DBSnap++

Creating Data-Driven Programs by Snapping Blocks

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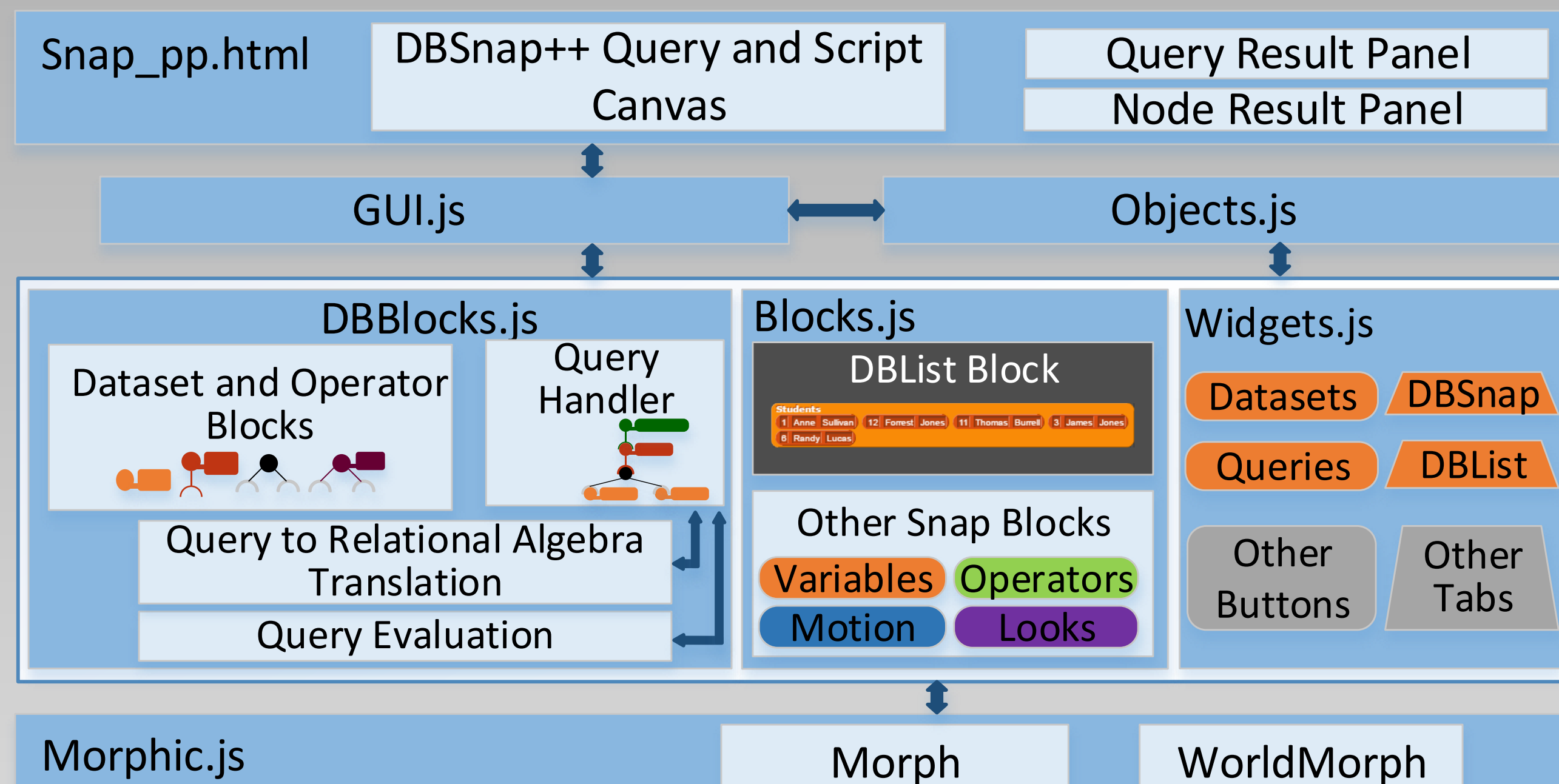
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Overview

