Implicit Deadline Calculation for Seller Agent Bargaining in Information Marketplaces

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Outline

- Introduction
- Market members
- Buyer-Seller Interaction
- Seller Behavior
- Results

Introduction

- Intelligent Agents
  - Autonomous Software Components
  - Represent users
  - Learn from their owners
- Information Markets
  - Places where entities negotiate for the exchange of information goods

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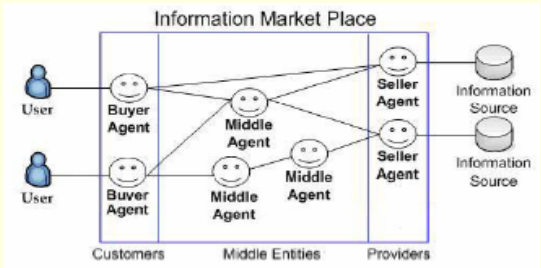
Market Member Roles

- Buyers
- Sellers
- Middle entities (matchmakers, brokers, market entities)

➔ Intelligent Agents may represent each of these entities



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Buyer-Seller Interaction (1/2)

- Can be modeled as a finite horizon Bargaining Game (BG)
- No knowledge about the characteristics of the opponent (i.e., the other side) is available
- The buyer aims to buy the product at the lowest possible price while the seller aims to sell the product at the highest possible price
- The buyer has a specific valuation for the product
- The seller has a specific production cost
- The two players have specific deadlines to conclude the transaction

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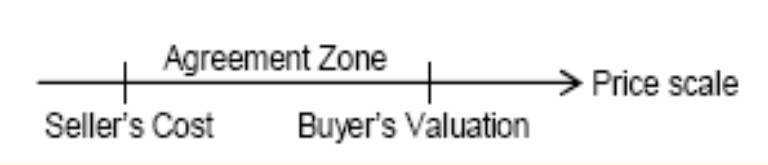
Buyer-Seller Interaction (2/2)



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Seller Behavior (1/6)

- The seller stays in the game for a specific number of rounds
- Profit
  - A Utility Function is used
  - Profit = price – production/retrieval cost
  - The greater the price is the greater the profit becomes

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Seller Behavior (2/6)

- Pricing Policy
  - It is based on: the cost (c), an amount of profit (ε), the proposal's number (x) and the popularity measure (q):

$$p^s(x) = \frac{\varepsilon}{x^{q+1}} + c, \qquad x = 1,2,....$$

  - The popularity measure depends on the product's cache ranking and it is calculated based on the Zipf's Law

$$q = i^{-k}$$

i is the product's ranking and k is the Zipf parameter (we use k=0.8)

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Seller Behavior (3/6)

- Pricing Policy (continued)
  - The seller performs as a caching server
  - The products are delivered to interested parties more than once
  - The products are classified according to their popularity

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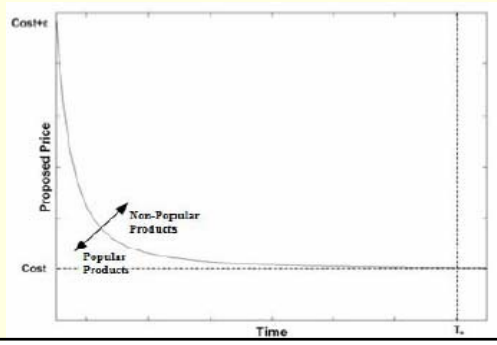
Seller Behavior (4/6)

- Pricing Policy (continued)
  - The seller concludes rapidly the game for popular products
  - The seller does not sell the product below its cost



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Seller Behavior (5/6)

- Deadline calculation
  - Based on its pricing function a deadline value could be defined if:

$$\lim_{x \to \infty} \left[\frac{-\varepsilon \cdot (q+1)}{x^{q+2}} \right] = 0$$

and hence

$$x^{q+2} \approx \alpha \cdot \varepsilon \cdot (q+1) \rightarrow T_s \approx (\alpha \cdot \varepsilon \cdot (q+1))^{\frac{1}{q+2}}$$

  - Variable α is the patience factor of the seller

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Seller Behavior (6/6)

- Patience factor
  - is based on the policy of the seller
  - indicates the patience of the seller
  - The greater the factor is the more time the seller spends in the game
  - indicates until when the game is meaningful for the seller

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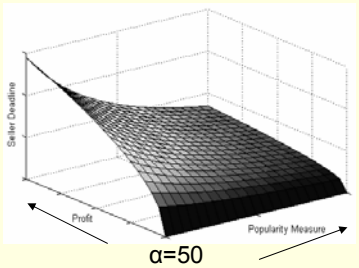
Results

- The greater the product's popularity is, the more quickly the seller reduces its prices
- Factor α (Patience factor) affects the game participation time of the seller
- The seller stays more in the game if it targets to higher profit



α=50

Profit (ε)=5, q=0.4 and Cost (c)=2					
α	20	50	100	200	500
Ts	8	11	15	20	30
Profit (ε)=20, q=0.4 and Cost (c)=2					
α	20	50	100	200	500
Ts	14	20	27	36	53

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Thank you!

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