Programmer Manual
Turtle

1. Problem Description

This program allows the user to control a turtle that moves on a 20 x 20 board. You can move the turtle forward any number of spaces, with the turtle stopping at the wall if you run into it. You can turn the turtle in the four cardinal directions, north, south, east, and west, allowing you to change directions. The turtle is holding a pen, which you can toggle up and down. If the pen is down, the turtle will draw on the board with the pen, leaving a certain brush stroke on the ground. There are four different selectable brush strokes you can choose from. You can also have the turtle jump to a new location by entering a specific x and y coordinate on the board. This moves the turtle, regardless of the direction it is facing, directly to that space without leaving any brush strokes in between.

2. Data Types and Classes

The data types used in this program fall into two categories: predefined data types and programmer-defined data types. The following subsections address the data types used.

2.1 int (predefined type)

Variables:

input	user input for the main menu
numSpaces	the number of spaces to move
posX	the x-coordinate to jump to
posY	the y-coordinate to jump to
brushSelection	the brush to select

2.2 char (predefined type)

Variables:

dir	the direction to turn

2.3 Board (programmer-defined type)

This class has:

Data members:	SIZE, floor, groundChar, turtleChar, drawChar, topCornerLeft, topCornerRight, botCornerLeft, botCornerRight, horWall, vertWall, turtle
Member functions:	Board, ~Board, printBoard, moveTurtle, jumpTurtle, turnTurtle, resetBoard, draw, togglePen, changeBrush, printTurtleInfo, checkCollision, initBoard

See the programmer manual for the Board class for more details

2.4 Turtle (programmer-defined type)

This class has:

Data members: pos, pen, direciton, previousX, previousY

Member functions: Turtle, ~Turtle, getCurrentX, getCurrentY, getPreviousX, getPreviousY, setCurrentX, setCurrentY, getDirection, move, turn, jump, changeBrush, changePenPosition, penDown

See the programmer manual for the Turtle class for more details

2.5 Direction (programmer-defined type)

This class has:

Data Members: dir

Member Functions Direction, changeDir, getDir

See the programmer manual for the Direction class for more details

2.6 Position (programmer-defined type)

This class has:

Data Members: posX, posY

Member Functions: Position, setPosX, setPosY, getPosX, getPosY

See the programmer manual for the Position class for more details

2.7 Pen

This class has:

Data Members: isDown, drawChar

Member Functions: Pen, togglePenPosition, getPenPosition, getBrush

See the programmer manual for the Pen class for more details

3. High Level Program Solution

Main Program

Create and initialize a new board

Print the initial board and the menu for input

Read in the input for the option selection

Call member functions from the Board class for the input option:

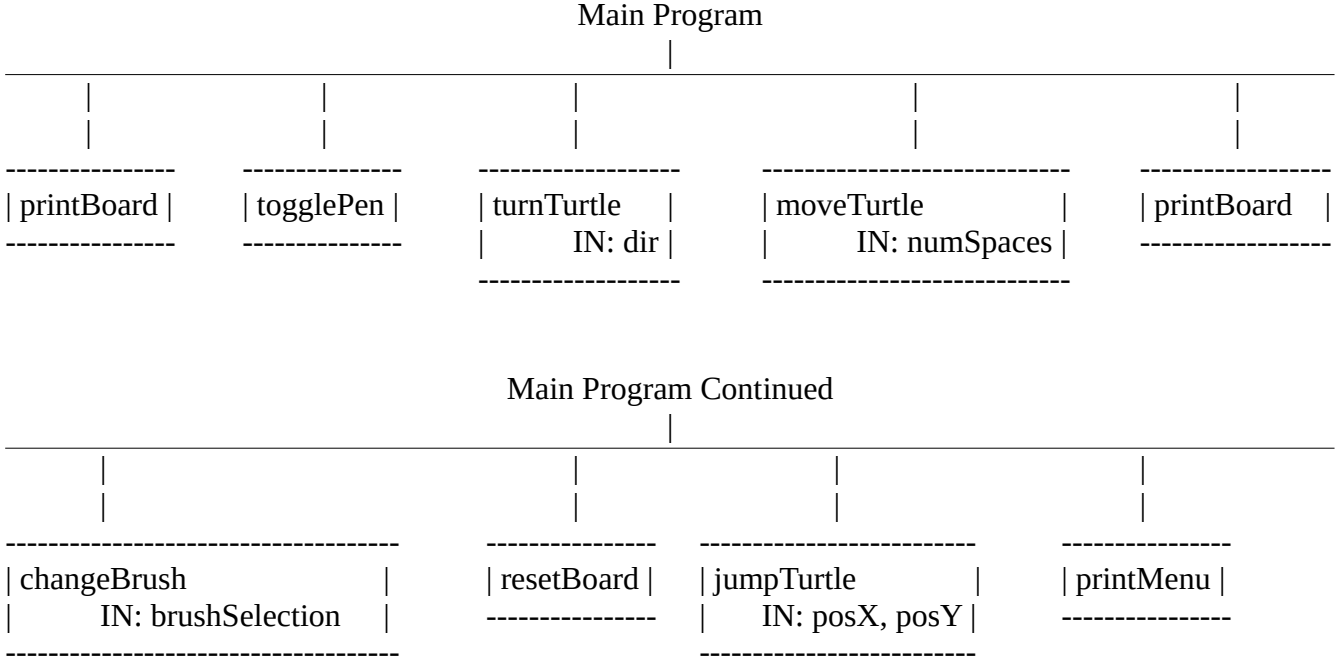
1. togglePen
2. turnTurtle
3. moveTurtle
4. printBoard
5. changeBrush
6. resetBoard
7. jumpTurtle
8. printMenu
9. exit program

Delete the Board

function printMenu()

print the menu options along with the corresponding integer selections, along with a prompt for the user to input their option

3.1 Design Graph



4. Limitations and Suggestions

This program only allows the user to draw using four predefined brush strokes. It could be extended to allow the user to input their own brush strokes to be used.

Only one turtle is on the board at a time. Multiplayer functionality could be implemented in order to allow two or more users to interact on the same board with two separate turtles. Extending this, a game could be created such as trying to fill up the most board space while preventing an opponent from doing the same.