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Outline

- Introduction
- The Model of Group-buying Auction
- Bidder's Strategy in GBA
- Comparison GBA with FPM
- Collusion in GBA
- Summary and Future Works

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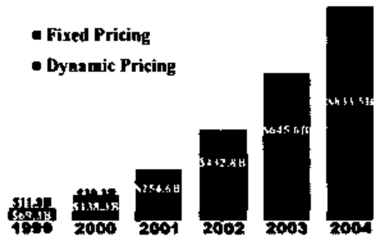
Introduction (I)

- **Dynamic Pricing vs. Fixed Pricing**

  Auctions make both buyers and sellers engage in the price discovery process. Auctions of various kinds will replace the fixed pricing model that now p des much of the Web



(From: Whit, 1999)

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Introduction (II)

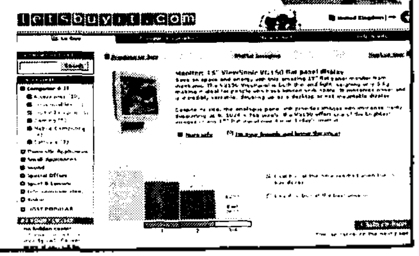
- **Group-buying: An Innovative Dynamic Pricing Mechanism (Horn et al., 2000)**

  "Co-buying is co-operative shopping for the 21st century. It's really simple way of getting better value by bringing people together via the Internet. By bringing together as many members as possible, LetsBuyIt.com can negotiate lower prices with merchant partners or manufacturers. The more people, lower prices."

  ---LetsBuy (2003)

  e.g., Mercata.com, Mobshop.com, actBIG.com, CoShoppe OnlineChoice, Letsbuyit.com, Yabuy.com, Coolbid.com.cn

  But, Mercata.com closed down in 2001(Cook, 2001) and Mobshop changed its strategic direction to the B2B market (Clark, 2001)



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Literature Review

- General auction theory
  - Vickrey(1961)
  - McAfee and McMillan(1987)
- Double auction
  - Satterthwaite and Williams (1989)
  - Sadrieh (1999)
- For a complete review of auction models, see Klempere
- Online auction
  - Beam, et. al.(1999)
  - Monderer and Tennenholtz (2000)
  - Gottlieb (2000)
  - Kauffman and Wang(2002a; 2002b)
  - Anand and Aron(2003)
- For a complete review of online auction, see Pinker, Seidmann a Vakrat (2003)

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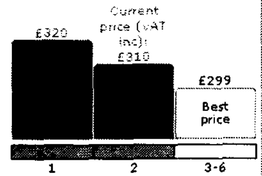
Group-buying

- Group-buying auction can be divided into two rounds: the offer round in which the seller sets his price curve according to how many units of a product to be auctioned and the auction period T; the bidding round in which the bidders bid one by one according to their arrival times.
- Suppose N units of a product to be auctioned and the auction lasting for T units of time
- A price curve is set by the seller before the auction
- $Q=(q_1,q_2,\dots,q_N)$
- e.g.,

  q_1=320, q_2=310
  q_3=299, q_4=299,
  q_5=299, q_6=299



- An auction will end if the number of winners reaches N or time reach

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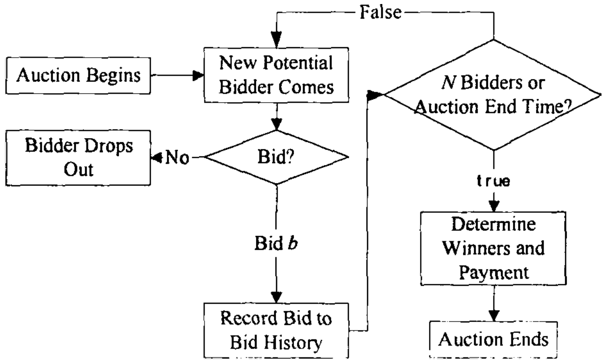
Auction Process



Bidder's Strategy

- Dominant Strategy
  - If $v<q_N$, not bid
  - Otherwise, bid $\Theta(v)$

  Where: v is a bidder's valuation, and

$$\theta(b)=\begin{cases} q_1, b\ge q_1 \\ q_j, q_{j-1}>b\ge q_j, j\in[2,N] \end{cases}$$

