

OPENDSA: A CREATIVE COMMONS ACTIVE-EBOOK

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PROBLEM & VISION

Problems:

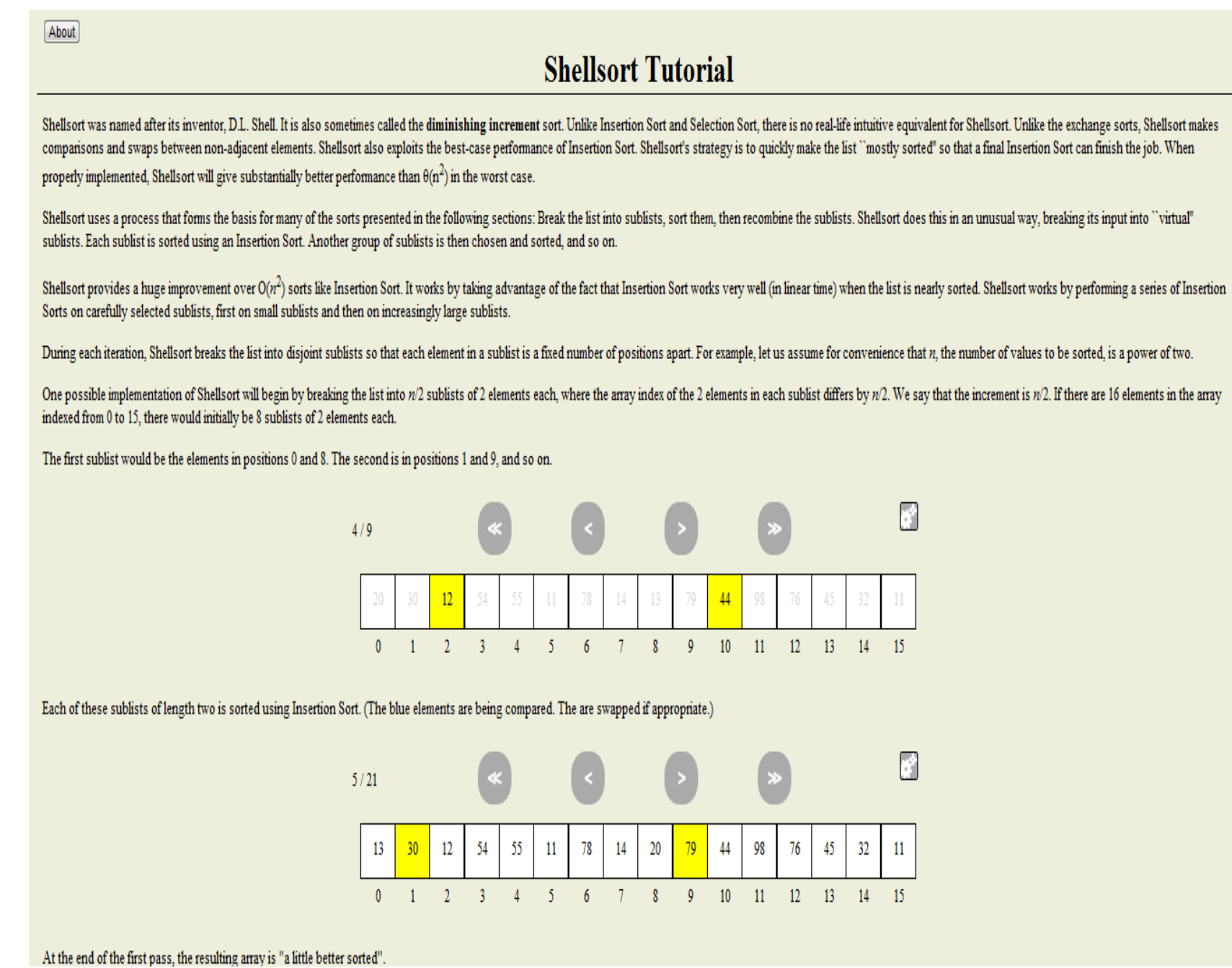
1) Data Structures and Algorithms (DSA) courses include much material on dynamic process which is hard to express in words and pictures.

2) Students in DSA courses do not get enough practice questions to assure them that they have learned the material.

