README for Non-Deterministic Turing Machine - contains111

Overview

This repository contains the implementation and documentation for a non-deterministic Turing machine (NTM) designed to detect the presence of the sequence "111" in a binary string. The machine's behavior, states, and transitions are defined in the `contains111.csv` file.

File Description

- `contains111.csv`: This single file contains all the necessary information about the states, transitions, and actions of the Turing machine.

Turing Machine Description

This non-deterministic Turing machine operates on a binary input tape and detects whether the sequence "111" is present in the tape. It uses a head to read and write on the tape and moves either left (L) or right (R) after each action.

State Transitions and Actions

The Turing machine includes the following states and transitions as defined in `contains111.csv`:

- **States**: `q0` (initial state), `q1`, `q2`, `q3` (accept state), and `qreject` (reject state).
- **Transitions**:
  - In state `q0`, upon reading `0`, it stays in `q0` and moves right; upon reading `1`, it moves to `q1` and moves right.
  - In state `q1`, upon reading `0`, it transitions to `q0` and moves right; upon reading `1`, it moves to `q2` and moves right.
  - In state `q2`, upon reading `0`, it moves back to `q0` and moves right; upon reading `1`, it transitions to the accepting state `q3` and moves right.
  - State `q3` indicates the detection of the sequence "111", completing the process.
  - The `qreject` state is not utilized in this configuration.

Input Tape and Expected Outcomes

Example 1

- **Input Tape**: `010110`
- **Expected Outcome**: The machine remains in state `q0` and does not detect the sequence "111".

Example 2

- **Input Tape**: `110111`
- **Expected Outcome**: The machine transitions to state `q3`, indicating that the sequence "111" is detected.

Example 3

- **Input Tape**: `1110`
- **Expected Outcome**: The machine transitions to state `q3`, indicating that the sequence "111" is detected.

Usage

To use this Turing machine, load the `contains111.csv` file into a Turing machine simulator capable of interpreting non-deterministic behaviors. Provide a binary string as the input tape, and the simulator will process the tape to determine the presence of the sequence "111".

Notes

- Ensure that the simulator used is compatible with non-deterministic Turing machines.
- The behavior and transitions of the machine are solely determined by the `contains111.csv` file.