of \( S \).
- Theta-join (\( \theta \)-join): \( R \times S \). Returns a similar result than the Cross Product but selecting only the rows that satisfy the predicate \( \theta \).
- Natural Join: \( R \times S \). This operator is similar to the \( \theta \)-join where the \( \theta \) predicate is the equality of all the common attributes between \( R \) and \( S \).
- Aggregation: \( \beta_{\theta_1 = \phi_1, \ldots, \theta_n = \phi_n}(R) \). This operator groups the records of \( R \) forming a group for each unique occurrence permutation of the grouping attributes \( \theta_1, \ldots, \theta_n \). If aggregated, computes each group under those circumstances.

Sample Programs

- Generating Bar Graphs
- The Sound of Data

DBBlocks.js
Query Canvas
Query Result Panel
Node Result Panel
Snap.html
DBSnap++
Widgets.js
Objects.js
DBList
DBSnap GUI.js
Morphic.js
Morph
WorldMorph

Future Work

- Complete final implementation tasks
- Make DBSnap++ publicly available
- Evaluate the effectiveness of DBSnap++ as a learning tool
- Compare DBSnap++ with alternative solutions and ways to learn about data-aware programming
- Write a research paper with the results of our work

References