Artificial Intelligence 5M - Loch Lomond Lake

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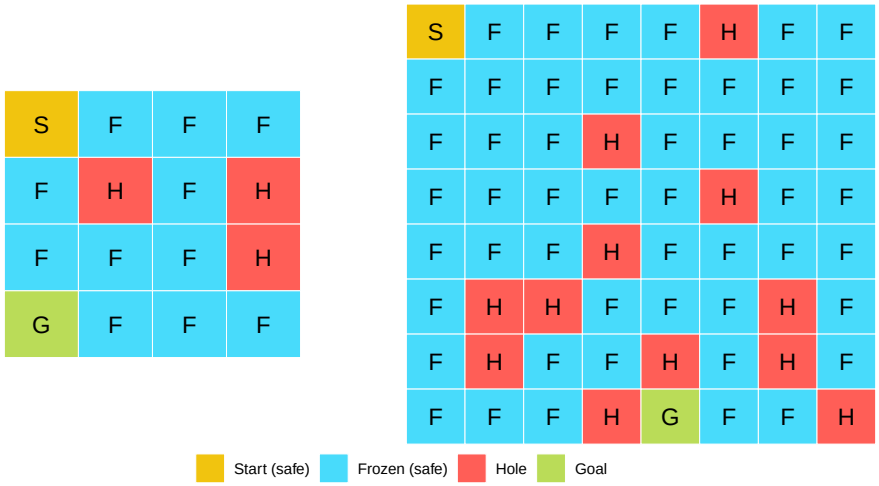
1 Introduction

The Loch Lomond Frozen Lake environment is a customized Open AI Gym derived from FrozenLake (https://gym.openai.com/envs/#toy_text).

The goal of this report is to design, implement and evaluate three diferent virtual agents which are able to navigate across the Loch Lomond Frozen Lake grid and retrieve the frisbee disc. Three different agents are analyzed: a senseless agent, a simple agent and a reinforcement agent.

2 Analysis



3 Methodology

4 Implementation

4.1 Senseless Agent

4.2 Simple Agent

4.3 Reinforcement Learning Agent

4.4 Environment Modifications

In order to add additional flexibility and generic support to the agents, slight changes were made to the `uofgsocsai.py` file, the one containing the main `LochLomondEnv` environment class. The

changes below were approved as long as justification was provided. The changes and justifications are as follows:

- Parameters `map_name_base`, `reward` and `path_cost` where added to the `LochLomondEnv` constructor. The default values are `8x8-base`, `1.0` and `0` respectively. The default values do not alter the functionality from the original file provided.
- Attributes `is_stochastic`, `reward_hole`, `reward` and `path_cost` were added to the class

The reason of the changes for the constructor was to add flexibility to be able to test different scenarios without the need to modify the file every time a different variant was analyzed. The attributes added to the class in order to be able to access them via the object (e.g. `env.path_cost`) and create a Markov Decision Process out of it. Even though a Markov Decision Process was out of the scope of this project, an inhouse mapper from `Open AI Gym` environment to Grid MDP with the only purpose of doing a sanity check between the final U and policy from the Reinforcement Learning agent and the ones that a `Policy Iteration` and `Value Iteration` algorithm would provide.

Finally, the way to assign en environment grid was changed from `MAPS_BASE[map_name_base]` to `copy.deepcopy(MAPS_BASE)[map_name_base]`, with the only purpose of being able to instantiate the `LochLomondEnv` more than once in a single run (e.g. `python run_rl.py 1,2,3,4,5,6,7`), which runs all the variants in a single call.

There may be other better ways of accomplish the same without code changes, but due to the current lack knowledge of Python programming, time did not permit to find better ways for it.

5 Evaluation

Every agent produces different evaluation files that will be created inside the `out` folder.

