

Computational Challenges in E-Commerce

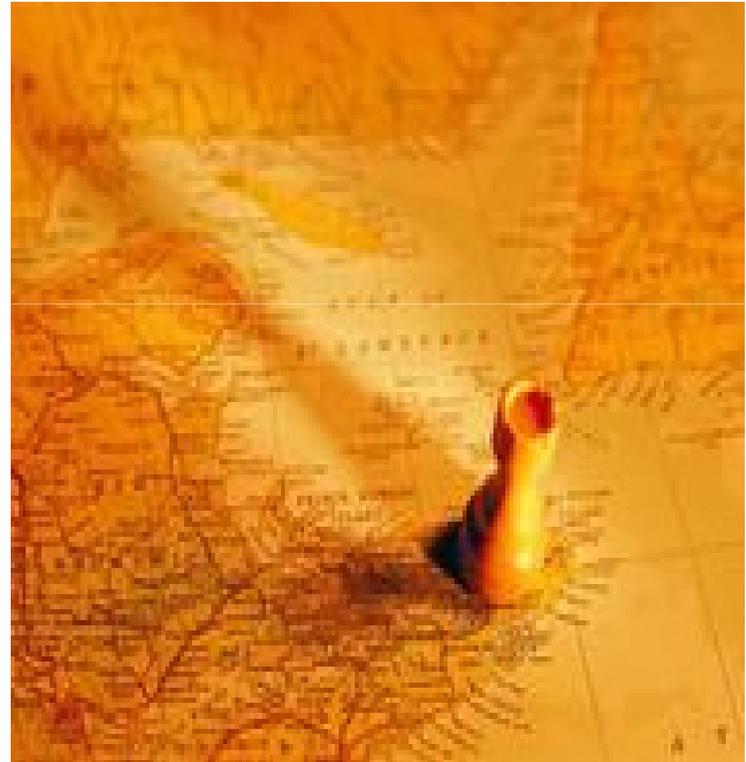


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What is E-Commerce?

- *Electronic commerce*: commonly known as *e-commerce* or *ecommerce*, consists of the *buying and selling* of products or services *over electronic systems* such as the Internet and other computer networks.
- In this article, we focused on *Internet-based commerce*.

Four Areas of Computational Challenges

➤ Individuals & organizations that use computers are *autonomous*. Generally, they will act to *maximize* their *self-interest* which is not considered in traditional algorithm design.

➤ Incentives plays a crucial role in the four areas of computation:

Resource Allocation, Knowledge Integration, Peer Production and Interaction, and Security and Privacy .

Resource Allocation

- Resource Allocation is a fundamental process that used to *assign* the available resources in an economic way.
- *Participants* declare their *perceived value* for the resource.
- *Market* computes the *best allocation* and the *prices* that participants should pay.

Auction

- Auction is a **decentralized prescription** for resource allocation.
- Classical auctions emphasize simple rules for **setting allocations** and **prices** manually.



- Combinatorial Auctions allow bidders to **express values** for bundles of goods. Sometimes it's NP-hard. For example, they are used to source truckload-transportation logics for Procter & Gamble, Walmart, and Target.

Advertising

- Advertising is a business based on *allocating attention*.
- Historically, advertising sales featured straightforward *allocation rules* and *manual negotiations*.
- Now, More aspects of advertising are being *automated*.
 - Google & Yahoo!
 - Edelman et al. and Varian model

Knowledge Integration

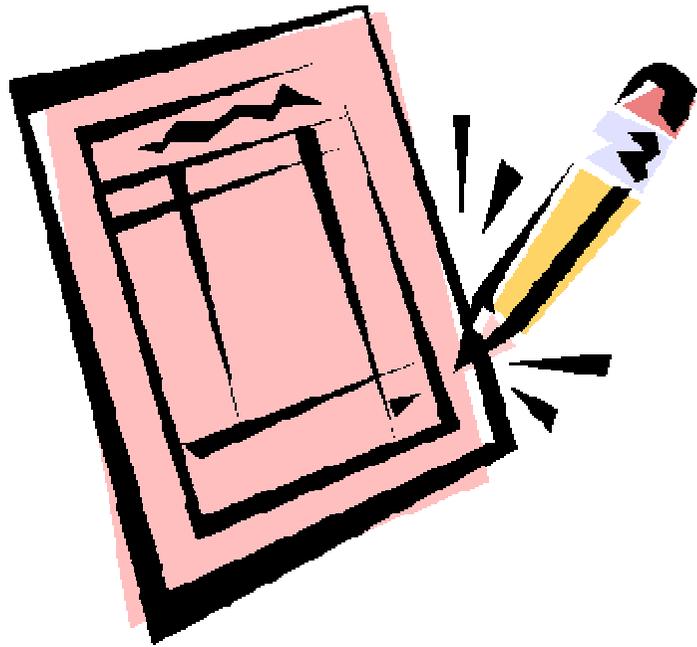
- In general, knowledge integration is the eliciting and aggregation of information from diverse and frequently *self-interested sources*.
- “*price discovery*” - a side effect of market-based resource allocation.
 - “Prediction Market”
 - Rating and reputation systems

Prediction market



- Liquidity:
 - Adjust prices *dynamically*.
 - Ensure *a bound* on the worst case loss.
- Expressiveness:
 - Severe computational cost.
 - Compromise* with computational complexity.

Rating and Reputation System

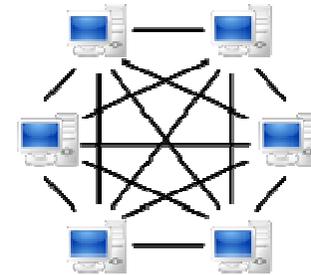


- Gathering *Subjective opinions* on a variety of things.
- *No* fundamental truths.
- Provide *considerable value*.

Peer Production and Interaction

- Peer production refers to large-scale collaboration that is not based on *price signals*.
 - Salient examples: Wiki, Linux.
 - Social production: Youtube, Facebook.
- *Motivations*: pleasure, communications or other regarding preferences.
- Challenges:
 - observe behaviors with a view to learning preferences..
 - modulate environment through appropriate constraints and affordances.

Peer to Peer



- Early protocols failed to provide appropriate *incentives* for the uploading of files.
 - Gnutella suffered from a large amount of free-riding.
- The BitTorrent protocol.
 - Limit users' download rate according to upload history
 - Inefficient market.

Trust Metrics

- EigenTrust algorithm

- Sybil attack

- Improved algorithm

- Shortest path

- Challenges:

- Find a satisfactory definition of informativeness.

Security and Privacy

- An economic *trade-off* between privacy intrusion and satisfactory interactions.
 - Individuals
 - Organizations
- Unwanted communication.
 - email spam
 - Link spam, shilling and click fraud
- Copyright enforcement

Summary

- ❑ Self-interest plays a crucial role in the procedures of e-commerce.
- ❑ The design of Internet protocols and services have often been guided by technology rather than economics.
- ❑ Economic and social science will drive Internet protocols and services into the future.