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CSC 4444 Assignment 1

1. Write the pseudocode for this agent, given the following construct:

function GOAL-BASED-AGENT(percept) **returns** an action
  persistent: *state*, the agent's current conception of the world state
    model, a description of how the next state depends on current state and action
    goal, a description of the desired goal state
    plan, a sequence of actions to take, initially empty
    action, the most recent action, initially none

  state ← UPDATE-STATE(*state, action, percept, model)*
  if GOAL-ACHIEVED(*state, goal*) **then return** null action
  if plan is empty **then**
    plan ← CREATE-PLAN(*state*, *goal*, *model*)
  action ← FIRST(*plan*)
  plan ← REST(*plan*)
  return *action*

2. To formulate this situation as a search problem, we will define the following definitions:
   a. State space: The state space consists of all the possible locations of the two friends on the map. Each state is represented as a pair of cities (C_A, C_B), where C_A is friend A's location and C_B is friend B's location
   b. Initial State: The initial state is the starting location of the two friends. This can be represented using an ordered pair (S_A, S_B), where S_A is the starting location for friend A and S_B is the starting location for friend B
   c. Goal state/goal test: The goal state is for the two friends to meet in the same city, achieved in the pair (C_A, C_B) where $C_A = C_B$
   d. Transition model/Successor function: On each turn, both friends move simultaneously to one of their neighboring cities, which can be shown by (C_A, C_B) → (C'_A, C'_B) where C'_A is a neighboring city of C_A and C'_B is a neighboring city of C_B. The available moves for each of the friends are defined by:
      i. The friend arriving in a city first must wait for the other friend to arrive before they are allowed to move again
      ii. The time needed to move from one city to the next city is determined by the distance of the road between the city, which is denoted as *d(i, j)*
      iii. We want the friends to meet as quickly as possible
   e. Action Cost Function: The cost (time) needed to move from city *i* to a neighboring city *j* is equal to the road distance *d(i, j)*. Each turn is completed only when both friends have arrived at their new locations. The cost function can be notated as:
      $COST((C_A, C_B) \rightarrow (C'_A, C'_B)) = MAX(d(C_A, C'_A), d(C_B, C'_B))$
      We are looking for a path that minimizes the total cost for the friends to meet at the same location.

3. https://github.com/sescob4/CSC-4444-Assignment-1