COMP34120: AI and Games - Project 2

Overview

Your task is to make a program which plays repeated 2-person Stackelberg pricing games as the leader under imperfect information.

Specifications about the leader:

Suppose that the leader's strategy (i.e., price) is u_L and the follower's strategy (i.e., price) is u_F, then the detailed specifications about the leader are given as follows:

- Unit cost: $c_L = £1.00$

- Strategy space: $U_L = [1.00, +\infty)$

- Demand Model (i.e., price-sale relationship): $S_L(u_L, u_F) = 2 - u_L + 0.3u_F$

- Daily Profit: $(u_L - c_L)S_L(u_L, u_F)$

- The leader has no information about the follower's strategy space and payoff function but there are a set of historical data (60 days) being provided by the game platform
- The leader's objective of playing is to maximise his accumulated profit for the next 30 days
- For the simplicity, it is assumed that the leader's unit cost, the strategy space, and the demand model are unchanged during the whole period (90 days).

Rules of playing:

At day t, the leader will announce his price $u_L(t)$ first; Knowing the leader's price, the follower will choose his responding price $u_F(t)$, where $t = 1, 2, ..., 90$, in which $t = 1, 2, ..., 60$ are for historical data, whereas $t = 61, 62, ..., 90$ are the days when the game is going to play repeatedly.

Game playing scenarios:

The leader (i.e., your program) is going to play two separated games in which a different competitor (i.e., the follower) is to be faced. In each of the repeated game, the leader chooses his learning method and strategy to play based on the provided set of historical data. Then each day during the playing period (i.e., the next 30 days or $t = 61, 62, ..., 90$), the leader will send his price $u_L(t)$ to the game

platform, and the follower will give his response $u_F(t)$. After receiving the follower's responding price $u_F(t)$ from the game platform, the leader can use this piece of information to update his knowledge and decide his price of the next day. In the other words, the leader (i.e., your program) should be able to take the follower's price of the previous day from the game platform for updating, and then decide and send his price of the next day to the game platform.

It should be emphasised that the follower's strategy and payoff function is subject to the changing and time varying environment (that is, the parameters in the follower's payoff function are not the same every day).

Schedule

- **Week of March 12 (Week 7):** Start to work on your project
- **Week of March 19 (Week 8):** Tell us what you plan to do, and how you plan to divide up the tasks among members of the group.
- **Week of April 30 (Week 11):** Group presentations telling us what you have done.
- **Midnight between May 4 and May 5:** Deadline to submit your program.
- **Week of May 7 (week 12):** The revision lectures will be arranged in this week.

Scheduled meeting times are Monday 4:00-5:00pm and Tuesday 9:00-10:00 in Collab, but you are only required to attend in week 8 long enough to tell us your plan, and week 11 for the presentations (we will schedule one or more presentation slots during that week.) Other booked times are just for help sessions.

Getting help

The best way to ask questions is to use the forum on Moodle associated with this course. This way, both the questions and answers can be shared with all the students.

We will also be available to give help during the schedule lecture/meeting times, but it would be helpful to tell us in advanced what kind of help you need (game theory, algorithms, programming). You can do this by making a request on the forum.

Assessment

We remind you of the assessment we announced during the first lecture.

1. This project counts 30% of your final mark.
2. 15% comes from the content of the approach. How good was the idea, how well-informed by the content of the course, outside literature, etc.

3.   15% comes from the performance of the approach – how well does it play (i.e., the accumulated profit) and how quickly does it play.

4.   The group mark will be distributed to the members of the group using: self-assessment, contribution to the WIKI, and demonstration of knowledge during the presentation.

The presentation

During Week 11 of Semester 2, all groups will make a presentation to the lecturers and the other groups. It is important that every member of the group speak and answer questions, so we can gauge the contributions of the members of the group. None of the marking will be based on presentation skills, so you need not make a polished presentation. The assessment is entirely on content: what your group did and what you learned from doing it.

Submission

Same as Semester 1, submission will be through Moodle.

Game Platform and Resources

The game platform and detailed explanation can be found in

   http://www.cs.manchester.ac.uk/ugt/2011/COMP34120/

or

   /opt/info/courses/COMP34120/Game