SpreadSheet Technical Manual

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The basis of this SpreadSheet is a 2D Array of Cell Objects, represented in the GUI by a JTable storing Strings.

As a general overview, when a value is entered into the SpreadSheet GUI, it constructs a Cell, stored in an underlying 2D Array at the same relative location it was added into the table. This stores the formula String, constructs an Expression Tree, and then calculates an integer value by calculating that Expression Tree. This value is then returned to the GUI. We go into further detail of these data structures below.

The Cell class has a String to represent the original formula, as well as an integer value, which is calculated by parsing the formula String with an Expression Tree into Literals for integer values, Cell Elements for representing other cells and their related dependencies, and Operators for the different functions. Bad input is thrown out and the original String is left unchanged. The Expression Tree uses a stack to handle the parsed input, as well as different priorities for functions. When an Expression Tree is built, cell dependencies are maintained in both directions by the Cell Elements contained in the Expression Tree of a cell representing prior dependencies, and by a Linked List being maintained at Expression Tree construction in the opposite direction. When a Cell Element is created, the cell it references adds the cell being constructed to its dependency Linked List.

We maintain accurate formulas by only modifying the stored String if a valid Expression Tree is constructed. When a cell's value is modified, we also make a call to all the dependents in the dependencies (as well as their respective dependents until all are reached) LinkedList to recalculate their Expression Trees and make a call to the GUI to refresh the integer shown there to the new, correct value.