Solution:

An active-eBook with deep integration of the following components:

- Text and images
- Dynamic presentation (AVs, interactive exercises)
- Rich, automated assessment exercises



INTEGRATED ASSESSMENT

The Assessment infrastructure should :

- Supply questions from a bank or automated generator
- Automatically evaluate student answers
- Collect and manage students' solutions for the instructor

Design goals:

- Support for rich activities specific to CS (programming-related exercises, AV simulation like in TRAKLA [1])
- Randomize question selection
- Allow repeated practice and multiple submissions
- Respect students' privacy

JAVASCRIPT AV (JSAV) LIBRARY

The JSAV library provides development tools for AVs and other dynamic components of the system using JavaScript.

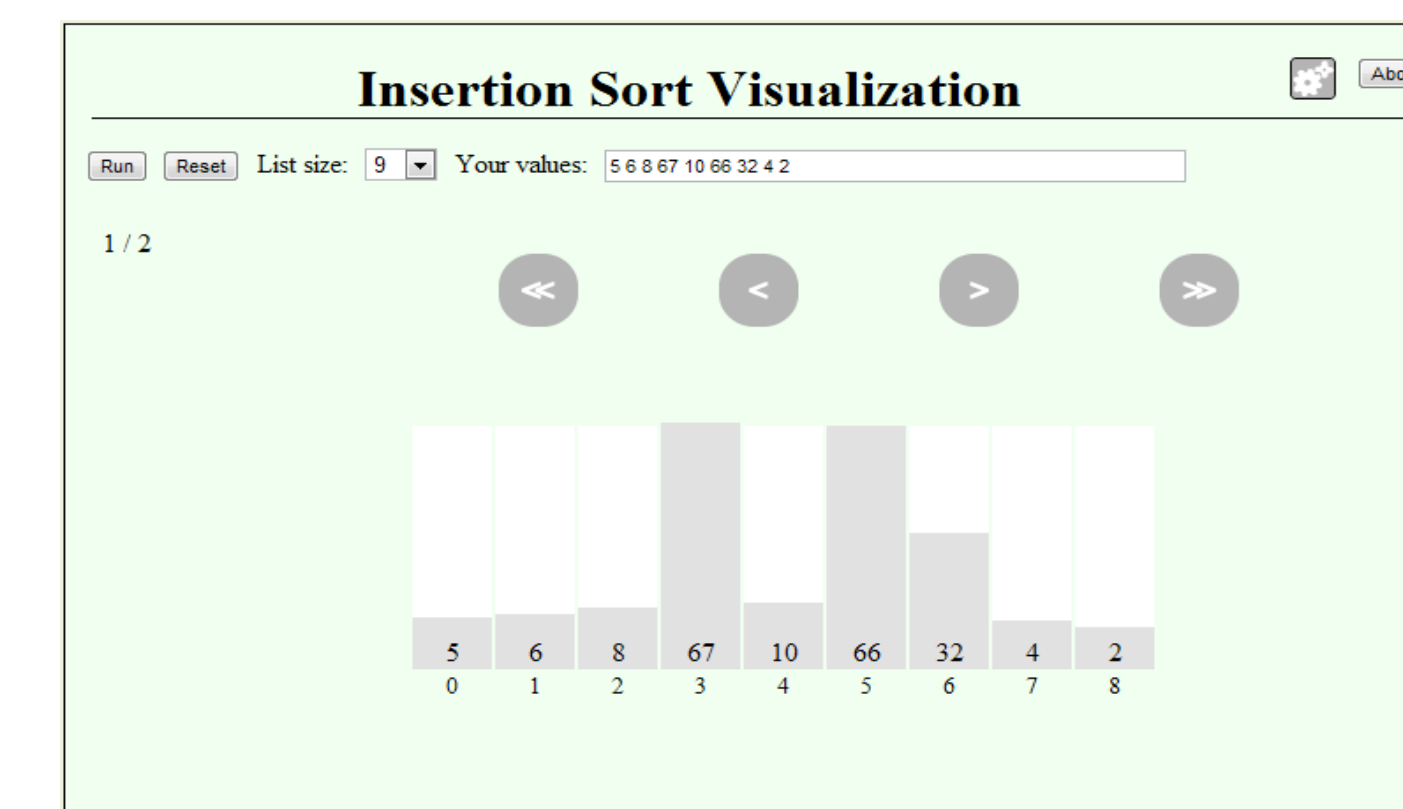
JSAV features: (some in development)

