A Field Experimental Comparison of Races and Tournaments

Objectives & Required Specs

NASA Tournament Lab, January 2015

NASA
Tournament Lab

THE OBJECTIVES OF OUR RESEARCH

Definition of Races & Tournaments

- In a **race**, individuals or groups compete to be first to achieve a particular objective.

- In a **tournament**, individuals or groups compete to carry out the best performance in achieving a particular objective.

Races & Tournaments are wide spread

- Races & tournaments are widely used as a mean to incentivize innovation:

  - **Races**: Longitude Prize (1714), Orteig Prize (1919) Ansari X-Prize (2004), Netflix Prize (2009)

  - **Tournaments**: NIH research grants, Goldcorp Challenge (2001), Super Bowl Ads Challenge (2012), Algorithmic contests on Top Coder, Kaggle, etc.

Key differences in theory

- Key differences:
    - Being “the best ranked” is not enough to win a race, the objective has to be achieved (performance levels matter).
    - Being highly skilled is not enough to win a race, having an early start is also important (complex dynamics of entry/exit).

Why not a tournament with reserve?

- If the key concern is that of having a competition in which performance levels matter, then this can be achieved by simply imposing a minimum-level of performance on a traditional tournament, reserving prizes for those achieving at least a particular score.

- We rarely observe such types of tournaments.

- Races are much more common, why so?

Experimental Design

- We want to compare outcomes of three treatments:
- A **race**
- A **tournament**
- A **tournament with reserve**

Why Top Coder should care about this experiment?

- Setting a minimum performance level forces TC clients to formally define their expectations about the outcomes of MMs (obvious implications for pricing).

- Races can provide quicker results, lowering congestion problems on the platform.

- Races & tournaments with reserve can help coders to better assess the efforts required to win to the competition. Reducing uncertainty can lower costs.

REQUIRED SPECS FOR THE EXPERIMENTAL COMPETITION

Outline of Required Specs

- Preliminary Competition
- Pre-registration phase
- Registration phase
- Competition Rooms & Treatments
- Submission phase
- Prizes distribution

Preliminary Competition

Goal: identifying scoring level for the race treatment

Requirements:

1. Invite 4 coders (2 yellows and 2 reds) + the copilot.

2. Each coder will get $300, and the best solution an additional prize of $200.

3. Each coder will be assigned to an individual room to submit code. With feedback on the distribution of scores of the others (identities are kept secret).

4. All the requirements for the Banner challenge (see below) should be satisfied also in this preliminary competition. Testing is done in the same way as in the real competition.

5.The invited coders will not be able to participate to the MM.

Pre-registration Phase

Goals: recruit highly-skilled coders (yellows and reds)

Requirements:

1. Registration will be capped at 350 coders & will be open only to rated coders.

2. Before registration, send early email only to yellows & reds to advertise the event.

3. After three days, public announcement on Top Coder Website for everyone.

4. At registration, general email to everyone rated and active in the last year.

5. Note that no other MM should be in place during the registration period & the submission period.

Registration Phase

Goals: informed consent & registration survey

Requirements:

1. The duration of the registration phase is of 5 days prior to the competition.

2. No problem statement, no test cases are available at this stage (hence no submissions during registration).

3. Because registration involves participation to a research study, registrants will be asked for their consent to be involved in the study (“I agree” button).

   (i)Top Coder members have to agree to receive communications via email during the competition.

   (ii)Top Coder members have to agree to complete a registration survey, as well as a final survey.

4. Top Coder members cannot discuss the competition rooms on the Forum or among themselves during the competition.

5.Harvard researchers will provide Qualtrics link to mandatory registration & final survey

Competition Rooms

Goal: form several independent competition rooms

Requirements:

1. At the end of registration, Top Coder will send Harvard Researchers the list of all registered Top Coder members.

2. Within the next 24 hours, Harvard Researchers will return a file with the registered members divided into N rooms.

3. Each room will be independent and no communication is allowed among different rooms.

4. Each room has its own forum and its own leaderboard.

5. Only room members can contribute to the forum. Leaderboard statistics are not published on the Top Coder website (i.e., only room members can see them). Room details are not public or available to non room members

6. The first entry of the forum will display the competition rules (see next).

7. Top Coder will collect all timestamps for each individual's access to: Problem statement; Download of test cases data; Link to Banner (existing algorithm); Leaderboard view page.

Treatments

Goals: communicate treatment rules to competitors.

Requirements:

1. Each room is assigned to one of three kinds of competitions:

   (i) **The race.** The winners are the first two coders to submit a solution with score greater than S. No prizes will be awarded if no submissions reach a score of at least S.

   (ii) **The tournament.** The winners are the two coders with the highest score at the end of the submission period.

   (iii) **The tournament with a reserve.** Only submissions that score at least S are eligible for prizes. The winners are the two coders with the highest score at the end of the submission period, given that the score is at least S. No prizes will be awarded if no submissions reach a score of at least S.

2. The threshold S will be determined after and on the basis of the results of the preliminary competition.

3. The rules for each type of competition will be shown in the room forums, by email, and in the problem statement.

Submission Phase

Goals: when to terminate the race & feedback during competition.

Requirements:

1. At each submission, Top Coder will compute the final scores in addition to the partial scores.

2. The final scores are not to be shown on the leaderboard, which displays the usual things (ranking, submissions, partial score, etc.).

3. Every day we will have a status update posted on the room forum. This tells competitors whether the threshold has been hit by someone or not. Top Coder should communicate the time at which they will run the periodic final score analysis and when they will publish the status update.

4. As soon as someone reaches a final score of at least S, Top Coder will send an email to all participants of the room to communicate that the first prize has been awarded, but the second prize is still available. Harvard researchers will provide the exact text of the email. This information will also be posted on the room forum.

5. As soon as also the second coder reaches a score of at least S, Top Coder will send a second email to all participants of the room to communicate that the competition is over. Harvard researchers will provide the exact text of the email. This information will also be posted on the room forum.

6. People will not be allowed to discuss the competition results outside the room forum (until the 10 days are over).

Prizes distribution

Goal: definition of room prizes.

Requirements:

1. There is a total prize purse of $25,000.

2. The prize purse will be evenly split across rooms.

3. The winner will be awarded 90% of the room prizes

4. The second placed competitor will be awarded the remaining 10%

5. In rooms with a condition on quality, no prizes will be awarded if no one achieves the minimum requirement.

6. Note that the competition is a non-rated event.

Questions & Thanks