Lab Assignment 6: Turing Machine Complexity

Objective: The objective of this lab assignment is to analyze the time complexity of Turing machines.

Instructions:

- Create a new file and name it "turing_complexity.c".
- Implement the following functions:
    - **`int simulateTuringMachine(char tape[], char transitions[], int maxSteps)`**: This function should simulate the execution of a Turing machine on the given input tape using the provided transition function, but with an additional parameter for the maximum number of steps allowed. The function should return 1 if the Turing machine halts and accepts the input within the maximum number of steps, or 0 otherwise. Analyze the time complexity of the Turing machine based on the number of steps taken.
    - **`void analyzeTuringComplexity(char transitions[])`**: This function should take the transition function of a Turing machine as input and analyze its time complexity based on the number of steps required to halt for different input sizes.
- In the **`main()`** function, provide a menu-driven program to interact with the Turing machine simulation and complexity analysis functions. The menu should provide the following options:
    - Simulate a Turing machine on an input tape with a specified maximum number of steps
    - Analyze the time complexity of a Turing machine
    - Exit the program
- Test your program with various Turing machines, input tapes, and maximum step limits to analyze the time complexity of the machines.
- Document your code and include appropriate comments to explain the purpose of each function and significant sections of code.
- Submit your code along with a brief report summarizing your implementation, any challenges faced, and the time complexity analysis results.