OH on Monday 11-12

2-extra late day (final due date Wed!)

dont forget all the Sendhil talks

? presentation of project ?

Remaining topics:

- more complex item set valuations
- cooperation
- speed of reaching good social welfare
- interesting games we didn't see
  - bandwidth sharing
  - project selection
- complexity of finding equilibria

¿ fairness

¿ multiperiod games

¿ mechanism design

¿ budgeted repeated auction

2nd price multiple items

1 single item bidding value dominant strategies

bids $b \gg v$ & all others bid 0

this Nash eq & PoA is bad!

Assumption: no overbidding

e.g. multi item separate auctions

bid b_j for item j

no-overbidding = all sets $v(S) \geq \sum_{j \in S} b_j$

Bidding optimally in given random environment is NP-hard

Recall 1 $T_1, \dots, T_m$

bid on T_i & $v' \gg v \gg 1$ on all others

Same proof, same bids

equally hard in 2nd price

So far we had $v_i(S) = \max_{j \in S} v_{ij}$

Example 2: $v_i(S) = \begin{cases} v_{ij} & \text{if } S = \{j\} \\ \max\limits_{\ell \neq j \in S} & v_{ij} + \frac{1}{2} v_{i\ell} \end{cases}$

General version: (XOS valuation)

v_{ij}^k person i on item j, option k

$$v_i(S) = \max_k \sum_{j \in S} v_{ij}^k$$

Claim above 2 are special cases:

b_k $(0, \ldots 0, v_{ik}, 0 \ldots 0)$

$\Rightarrow \max\limits_j v_{ij}$

add $(0, \ldots, v_{ij}, 0 \ldots \frac{1}{2} v_{i\ell}, 0 \ldots 0)$

to get second example

Submodular valuation

$A \subseteq B$ & j

$$v(A+j) - v(A) \geq v(B+j) - v(B)$$

Claim submodular is XOS

Proof: π permutation elements

$$A_i^\pi = \{ j \mid \pi(j) < \pi(i) \}$$

define $\quad v_i^\pi = v(A_i^\pi + i) - v(A_i^\pi)$

Claim 1 $\quad v(S) \le \max_{\pi} \sum_{j \in S} v_j^\pi$

put S first in ordering

$v(1)$ $\quad v(1,2) - v(1)$

$v(1,2,3) - v(1,2)$

first $|S|$ elements in this order

$$\sum_{i \in S} v_j^\pi = v(S)$$

Claim 2: $\quad v(S) \ge \sum_{j \in S} v_j^\pi \quad$ all π

π 

pushing $j \notin S$ later only increases the values in S