- Equivalent optimal bids may exist

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Numerical Example

- Bidder's Dominant Strategy
  - Q=(100,90,80,70,60) v=74
    B_0=(90,90)
  - v=74 ⇒ $\Theta(v)$=70

				(60,60)
				14
				14
				14
				4
				4

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Optimal Auction (I)

- Objective: Optimize the Expected Revenue of the Seller
- The Optimal Price Curve Is Horizontal,

  $Q^*=(q^*, q^*, \ldots, q^*)$
  where q^* is the optimal fixed price for the seller

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Numerical Examples (I)

Suppose that T=3, N=5, the distribution of bidders' values is a normal distribution with **μ = 5 and** σ = 3; the bidders' arrival process is a Poisson one with **λ =1,** it can be calculated that

Q^*=(4.47, 4.47, 4.47, 4.47, 4.47)

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Numerical Examples (II)

- Simulation Results

Price Curve	*A*	*B*	*C*	*Q**
Expected Revenue	7.52	7.49	7.50	7.60

- A=(4.3, 4.2, 4.1, 4.0, 3.9)
- B=(5.1, 4.9, 4.7, 4.5, 4.3)
- C=(5.0, 4.9, 4.8, 4.7, 4.6)

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Optimal auction (II)

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- When the seller's objective is to maximize his expected profit (i.e., $U=r(q_r-c(r))$)
  - the unit cost of the auctioned object is constant with different volumes

    The optimal group-buying auction is inferior to the optimal fixed-price mechanism

  - the unit cost of the auctioned object is decreasing in volume (i.e., with economics of scale)

    The group-buying auction is superior to the fixed-price mechanism

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Numerical Example

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- Suppose that the potential buyers' arrival process is a Poisson process with $\lambda = 1$; their valuations are drawn from the same uniform distribution in interval [0,1], $l=5$, where t varies from 7 to 13, c_1 is uniformly distributed in [0.01,0.4], and is uniformly distributed in [0.1, 0.9].

APG denotes the average profit for the optimal GBA
APF denotes the average profit for the optimal FPM

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Optimal auction (III)

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- When the seller's objective is to maximize his future revenue (e.g., $U=r^2q_r$)

  The group-buying auction is superior to the fixed-price mechanism

- Examples: Suppose that the potential buyers' arrival process is a Poisson process with $\lambda = 1$; their valuations are drawn from the same uniform distribution in interval [0,1], where $t = 4$, l varies from 1 to 6

From the table, the optimal price levels in the price curve are quite different. From this table we can see the optimal price curve is (0.4173, 0.4173, 0.3620, 0.3620,...) with $l = 2$, and the expected utility will be 3.2879

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Collusion (I)

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- Generally the collusion of bidders is forbidden, in that although it's beneficial for the bidders, it's harmful for the seller.
- Almost all auction types are susceptible to collusion, but degrees of incentives vary(Cassady(1967), Hendricks and Porter(1988), Pesendorfer(1996)). Mead (1967) shows that the English auction is more susceptible to collusion than the sealed auction; In addition, collusion is more likely to occur in the first-price sealed auction than in the second-price sealed auction. McAfee and McMillan(1992) show how to overcome the division-of-the-spoils difficulties, and point out that the bidders can reasonably divide the profitability by holding a pre-auction.

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Collusion (II)

- In the group-buying auction , the collusion of buyers is beneficial to the seller as well as to buyers
  - The bid of a coconspirator will b less than $\theta(v)$;
  - The bid of a coconspirator will be no higher than $\theta(v_1)$, v_1 is the highest bi among the coconspirators。

Collusion (III)

- **Example:** $\lambda=1$, $v\sim U(0,1)$, $T=40$, $N=100$

	the fixed-price	*Group buying auction without collusion*	*Group buying auction with collusion*
Seller's revenue	**10.0**	**9.1**	**13.8**

Summary and Future Works

- Summary
  - The Model of Group-buying Auction
  - Optimal Auction
  - Collusion
- Future works
  - Consider common value model or affiliate va model.
  - Collusion issues
  - Integrate with Supply Chain Management

Thanks!