- Dynamic slideshows
- Layout of standard data structures and animation elements
- Engagement: support for asking questions and "proficiency exercises" where students simulate an algorithm
- Pseudocode display
- Server-side support for grading activities
- Flexibility: existing functionality can be overridden

IMPLEMENTATION

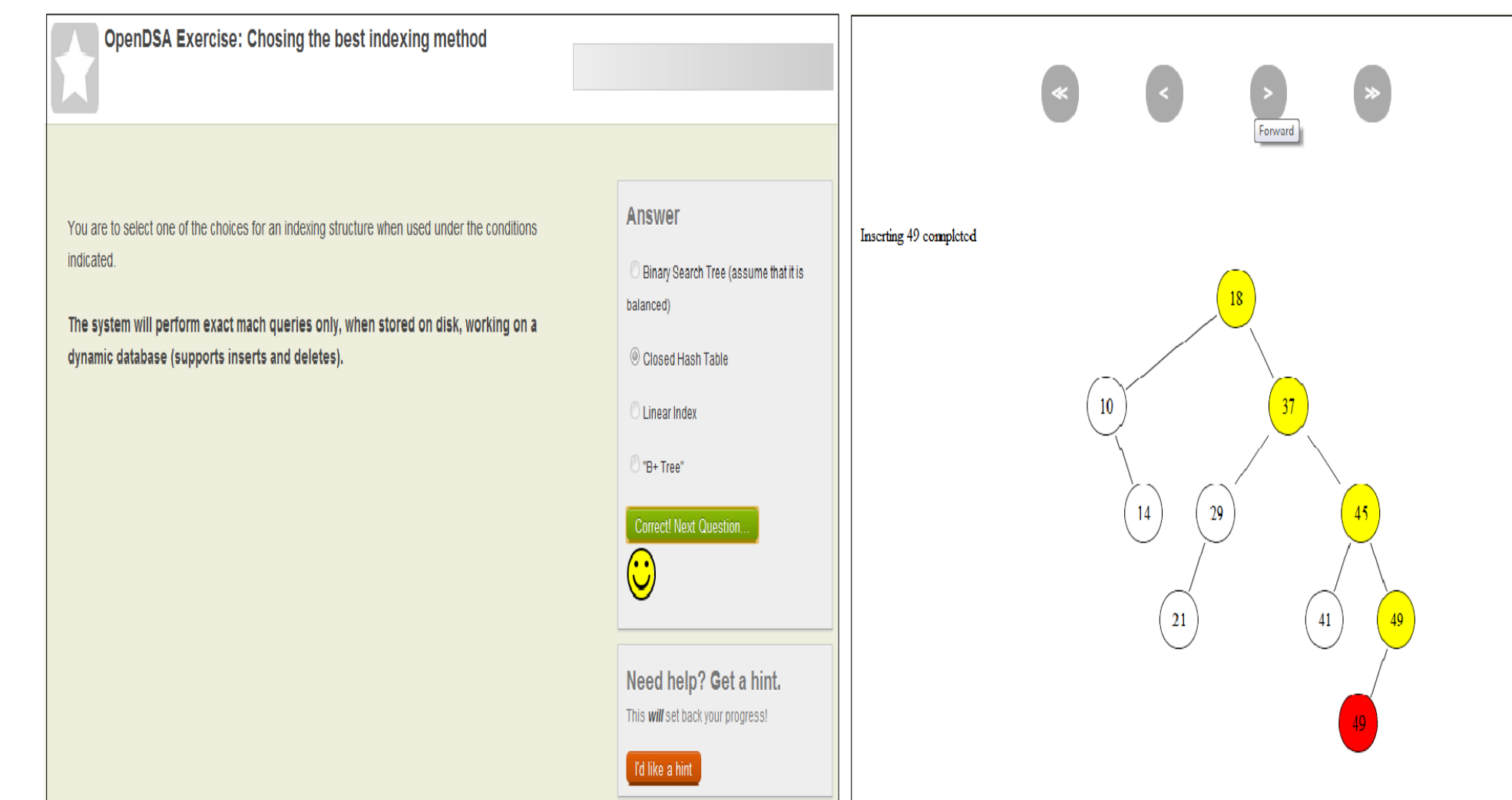
Our *active-eBook* is intend to engage the student at a higher cognitive level. We expect its content to:

