算法设计与分析

Algorithm Design and Analysis

——课程介绍

A Brief Intro

计算机科学与技术学院
网络工程系
黄河

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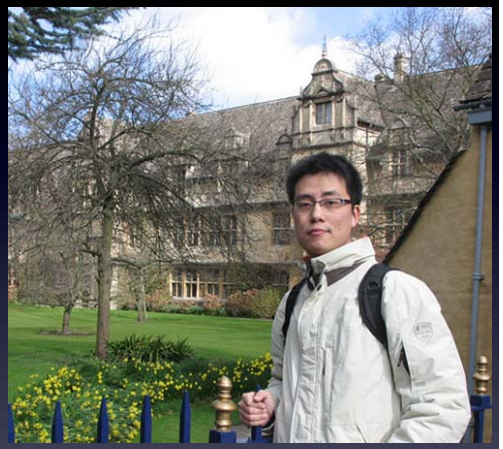
关于我

1983年生，安徽合肥人，副教授，硕士生导师。目前担任中国计算机学会物联网专委会委员。2011年6月博士毕业于中国科学技术大学计算机学院软件与理论方向，并于同年8月加入苏州大学，2013年破格晋升副教授。目前，已在国内外知名学术期刊及会议发表论文60余篇。作为项目主持人主持国家军口863项目，国家自然科学基金面上项目，青年基金项目等8项纵向课题，累计纵向经费超过300万元。曾获得2014年度国家教育部自然科学二等奖。



home.ustc.edu.cn/~huang83 英文个人主页

web.suda.edu.cn/huangh 中文个人主页

联系方式:

- 苏大本部理工楼544办公室
- http://home.ustc.edu.cn/~huang83/turing.html
- 邮箱：huangh@suda.edu.cn
- QQ：95225262
- Wechat: huangmaomao1983
- 课时：17*2=34课时 (实际：16*2=32课时)

成绩评定方式

- 期中考试 20%
- 期末考试 60%
- 平时成绩20%
  - 作业 (请不要抄袭，在批改作业过程中会关注这件事)
  - 实验

📖 选用教材 (Text Book)

算法导论 (原书第3版)
Introduction to Algorithms
Third Edition
(Thomas H. Cormen et al.)

为何选择这本书作为教材？
如何学习这本书？请自己阅读前言
瑞典式自助餐 Sweden buffet (such as IKEA)

建议参考资料

电子工业出版社，王晓东 编著，《计算机算法设计与分析(第4版)》

- 国内较为经典的算法课程教材
- 内容全，内容较为笼统

课程预计教授内容

- 算法绪论，渐进时间表示，算法复杂性分析，NP完全性理论 (ch 1~3, ch 34)
- 递归与分治策略(时间性能分析) (ch 4, ch 7)
- 动态规划（原理，0-1背包等4个算法）(ch 15, ch 25)
- 贪心机制(原理，时间安排及0-1背包等几个算法，贪心算法存在最优解的理论基础——拟阵Matroid) (ch 16, ch 23, ch 24)
- 近似算法(近似算法概念，2-approx/FPTAS 0-1背包贪心算法) (ch 35)
- 回溯法 backtracking
- 分支限界法 branch & bound
- 概率算法 (Las Vegas, Monte Carlo, Sherwood算法) (课外补充)
- 分布式算法，并行算法 (同学根据自己的需求，日后可以自学)

What's Auction?

Sotheby's
Christie's

What's Auction?

- Classic auctions
  - English auction: (公开竞价上升报价拍卖)
    - bidding starts at 0 (or one preservation price), bidders submit their bids in turn
    - new bid has to exceed the current bid
    - the last bidder wins, pays his bid
  - Dutch auction: (公开竞价下降报价拍卖)
    - bidding starts high, auctioneer lowers the price
    - the first bidder to accept the price wins

What's Auction? (cont'd)

- Sealed-bid auctions (密封报价拍卖)
  - Def. of the Sealed-bid auctions: all the bidders submit their bids simultaneously in envelopes
  - The bidder who submits the highest bid wins and .....
    - pays his bid

      (first-price auction)
    - pays second-highest bid

      (second-price auction)

What's Auction? (cont'd)

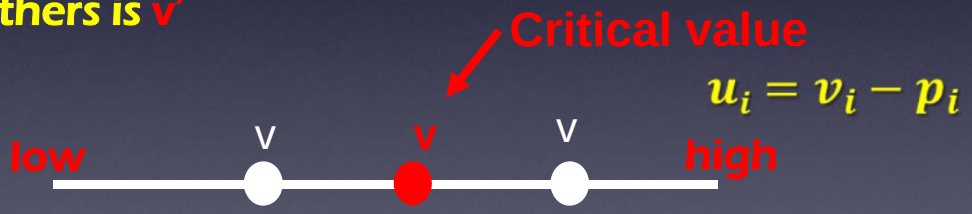
- Need for truthful auction mechanisms
  - Selfish Bidders lead to challenges and overheads
    - e.g. Indian 2G licenses auction (39 billion), Google auction for 700MHz (19.6 billion)
    - Auction: Game among strategic players
    - Everyone's Goal: Maximize individual utility (最大化个人收益)
      - Utility = (Bidder's True Valuation – Price Paid)
      - $u_i = v_i - p_i$
  - Truthful Auctions help overcome these challenges and overheads

Vickery: A Classical Truthful Auction

- Consider an auction for single item
- Vickery Auction (Nobel Prize Winner)
  - Bidders submit bids in sealed envelopes
  - Auctioneer
    - Awards the item to the highest bidder
    - Charges winner the bid of the second highest bidder (2nd -price auction)

Bidding strategies

- 2nd-price auction: The dominant strategy of each bidder is to bid truthfully
  - Bidders submit their bids in the sealed envelopes
  - Proof: suppose your valuation is v, the highest value among others is v′



  - winner's payment is the lowest amount he can bid and still win