

## **Drawing Trees and Animating Tree Changes**

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Drawing trees and animating tree changes (subtree addition, replacement, and removal) can allow new visualizations of computational and graph theoretic processes. We will be demonstrating a library that we have designed and built for exactly this purpose as well as two visualizations designed to show off its capabilities. Our first demonstration shows the ability to watch the execution of a piece of Lisp code, while our second example shows a tree being parsed by a tree automaton. In the Lisp example, the code being executed may be entered by the user, and in the tree example the tree is user-entered, although the automaton is not. Drawing a graph as a tree can even prove useful when the graph being drawn is neither directed nor acyclic. We present one last example visualization using a graph which is not a DAG, which allows us to animate the creation and usage of a doubly-linked list. We hope that the library will be of use to educators who want to provide a visualization of trees and graphs and of computational processes on these structures.

Keywords: computing, teaching, graph visualization, trees, animation