COMP 560: Artificial Intelligence

Assignment 1

Members: Arturo Schmidt, Jesse Oliver, Noah Poirson

Local Search:

Local Search was implemented using a variation of repeated hill-climbing. The basic functionality of the implemented algorithm works as follows.

*Map object contains adjacency list of states and array of colors
*State object contains its name, color and a changed value to keep track of the number of color changes made to a particular state and limit them to avoid infinite loops.

1) All States are initialized to null color values, the map as an adjacency list is created and the number of discolored States, which we use as a heuristic function, starts as the number of States in the map.
2) We iterate until either the state of the map remains the same or the number of discolored State's reaches 0, which means we have reached a valid solution.
3) The inner loop loops over the adjacency list, randomly changing a state's color if changing its color will not result in a violation. The main violation being looked at is if it would be the same color as one of its neighbors.
4) If an appropriate change is made, and a valid change to that state has not been done previously, the number of discolored states decrements getting us closer to a valid map state.
5) This is called repeatedly by repeatedHillClimbing until a valid solution is found within the 1 minute time frame.

Backtracking Search:

Backtracking search was implemented with forward checking.

*Map object contains adjacency list of states
*State object contains name
*stateColors contains possible colors for each state

1) Use Minimum Remaining Values heuristic function to find the states with the fewest remaining colors

2) Use Most Constraining Variable heuristic function to choose the state with the most neighbors out of the candidate states with fewest remaining colors
3) Assign the chosen state a color from it's available colors
4) Remove the chosen color from the neighboring states possible colors
5) Jump back to 1

Contributions:

Jesse Oliver and Arturo Schmidt both worked on Local Search. Originally, we worked on it by ourselves until someone needed assistance. Arturo and Jesse both set up an adjacency list and got each state pointing to each other, but Arturo was able to get a bit farther in his hill-climbing algorithm than Jesse, so they both met up and worked from what Arturo had in his code so far. By working through Arturo's starter code, they both were able to implement the final hill-climbing solution currently in the repository.

Noah Poirson was given the task of doing the backtracking search on his own because we all agreed it was the easier of the two searches. Everything besides the reading through stdin and adjacency list setup in the backtracking search file was Noah's work.