- Be about dynamic processes
- Keep the students engaged
- Contain many assessment activities



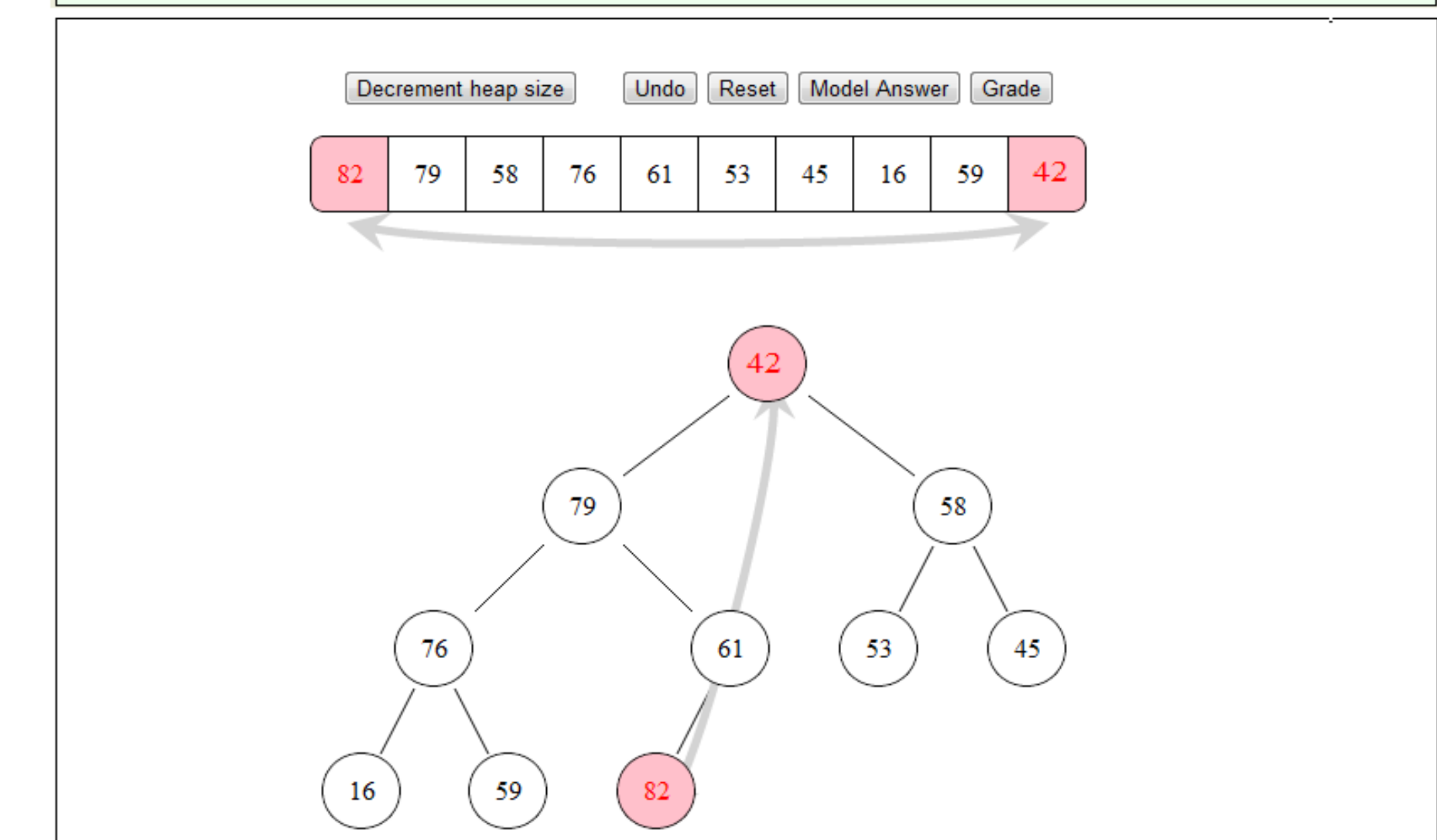
