λ: An Autograder for λSnap!

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Features Overview

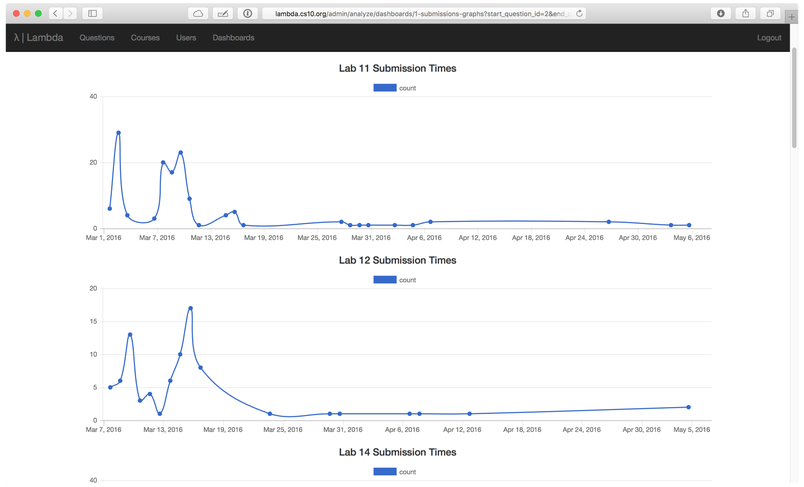
- Client-side, in-browser feedback for Snap*!*
- Designed for instant feedback,
  and interative improvements -- reduce staff dependency!
- Contains a set of 'Questions' and 'Tests'
- Flexible tests
  - Simple I/O "unit" tests.
  - Static Analysis
    - i.e. assert a solution contains specific functions
  - detect drawing and some visual output.
- Create dashboards analyzing student performance
- Example Flow:
  - Instructor adds tool to course via LTI
  - For Each Assignment:
    - Instructor sets the URL to a Snap! assignment
    - Student opens embedded Snap!
    - Student Clicks "Get Feedback"
    - Feedback window is shown
    - Grades are submitted in background

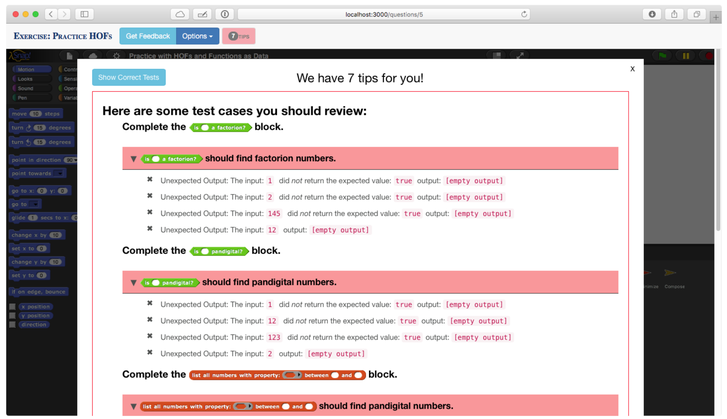
Future Work

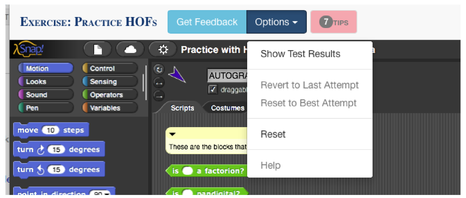
- Image-Based Output Analysis
- Allow writing tests in Snap*!*
- Hint Generation
- Problem Recommendation
- Easier generation of statistics dashboards
- Flesh out access controls for Instructors and TAs.
- Support for group assignments

- collect student responses to multiple choice questions
- Instrument Snap! and compare deubgging methods
- Use the tool for an entire semester.
- better data collection needed for analyzing the
  'traditional' lab enviroment

Screenshots







Technical Notes

- Ruby on Rails app, with PostgresSQL and Redis DB
- Snap! extenstions implemented in Javascript
- IMS LTI v1.2 protocol for authentication with LMSs
  - *Learning Tools Interoperability*
  - Canvas, Blackboard, Moodle, edX, etc all work.
  - Means additional student accounts are optional.
- OAuth2 support for Google, others as needed.
- Uses a very basic JSON REST API

Trail Setup

- CS10 (UCB's CS0 course) used for 3 lab assignments
- ~200 students across 7 sections
- First 11 assignments require 'oral' check-offs w/ TAs
  - students answer a couple questions, show code
  - each check-off took 2-5 mins (on average)
  - some labs had a really long queue
- Lab 12: required the autograder
- Lab 13: no autograder available.
- Lab 14, 15: Students have a choice of check-off method

Initial Findings

- Students prefer the autograder,
  though they do notice any bugs
- Students did complete work at home,
  though not required.
- Students were 'turning in' check-offs sooner than they
  would complete an oral check-off.
- Students submitted 2-3 times on average.
  - Maximum number was 26, likely due to bugs.
  - What should we expect from students?
- Initial TA reports were that there seemed to be fewer
  student questions / waiting around than normal

http://cs10.org/conferences | http://bjc.berkeley.edu | http://lambda.cs10.org