Querying Databases by Snapping Blocks
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Overview

Computer Science Education has focused on studying block-based programming. In this approach, computer programs are created by connecting blocks and the blocks' shapes determine the permitted connections. The focus is on the program's logic instead of its syntax. DBSnap is a web-based application to build database queries, particularly relational algebra queries, by snapping blocks. DBSnap aims to have the same transformational effect on database learning as previous block-based systems had on traditional programming learning.

**DBSnap key features:**
- Highly Dynamic Web App
- Intuitive Query Blocks
- Construction of Intuitive Database Query Trees
- Intermediate Node Inspection
- Shows the Query Results as the Query is Being Built
- Publicly Available & Open Source

Architecture

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<tr>
<th>DBSnap.html</th>
<th>DBSnap Query Canvas</th>
<th>Query Result Panel</th>
<th>Node Result Panel</th>
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<tr>
<td>GUI.js</td>
<td>DBBlocks.js</td>
<td>Dataset and Operator Blocks</td>
<td>Query Handler</td>
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<td>Morph.js</td>
<td>Morph WorldMorph</td>
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Operator Blocks

- **Selection:** \( a_1(R) \). This operator selects all the records of relation \( R \) that satisfy the predicate \( \theta \).
- **Cross Product:** \( R \times S \). This binary operator pairs each record of \( R \) with each record of \( S \).
- **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:** \( \rho_{a_1, \ldots, a_n}(R) \). This operator changes the name of relation \( a \) to \( b \) and the name of the attribute at position \( i \) to \( f_i \).
- **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 \( S \).
- **Set operators:** DBSnap also supports common set operations such as Set Union (RUS), Set Difference (R – S) and Set Intersection (R \( \cap \) S).

Example Queries

Select **Level**="Sophomore"

Group by **Cid**, **Level**, **CName**

Aggr: [min(age), max(age)]

Cross Join **Course**

Select **Level**="Sophomore"

Group by **Cid**, **Level**, **CName**

Aggr: [min(age), max(age)]

Natural Join

Table **Course**

Table **Course Student**

Table **Course_Student**

Table **Students**