TEACHING TURING
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OVERVIEW
Teaching Turing is a fun, educational environment for learning about and programming Turing machines. The goal of Teaching Turing is to show people how Turing machines work by having them program a Turing machine themselves. The structure of Teaching Turing is divided into a series of with the earliest stages very clearly walking the user through the basic controls of a Turing machine, then working up to a series of graphic puzzles solved through programming. We want to present the Turing machine in a simple, easy to understand way. Users can move at their own pace through the levels, or proceed to free exploration and programming of the machine.

REPRESENTATIONS
The Turing machine’s tape is represented as an infinite 2D board of colored squares, with each color representing a possible symbol. The number of symbols is limited to 6 distinctive colors, though early levels use only two or three.

The tape has been replaced with an infinite two-dimensional board, on which the machine head can move north, south, east, or west. As in the classic Turing machine, for each state and input symbol an output symbol and new state are specified.

The current position of the machine’s read head is represented by a bird character named Turing that travels across the board.

INTERFACE
All GUI element remain on-screen at all times, presenting the user with a consistent, easy-to-use interface. These elements include a description of the current puzzle, the board, the states and their associated rules, and controls for running the Turing machine.

The rules are grouped by their input state. Each state includes rules for each symbol used in the current puzzle. The user cycles through the output symbols, directions to move, and next states by clicking them.

In the exploration mode, the board is edited in the same way as the rules. It scrolls as needed.

LEVELS
The puzzles proceed in difficulty from easy to hard. The first puzzles guide the user through the interface, showing them each step needed to program the machine for a particular task. Then, the user is asked to solve puzzles requiring simple changes to almost working machines. Finally, the user will begin to create machines from scratch.

The puzzles exploit the graphic nature of the board by asking the user to navigate using colors as landmarks or to create a pattern of colors. The abstract nature of color will allow symbols to have different meanings in various puzzles and help the user to grasp the general nature of the Turing machine. That is, in one puzzle the goal may be to avoid blue squares, but because the obstacle
Puzzles 1-5
These puzzles guide the user through the interface and the concepts of the Turing machine by stepping through the steps of creating a program to detect palindromes. Checking understanding along the way by asking multiple choice questions about what the machine will do next.

Puzzle 1:
Advance the Turing machine to the red square and then stop. An introduction to the interface. The user is guided through the successive steps necessary to program the machine.

Puzzle 2:
Advance the Turing machine to the red square and then stop, turning all yellow squares white along the way. The user continues to be guided through the interface, and is shown how to create rules and specify the color to be written to the tape by a rule.

Puzzle 3:
Turn around at the red square, and then stop at the next red square. An introduction to the concept of states. The user creates a second state. In the first state, encountering a red square makes the machine turn around switch to the second state. In the second state, encountering a red square stops the machine.

Puzzle 4:
Copy the color of the start square onto the next white square encountered. The machine starts in state 1 and switches states when it finds a colored square (to state 2 for a red square, state 3 for a blue). In either state 2 or state 3, when a white square is found, the initial color is written to it.

Puzzle 5:
Palindrome detector. Four states (one to look for the next color at the left end of the tape, one to look for matching blue cells at the right end of the tape, one to look for matching reds, and one to go back to the left side of the tape).

Puzzles 6-10
These puzzles introduce the two dimensional board, the ability to turn left and right, and present the user with problems to solve without explicit guidance (though possibly with some sort of hints).

Puzzles 11-15
More difficult challenges to show the user more of the potential of the Turing machine.