Progress Presentation

June 6th - June 15th

Agenda

- particle filter divergence

What kind of strategies do civilisations in the universe employ to ensure their survival, and how do these strategies change over time and space?

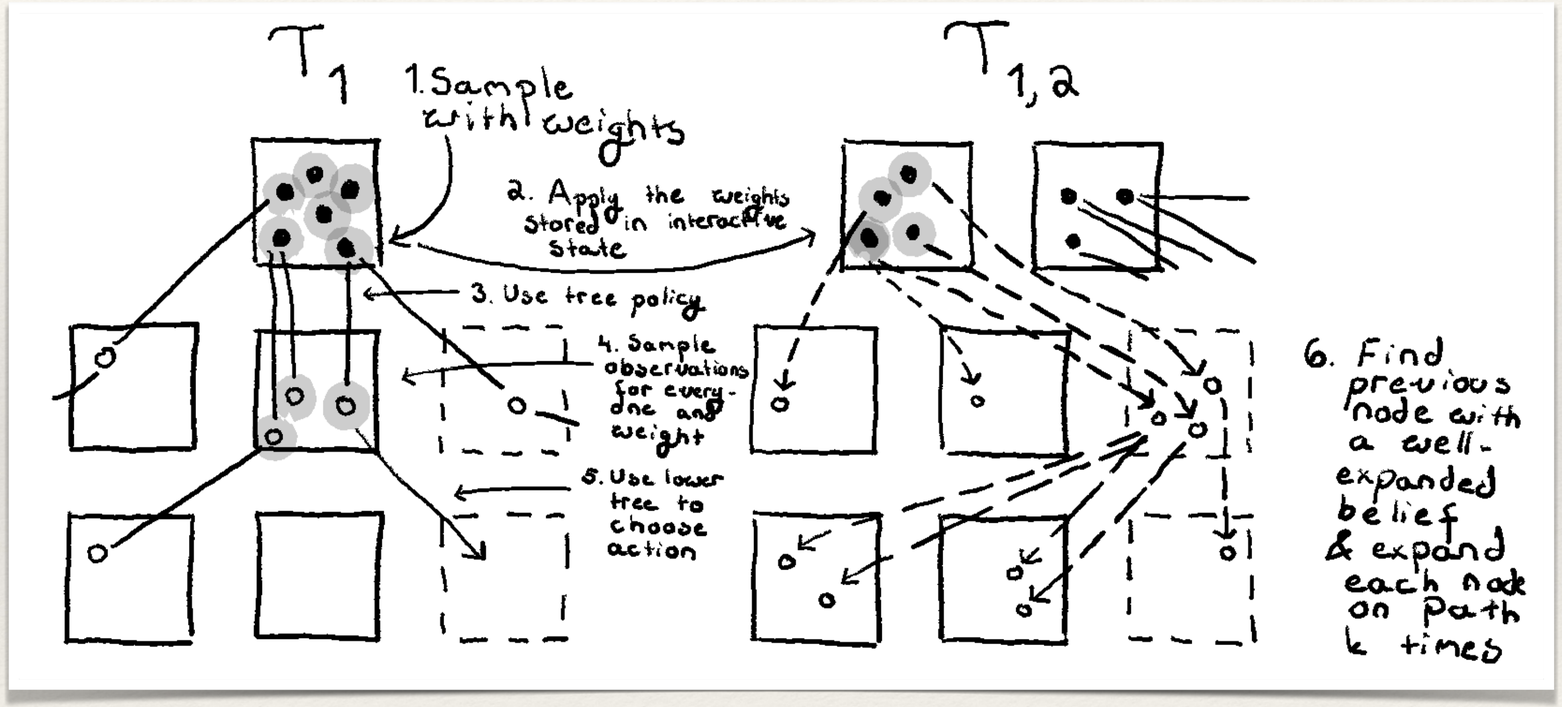
Issues with Particle Filter

- There seem to be two separate causes for particle filter divergence:
  - **mismatch** between what agent 2 thinks 1 does and what 1 does
  - **impoverishment**? too few particles? (diverges even at level 1 where there is no mismatch)
- possible solutions:
  - **mismatch**: changing the planning method (again)
  - **impoverishment:**
    - resampling particles more systematically (tried systematic resampling and "binned systematic resampling")
    - adding random particles / noisy copies of particles
      - but at what point / how many? adding at every step could bias estimates of action values

Planning

- The top-down planning doesn't properly address the mismatch issue
  - the mismatch happens in the -1 node, and simulations still use the same lower tree / default policy
- Instead: (?)
  - bottom-up, like before ("what would agent do given the actions it expects from others")
  - when simulations in higher trees use a child tree and there is a mismatch (PF divergence),
    - create random particles in the node
    - simulate from node (but don't back up action values further than the node)

Current top-down planning



Meeting Notes

- Two ways to avoid particle deprivation:
  - try a higher observation noise
  - add random particles
    - how many? Experiment, see sources
- Sources on particle filters:
  - Simulating Crowds in Real Time with Agent-Based Modelling and a Particle Filter: https://eprints.whiterose.ac.uk/159617/8/3.pdf
  - Obstacles to high-dimensional particle filtering: https://journals.ametsoc.org/view/journals/mwre/136/12/2008mwr2529.1.xml