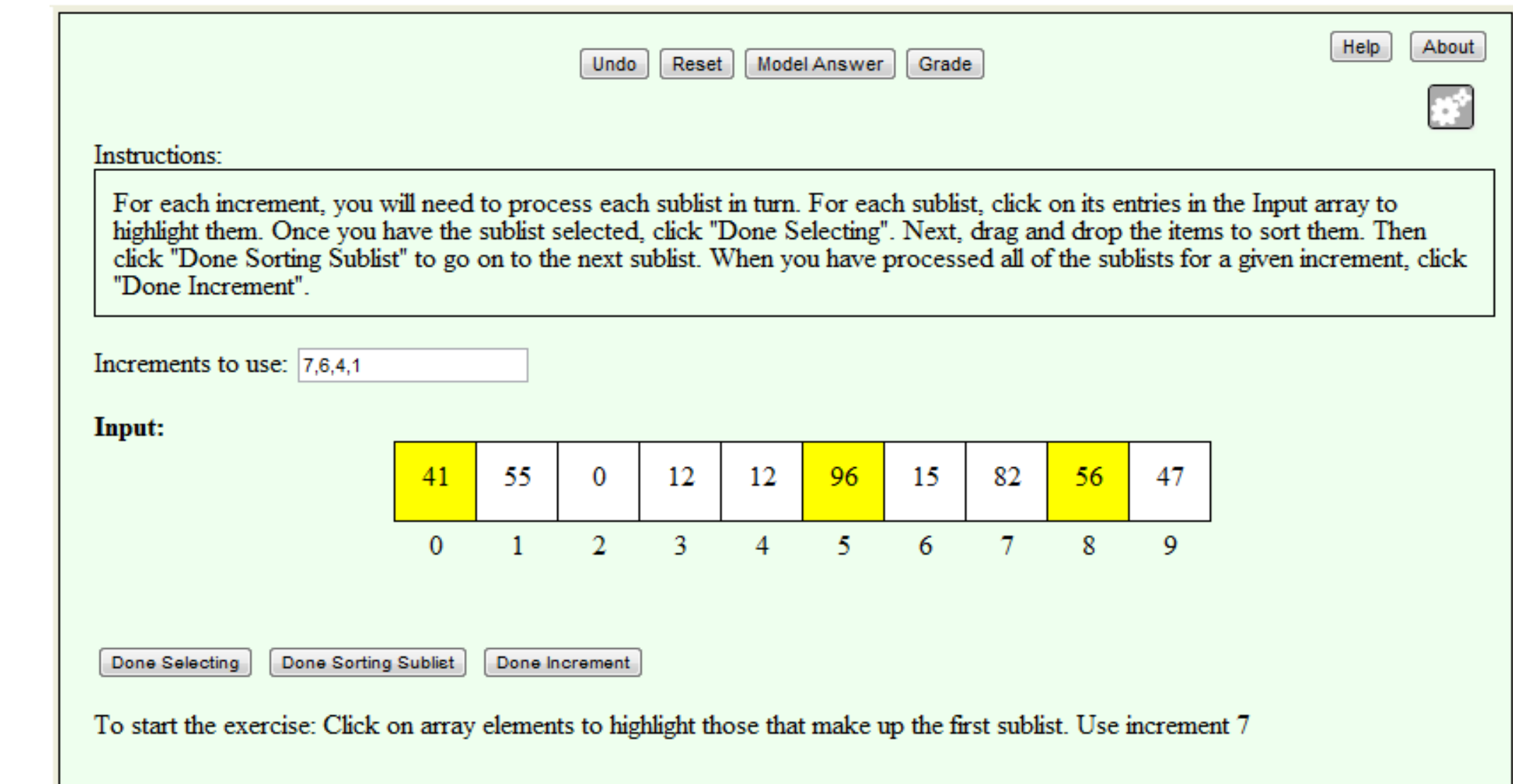
We use the **Khan Academy** exercise framework [2] to develop smaller exercises and questions. It provides support for :