- 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 [7, 8].
- While some systems have been proposed to enable the specification of database queries [2-6], there is significantly less work on the development of integrated systems to build full data-aware programs.
- We implemented DBSnap++ [1], a web-based environment that enables the specification of programs that integrate conventional programming instructions and database queries.
- DBSnap++ supports the specification of intuitive database query trees and a new type of list that dynamically gets its content executing a database query.
- DBSnap++ supports the manipulation of datasets as well as the creation of programs that generate different results when the underlying data changes.
- DBSnap++ aims to have a transformational effect on data-driven programming learning.
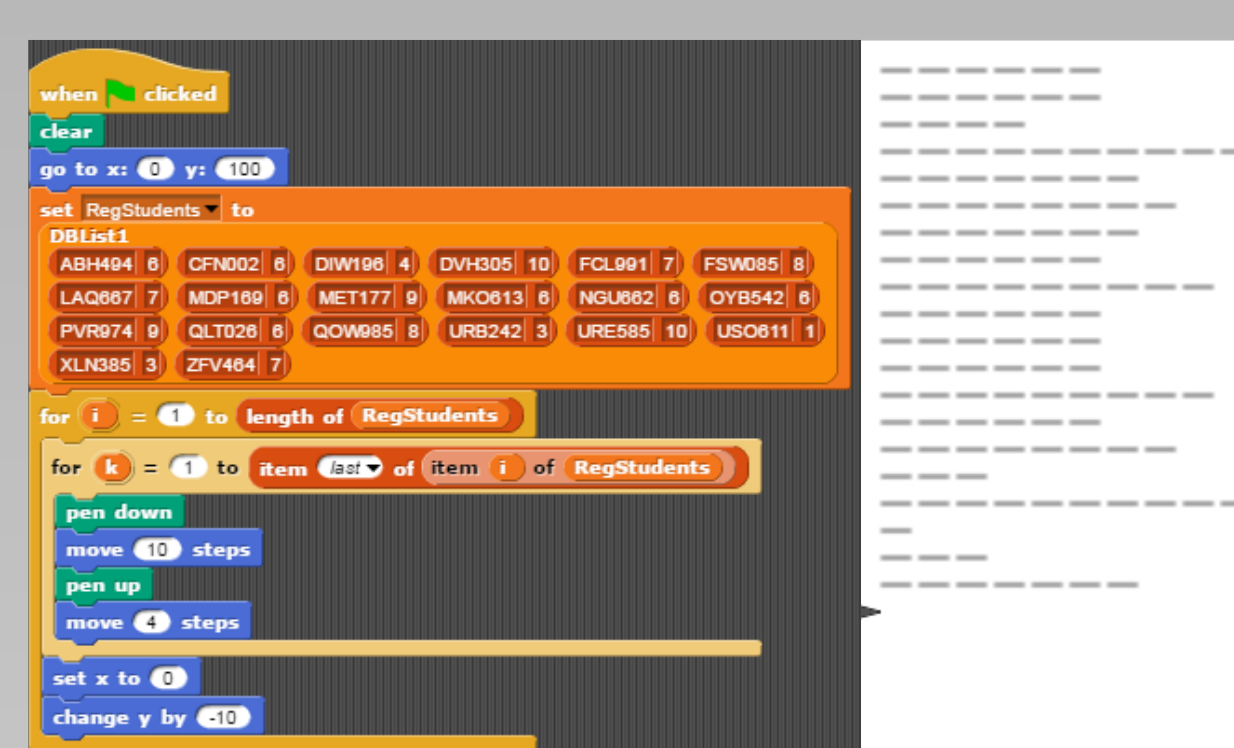
Architecture

Creating a Data-Driven Program

Importing a dataset → Specifying the query → Generating a DBList

Creating a program using the DBList → Modifying the query (in this example) or data → Re-executing the program

Sample Programs

Generating Bar Graphs

Displaying data using a bar graph

Database: University DB
Data tables: Students, Courses
Program: Shows the number of students registered in each course. A course is represented by a sequence of line segments. Each line segment represents a student in that course..
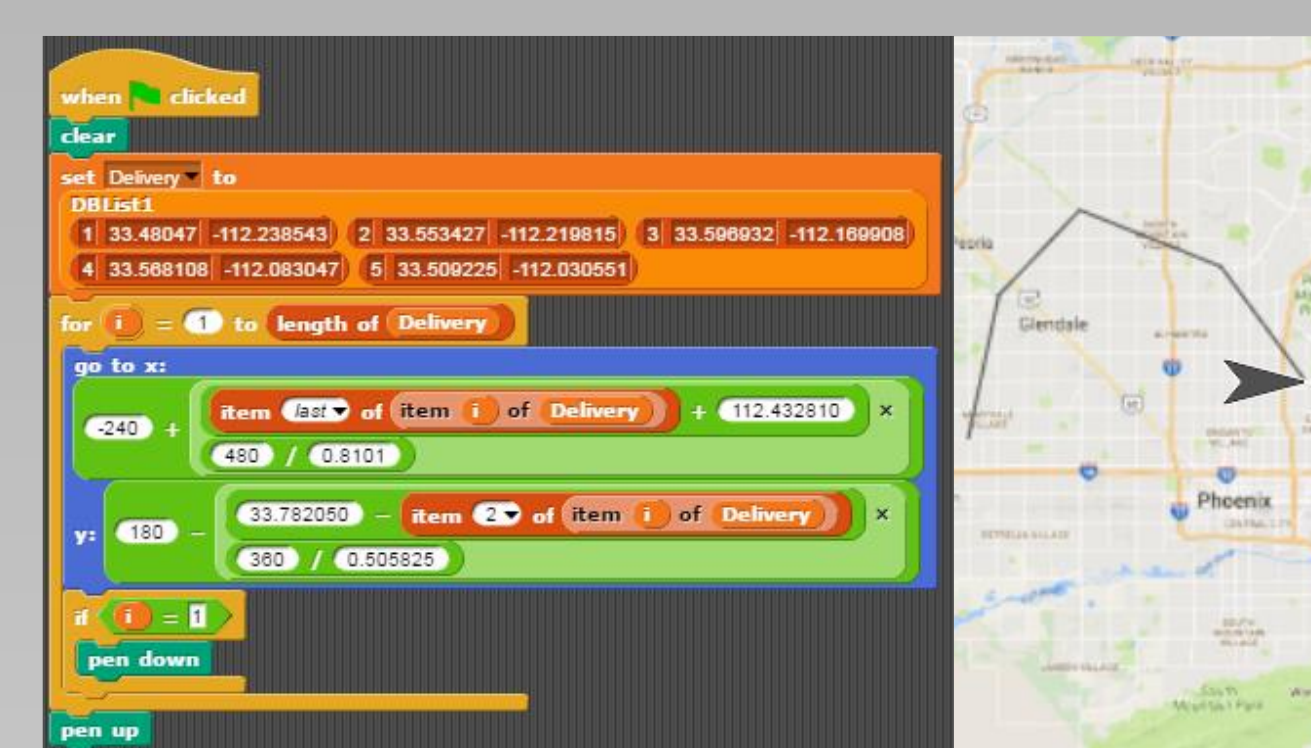
The Sound of Data

