

The **ALgorithm VI**sualization **Storyboarder (ALVIS)** is an end-user programming environment for quickly creating "low fidelity" (i.e., rough, unpolished, sketched) animated visual representations that model a wide variety of phenomena. While non-computer scientists can use ALVIS to develop animations of scientific or business processes, ALVIS is tailored for the computer scientist, especially the introductory computer science student, interested in exploring and designing computer algorithms.

Support for End-User Programming

Underlying ALVIS is a powerful procedural scripting language called SALSAs (Spatial Algorithmic Language for StoryboArding). With a natural language syntax that resembles common pseudocode, SALSAs is suitable for "programming-in-the-small" single-procedure algorithms. A distinctive feature of SALSAs is its ability to capture algorithmic logic through spatial relationships among the objects in the program. Indeed, writing an algorithm in SALSAs amounts to building a visual representation in which the objects of the animation model the programming objects of the algorithm.

The ALVIS environment supports a hybrid *programming-by-demonstration* model in which

- program object creation, modification, and animation can be easily specified through a combination of direct manipulation and dialog box fill-in; and
- program control and iteration, in contrast, must be programmed in the conventional way: by typing SALSAs code directly into a code editor; an eager evaluation mechanism provides continuous feedback on the syntactic correctness and graphical appearance of each line of code as it is being typed in.

Support for Presentation

In addition to supporting quick and easy program creation, ALVIS supports the *presentation* of programs for the purposes of feedback and discussion. To that end, three key features are provided:

- a *dynamic editing model* that allows a presenter to test out audience suggestions and fix program bugs on the spot—in most cases, without the need to restart the script from the beginning.
- a *flexible execution model* that enables the presenter to execute and single-step a SALSAs program both forwards and backwards; and
- a *mark-up tool* that allows the presenter to annotate the animated visual representation produced by a SALSAs program as the program is executing.

Support for Storytelling

In prior empirical studies of sessions in which computer science students presented their own algorithm visualizations to their classmates and instructor for feedback and discussion, we observed that visualizations with storylines stimulated increased audience involvement and participation. Indeed, we hypothesize that one of the key benefits of self-constructed visualizations is their ability to stimulate and mediate conversations about domain concepts. To support the construction of visualizations with story content, ALVIS provides two key features:

- *The "say" command.* This command pops up a comic strip style speech bubble above a given variable. Using the "say" command, one can incorporate dialog into a visual presentation.
- *Background graphics.* One can draw a custom background, allowing the animation can take place within a scenario or setting of interest.

Further Information

Originally developed as part of Chris Hundhausen's doctoral dissertation, ALVIS is the centerpiece of the "Algorithms Studio" project funded by the National Science Foundation under grant no. 0406485. For the latest version of ALVIS, which is open source software, and for further information on the research program surrounding ALVIS, see <http://eecs.wsu.edu/~veupl/proj/algstudio/> or e-mail Chris Hundhausen at hundhaus@eecs.wsu.edu.

Introducing...



The ALgorithm VIsualization Storyboarder

Version 2.0

The Premiere Public Release
Coming December, 2004

*An end-user environment for
designing algorithms and
quickly and easily creating
accompanying "low fidelity"
animations*

<http://eecs.wsu.edu/~veupl/alvis>

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The ALVIS Interactive End User Programming Environment

Script View

Displays the editable SALSA script that generates the animation

These SALSA commands can be directly typed in; use the tools on the right to generate many SALSA commands by direct manipulation

The target marks the next line of code to be executed—in this case, the while loop conditional statement

The arrow marks the line of code that was just executed; to support programming by demonstration, ALVIS "follows the caret," so that the line being edited is always the line being executed.

Use this slider to control the speed of the animation.

Use the execution controls to run or single-step the SALSA code forwards or backwards.