6 Conclusions

7 References

8 Appendices

8.1 Appendix A: Title Here

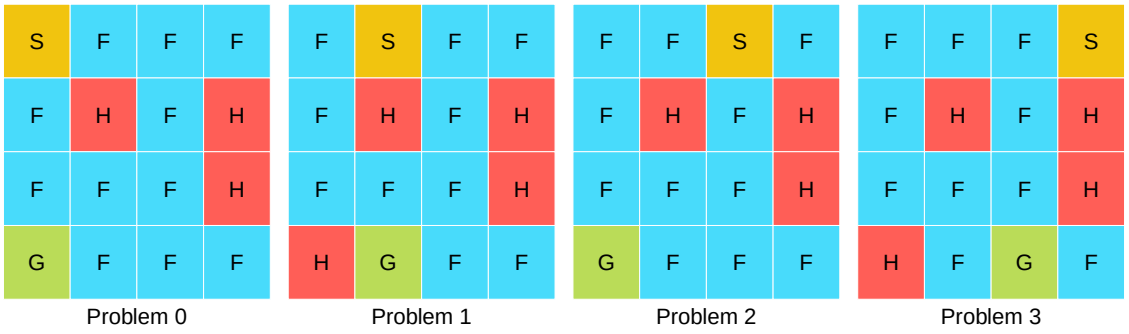


Figure 1: My caption here

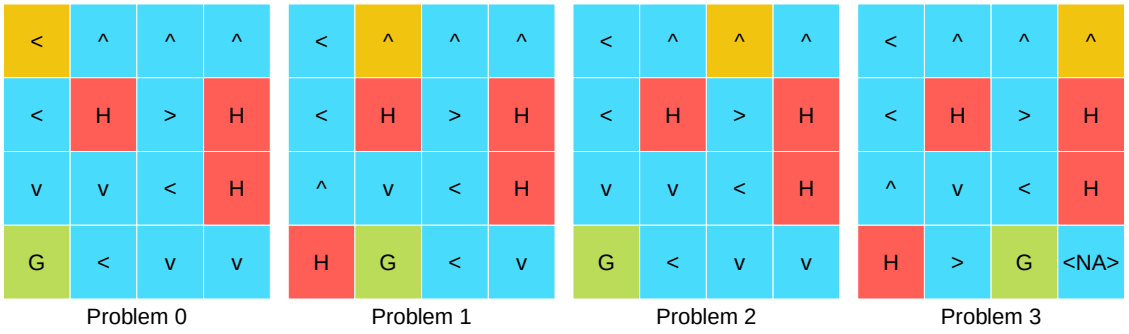


Figure 2: My caption here

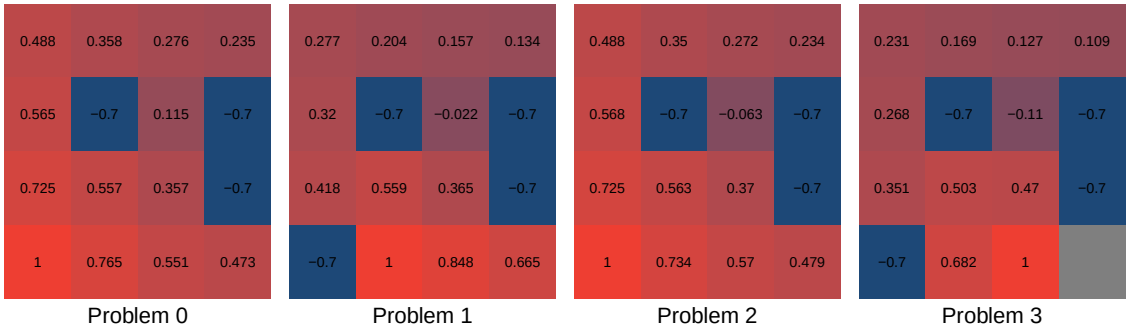
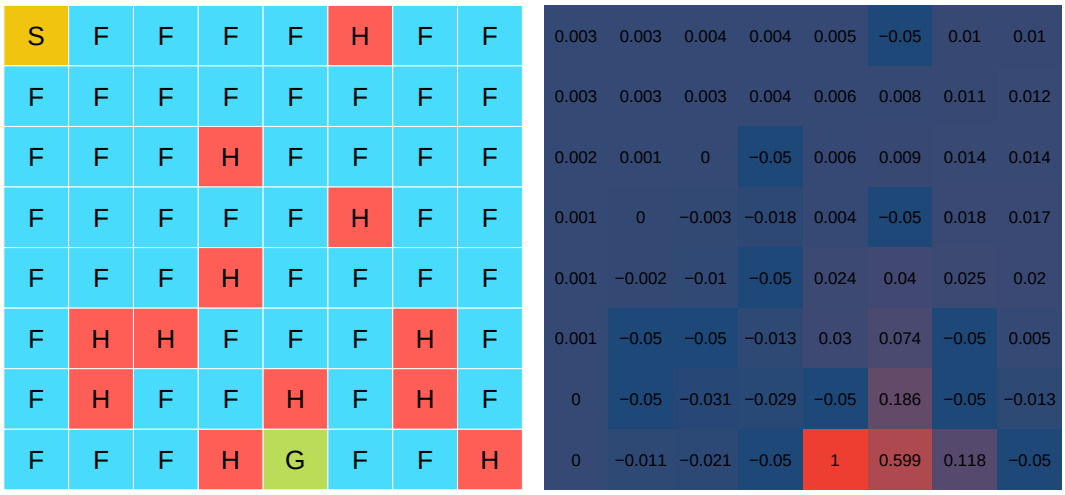


Figure 3: My caption here

8.2 Appendix B: Title Here



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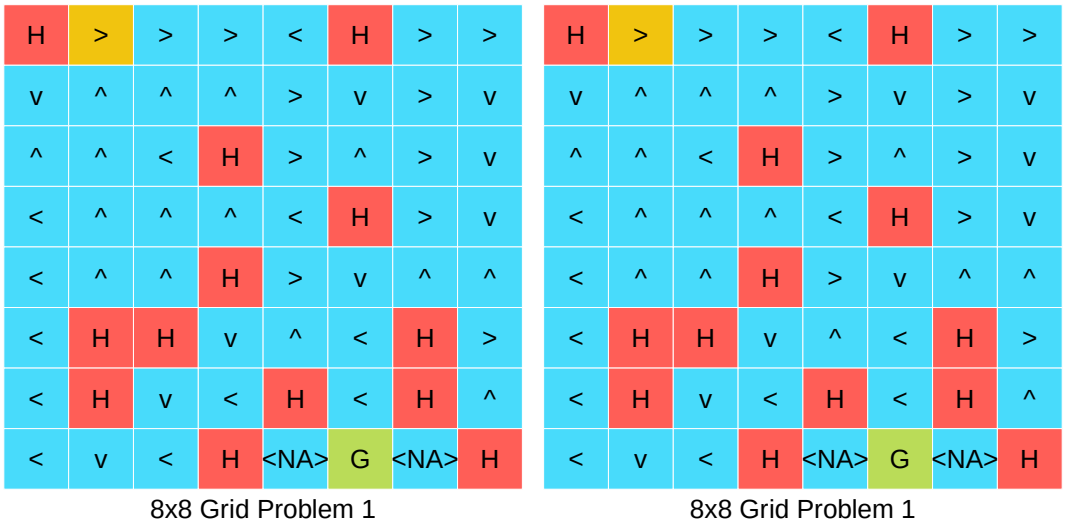

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