Project 2 Readme Team Gunna

Version 1 9/11/24

A single copy of this template should be filled out and submitted with each project submission, regardless of the number of students on the team. It should have the name readme_"teamname"

Also change the title of this template to "Project x Readme Team xxx"

<table>
<tr><td>1</td><td>Team Name: Gunna</td></tr>
<tr><td>2</td><td>Team members names and netids: Timothy Gunn, Tgunn2</td></tr>
<tr><td>3</td><td>Overall project attempted, with sub-projects: Tracing NTM behavior</td></tr>
<tr><td>4</td><td>Overall success of the project: Overall, this project was fairly successful.</td></tr>
<tr><td>5</td><td>Approximately total time (in hours) to complete: 6</td></tr>
<tr><td>6</td><td>Link to github repository: https://github.com/TimGunn60/Project2-TOC</td></tr>
<tr><td>7</td><td>List of included files (if you have many files of a certain type, such as test files of different sizes, list just the folder): (Add more rows as necessary). Add more rows as necessary.
<table>
<tr><td>File/folder Name</td><td>File Contents and Use</td></tr>
<tr><td colspan="2">Code Files</td></tr>
<tr><td>src</td><td>ntm_tracer.py</td></tr>
<tr><td colspan="2">Test Files</td></tr>
<tr><td>input</td><td>Aplus.csv
Composite.csv
equal_01s.csv</td></tr>
<tr><td colspan="2">Output Files</td></tr>
<tr><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="2">Plots (as needed)</td></tr>
<tr><td>N/A</td><td>N/A</td></tr>
</table>
</td></tr>
<tr><td>8</td><td>Programming languages used, and associated libraries:
Python</td></tr>
<tr><td>9</td><td>Key data structures (for each sub-project):</td></tr>
</table>

	To keep track of the NTM simulation tree, a list of lists was used, where each inner list contained the set of possible configurations at that level in the NTM tree. To represent a configuration, a tuple was used containing everything to the left of the head, the current state of the machine, the character under the head plus everything to the right, index of the parent configuration for backtracking, and which transition number from the parent was taken.
10	General operation of code (for each subproject): The run method in the NTM_tracer class performs a BFS simulation of an NTM using a list of lists, with the original configuration placed into tree[0]. The while loop in the run method runs until an accepting state is found, or a max_depth is reached. For each level in the tree, the code iterates through each configuration in that level. Before simulating a transition, the code checks to see if the current configuration is accepted or rejected.
11	What test cases you used/added, why you used them, what did they tell you about the correctness of your code. I added composite.csv and equal_01s.csv to test whether the ntm_tracer functioned when faced with different NTM structures and languages. Testing allowed me to confirm that the program properly handled branched computation paths, tape writing, and head movement.
12	How you managed the code development: I began by writing the main loop to assemble the NTM tree, then I wrote a helper method to calculate the non-determinism of the tree. After that, I completed the print_trace_path method to print out each level of the NTM tree
13	Detailed discussion of results: After running my NTM tracer on the a+ NTM with the input string “aaaa”
14	How team was organized: N/A
15	What you might do differently if you did the project again: If I did the project again, I would ask more clarifying questions about the output and the expectations for the project. Even though I read the project outline, I was still unsure about project setup and output.
16	Any additional material: N/A