- Semi randomization of questions
- Automatic feedback
- Hints



We choose **HTML5** along with **JavaScript** and **CSS** as implementation technology because:

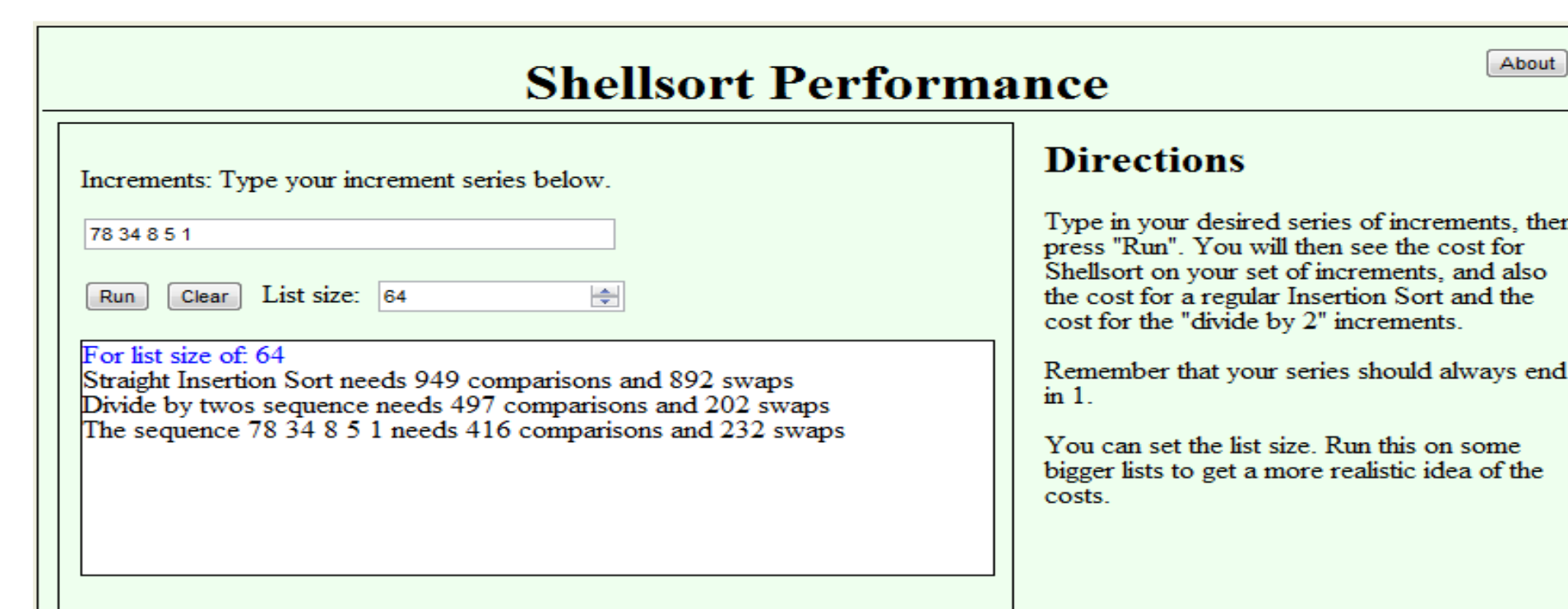
- HTML 5 is a new standard for building dynamic and multimedia web artifacts
- They are supported by most web browser
- Platform independent; easily portable between PC browsers and mobile devices



JOIN THE PROJECT

This is an open-source project, organized around a creative commons infrastructure. We invite others to join us by contributing AVs, exercises, and alternate text. Individual instructors will be able to choose from existing modules and connect them together to build their own textbook from the OpenDSA collection.

See: <http://algoviz.org/OpenDSA/>



REFERENCES

- [1] Lauri Malmi and Ville Karavirta and Ari Korhonen and Jussi Nikander and Otto Seppälä and Panu Silvasti. Visual Algorithm Simulation Exercise System with Automatic Assessment: TRAKLA2. In *Informatics in Education*, vol 2, pages 267-288, 2004.
- [2] The Khan Academy. Khan Academy Exercises. Accessed February, 12 2012. <https://github.com/Khan/khan-exercises>.
- [3] C.A. Shaffer, T.L. Naps, and E. Fouh. Truly Interactive Textbooks for Computer Science Education. In *Proceedings of the Sixth Program Visualization Workshop*, pages 97-103, June 30, 2011, Darmstadt, Germany.
- [4] C.A. Shaffer, V. Karavirta, A. Korhonen and T.L. Naps. OpenDSA: Beginning a Community Hypertextbook Project. In *Proceedings of 11th Koli Calling International Conference on Computing Education Research*, pages 112-117, November 17-20, 2011, Koli National Park, Finland.