Evolving Bidding Strategies

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Outline

✔ Motivations
  • balanced-bidding strategy
✔ Goal
✔ Encoding the strategies
✔ Discussion
Motivations

✔ On Best-response Bidding in GSP Auctions by Cary et al.

- GSP auction
- Asynchronous rounds
  ✔ Choose one bidder at random
  ✔ Only this bidder updates his bid
- Full information: all bids are public
- Not strategyproof
- Large set of bidding strategies
Balanced-bidding strategy

✔ Targets the slot $s_j^*$

\[ s_j^* = \arg \max_s \{ \theta_s(v_j - p_s(j)) \} \]

✔ Choose the bid $b'$ such that

\[ \theta_{s_j^*}(v_j - p_{s_j^*}(j)) = \theta_{s_{j-1}^*}(v_j - b') \]

✔ If $s_j^*$ is the top slot

\[ b' = \frac{v_j + p_1(j)}{\gamma} \]
Unique fixed point

- BB converges to a NE with VCG payments
  - but all bidders have to play BB...

What if we take into account the whole history?
Goal

✔ Design and implement a framework for GSP and VCG auctions

✔ Find new strategies
  • Genetic algorithm
  • (Particle swarm optimization)

✔ Analyze and understand the strategies
Genetic algorithm

Population

Evaluation

Parents

Offspring

selection

crossover

mutation
Encode last \( h = 5 \) bids for \( n = 5 \) bidders
\[
\frac{v}{\epsilon} = 10
\]
Length of one chromosome
\[
2^{8hn} = 2^{8 \times 5 \times 5} = 1.6069 \times 10^{60}
\]
Strategy space is... BIG!
Size of data structure
\[
2^{8hn} \left\lfloor \frac{1}{2} \frac{v}{\epsilon} \right\rfloor = 8.0347 \times 10^{60} \text{ bits}
\]
\[10^{51} \text{ GB / chromosome}\]
Discussion

How to encode the strategy?

Which strategy?