Animation Canvas

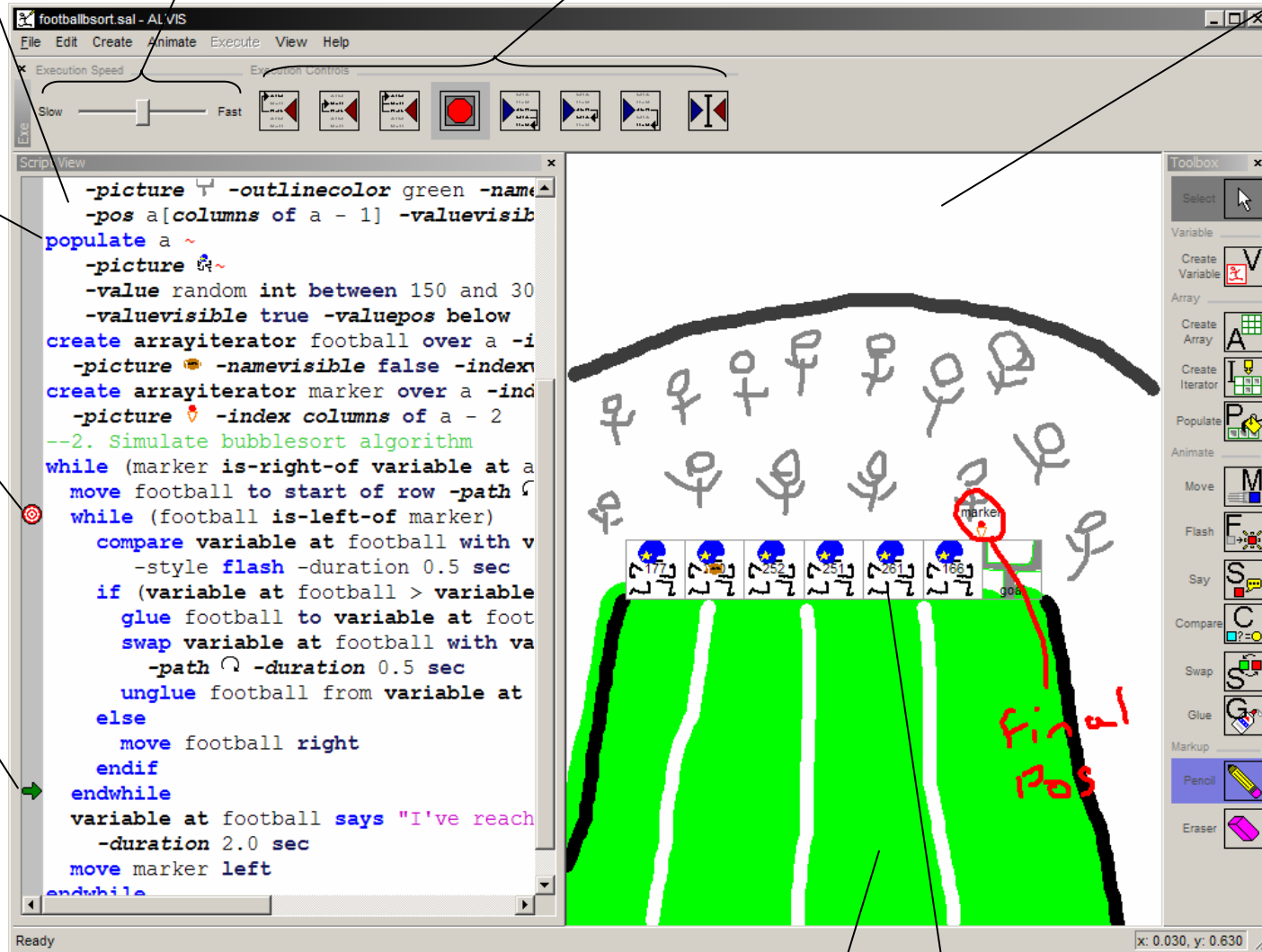
Displays the animation generated by executing the SALSA script up to and including the line marked by the arrow

Use the creation tools to lay out program objects by direct manipulation

Use the populate tool to quickly generate sample input data within an array

Use the animation tools to generate program animations by direct manipulation

Use the mark-up tools to annotate an animation during a presentation



Switch to background mode to sketch out a custom background that serves as a backdrop for a story-based animation

SALSA program variables are represented pictorially; choose the picture from a library, or create one from scratch using the built-in sketchpad