Behavior Trees

ROOMBA'S ROAMINGS (100 Points + 30 Points Bonus)

This new type of Roomba has very simple reflex rules. It will always check the battery level first. If the level is below 30%, it will plan a path to its charging base ("home"), go there, and start the docking procedure. If the battery is at a sufficient level, it will start the function it was commanded to perform. The available commands are:

1. Spot cleaning: it will perform a 20s intensive cleaning in a specific area
2. General cleaning: go around the room and vacuum dust until the battery falls under 30%
3. Do nothing

During general cleaning, if the dust sensor detects a particularly dirty spot, the Roomba will perform a 35s spot cleaning.

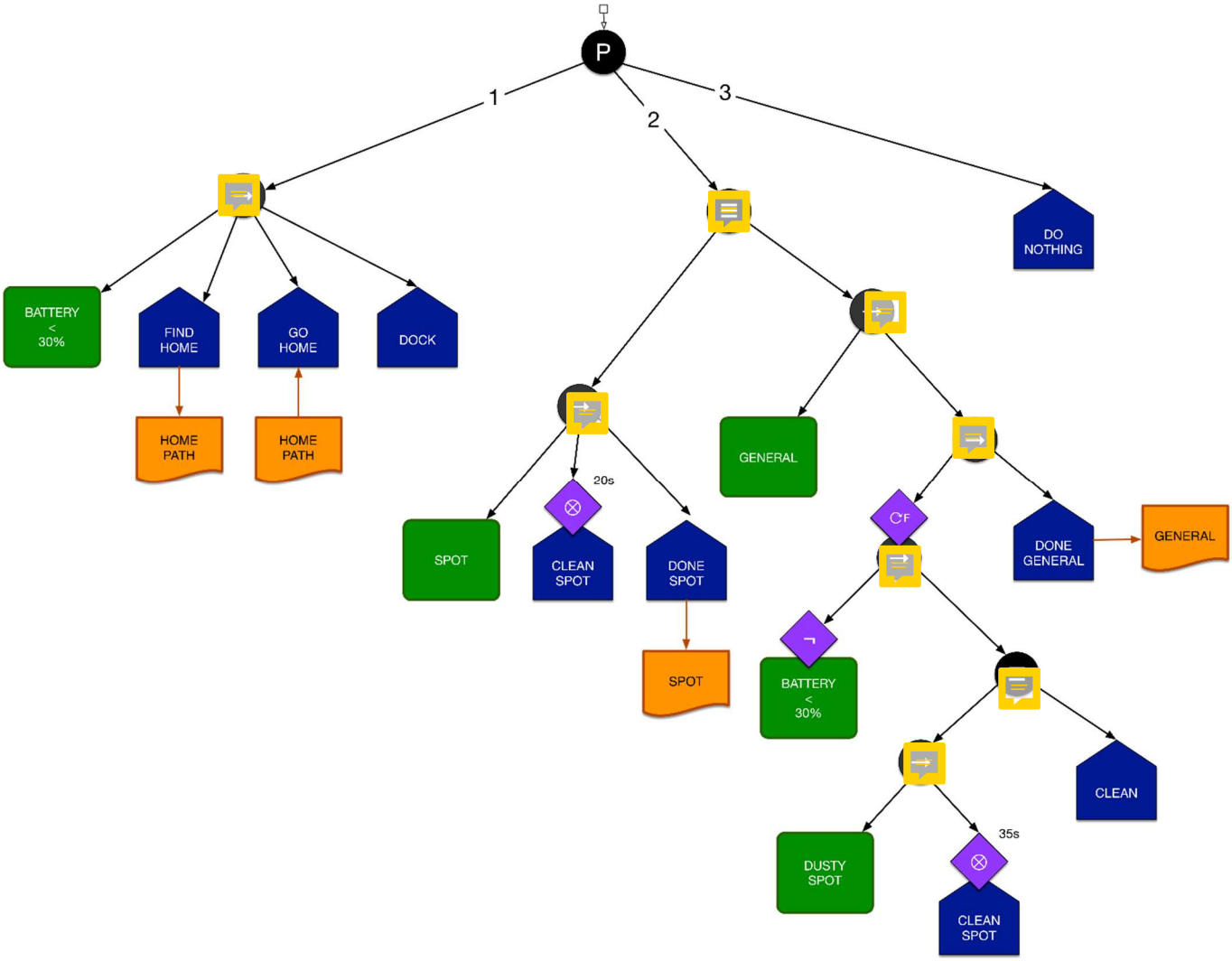
The goal of this problem set is to implement the provided behavior tree. As we talked about in class, trees can be represented with concatenated IF-THEN-ELSE rules. Trees can also be implemented a hierarchy of node types (additional 30 Points).

Your implementation should accept a blackboard object as input (a regular hash map or dictionary). The blackboard contains the following elements:

1. **`BATTERY_LEVEL`**: an integer number between 0 and 100
2. **`SPOT`**: a Boolean value – **`TRUE`** if the command was requested, **`FALSE`** otherwise
3. **`GENERAL`**: a Boolean value – **`TRUE`** if the command was requested, **`FALSE`** otherwise
4. **`DUSTY_SPOT`**: a Boolean value – **`TRUE`** if the sensor detected a dusty spot during the cycle, **`FALSE`** otherwise
5. **`HOME_PATH`**: The path to the docking station

`SPOT` and **`GENERAL`** should not change until the command has been completed. The tree evaluation is called several times, each time simulates a 1s interval. Certain tasks should return **`RUNNING`** if they have not completed the job yet, and last for the specified number of cycles (20 cycles, or 35 cycles).

Except for **`DONE GENERAL`** and **`DONE SPOT`**, none of the other tasks will need to be implemented as printing a string with the name of the task and the state (SUCCEEDED, FAILED, RUNNING) will be sufficient. **`DONE GENERAL`** and **`DONE SPOT`** will set to **`FALSE`** the corresponding values in the blackboard.



SUBMISSION

Submit your solutions via Canvas.