# Functional Requirements

## -- Input and Output

- The software shall allow users to input an initial configuration of the tape's symbols and the read/write head's position.

- The software shall provide an interface to display the resulting configuration of the tape after each computation step.

- The software shall generate an output indicating the final state and content of the tape upon halting.

## -- Transition Rules

- The software shall enable users to define custom transition rules for the Turing Machine's behavior.

- Transition rules shall consist of the current state, the read symbol, the write symbol, the head movement direction, and the next state.

- The software shall validate the correctness of user-defined transition rules.

## -- Tape Manipulation

- The software shall allow users to manipulate the content of the tape cells, including reading and writing symbols.

- Users shall be able to move the read/write head left or right along the tape.

## -- State Transition

- The software shall execute the defined transition rules in accordance with the current state and the symbol read from the tape.

- The software shall update the tape's content, move the read/write head, and transition to the next state based on the applied transition rule.

## -- Multiple States and Symbols

- The software shall support the creation of multiple states and symbols for the Turing Machine.

- Users shall be able to define the initial state and any halting states.

## -- Error Handling

- The software shall detect and handle errors such as invalid transition rules, attempts to move the head beyond the tape boundary, and undefined states or symbols.

- The software shall provide clear error messages and guidance to users for corrective actions.

# Non-Functional Requirements

## -- Performance

- The software shall execute computations efficiently, even for large input data and complex transition rules.

-. The response time for updating the tape and transitioning between states shall be minimal.

## -- Usability

- The software shall feature an intuitive and user-friendly interface for defining transition rules, inputting initial configurations, and visualizing the tape's changes.

- Users shall be provided with clear instructions and tooltips to facilitate interaction.

## -- Portability

- The software shall be compatible with major operating systems, including Windows, macOS, and Linux.

- The software shall run on commonly used web browsers without any compatibility issues.

## -- Security

- The software shall not compromise user data or system security.

- User-defined transition rules and tape configurations shall be stored securely.

## -- Documentation

- The software shall provide comprehensive documentation that explains its features, functionalities, and usage.

- The documentation shall include examples, tutorials, and explanations of Turing Machine concepts.

## -- Extensibility

- The software shall be designed with modularity to allow for future enhancements, such as additional features, visualization options, and extensions.

## -- Testing

- The software shall undergo thorough testing, including unit testing, functional testing, performance testing, and usability testing.

- A comprehensive test plan shall be developed to ensure the software's reliability and accuracy.