The Platform Design Problem

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Problem

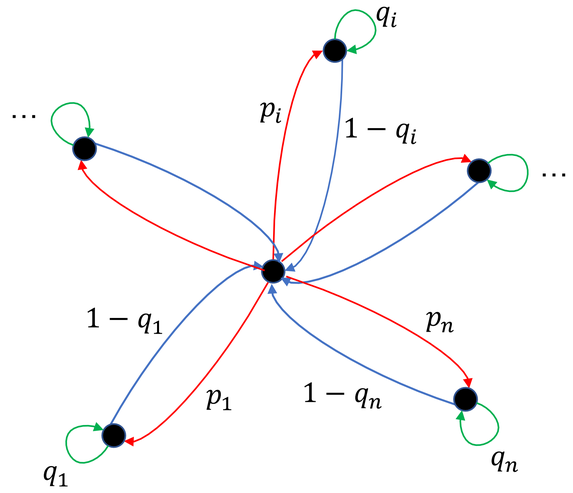
Model the revenue-maximization problem of modern online firms (e.g. Google, FB, etc.) and understand computational tractability.

Bi-Level MDP Optimization Model

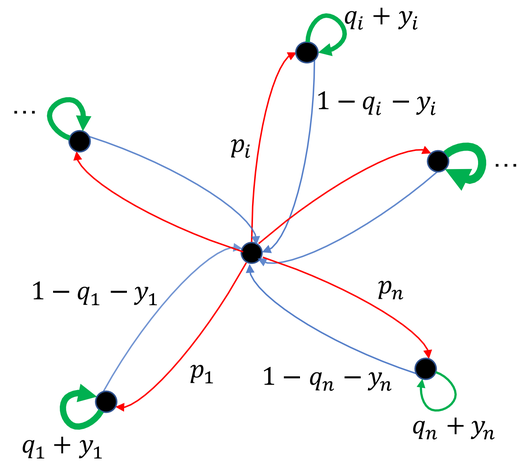
Agent: participates in Life MDP

Designer: tweaks the Life MDP by building platforms.

Goal: Designer wants to indirectly optimize its reward via Agent's optimal behavior! (Find Stackelberg)



Life MDP



Tweaked MDP via y_i

Main Question:

Computational tractability of Stackelberg Equilibrium for the Designer-Agent game?

Main Results (informal)

1. General (unstructured) design problem is NP-hard.
2. Flower (diagram) design problem has a DP FPTAS, and is NP-complete.
3. Results generalize when other Designers have already built platforms, and to settings with small #s of Agent types.

Future Work

Follow-up questions:

1. Designer vs. Designer games
2. Privacy/Ethics/Fairness questions for Agent welfare
3. Learning settings and Strategic behavior
4. and many more…