Playing different notes based on retrieved data

Database: University DB
Data tables: Course_Student
Program: Represents the number of grades received by the students of a given class. Plays a beep for each student and different notes for different letter grades.

Delivery Schedule

Displaying the delivery route over a map of the city

Database: Delivery DB
Data tables: Delivery_Schedule
Program: This program uses a equation to scale the coordinates based on the size of the map window and moves to each point (x, y) to draw the path of the delivery schedule.

Comparison with other Learning Tools

Feature	DBSnap++	SQLSnap	DataSnap	Bags	iDFQL	RALT
Implementation technologies	HTML5, JavaScript	HTML5, JavaScript	HTML5, JavaScript	HTML5, JavaScript	Borland C++	Java Swing
Allows importing or connecting to custom data	•	•	•	•		
Build-in datasets	•		•	•		
Can work without external data source	•		•	•		
Data graphs	•		•			
Data manipulation (insert, update, delete)	•					
Hosted Service	•		•	•		
Open source code	•	•		•		
Publicly available	•	•		•	•	•
Querying Capabilities: Aggregations	•	•		•	•	•
Querying Capabilities: Grouping	•	•		•		
Querying Capabilities: Joins	•	•		•	•	•
Querying Capabilities: Projection	•	•		•	•	•
Querying Capabilities: Selection	•	•		•	•	•
Querying Capabilities: Set Operations	•	•		•		•
Querying Capabilities: Views	•					
Shows query results as query is built	•			•		
Supports data-aware programs	•					
Tools to explore intermediate query results	•					
Uses tree-based query representation	•					
Web application	•	•	•	•		

References

1. Y. N. Silva, A. Nieuwenhuyse, T. G. Schenk, A. Symons. *DBSnap++: Creating Data-driven Programs by Snapping Blocks*. The 23rd Annual Conference on Innovation and Technology in Computer Science Education (ITiCSE), Larnaca, Cyprus, 2018. **Accepted research paper presenting the results of this project.**

2. Y. N. Silva, J. Chon. *Querying Databases by Snapping Blocks*. The 31st IEEE International Conference on Data Engineering (ICDE), Seoul, Korea, 2015

3. Y. N. Silva, J. Chon. *DBSnap: Learning Database Queries by Snapping Blocks*. The 46th ACM Technical Symposium on Computer Science Education (SIGCSE), Kansas City, Missouri, USA, 2015

4. J. Gorman, S. Gsell, and C. Mayfield. *Learning relational algebra by snapping blocks*. In ACM SIGCSE, 2014.

5. J. D. Hellmann. *DataSnap: Enabling Domain Experts and Introductory Programmers to Process Big Data in a Block-Based Programming Language* (Master's thesis). Virginia Tech, Virginia, USA, 2015.

6. E. Modrow. *SQLsnap!*. http://snapextensions.uni-goettingen.de/.

7. J. H. Maloney, K. Peppler, Y. Kafai, M. Resnick, and N. Rusk. *Programming by choice: Urban youth learning programming with scratch*. In ACM SIGCSE, 2008.

8. C. North and B. Shneiderman. *Snap-together visualization: Can users construct and operate coordinated visualizations?* Int. J. Hum.-Comput. Stud., 53(5):715–739, 2000.