Calculator Using Turing Machine

# Team Members

1. Kiran Srinivasan (Roll number: 106120051)
2. Vishal Menon (Roll number: 106120145)

# Problem Statement

We have implemented some basic arithmetic operations using a Turing Machine. T

# Sequence of steps to solve the problem

1. Store transition functions of various operations in files
2. Design a menu driven user interface to read user input
3. Design a Turing Machine
   1. Implement a cell class (for each cell in the tape)
   2. Read transition functions for different operations from files
   3. Store the transition function in a 3d array (indexed by direction/new symbol/new state, tape symbol, current state)
   4. Interpret user input in unary form on tape
   5. Enable traversal and modification of tape during state transitions
   6. Print each modification and transition on console if required
   7. Finally, print the output on tape on console

# Input and Output screenshots

Text

Description automatically generated

Text

Description automatically generated with medium confidence

Text

Description automatically generated

Text

Description automatically generated

Text

Description automatically generated

**Text

Description automatically generated**

**Text

Description automatically generated**

**Text

Description automatically generated**

**Text

Description automatically generated**

# Code explanation

The turing\_machine class contains a tape (a doubly linked list of cells), a 3d array of integers “delta” to store the transition function, and integers to store the current state, number of tape symbols and the number of tape symbols.

The constructor takes a character array string denoting the operation to be performed as parameter and reads the transition function from the corresponding file.

The insert method modifies a single tape cell and moves either left or right on the tape.

The loadInput method takes interprets user input in either unary or binary depending on the operation and loads the input on tape.

The calculate method performs modification and traversal on the input depending on the transition function, current state and tape symbol

The output method interprets the final output on tape after calculate has been executed and displays it on console.

The printTape method displays the current transition and modification taking place on the tape.