A General Framework for the Logical Representation of Combinatorial Auctions

We propose a framework, called CEDL, for representing auction-based markets. CEDL is the first language for describing combinatorial auctions from a logical perspective. The general dimension is illustrated by representing different protocols. The main benefit is to derive properties about protocols.

**Introduction**

Our goal is to build up a framework for representing and reasoning about auction-based markets

(i) Describing the protocol rules
(ii) Bidders express preferences over goods

**Example: Simultaneous Ascending Auction**

Goods are sold simultaneously, the price of unsold goods increases each turn

Action legality rule:

- legal(i, or[p1,...,pn]) ↔ (pj = 0 ∧ trade(i,j) = 0) ∨ (pj = price(j) ∧ trade(i,j) = 1)

Update rule:

- ◯ (trade(i) = win(i,β1, ..., βm, x1,1, ..., xnm))

**Example: Combinatorial Exchange**

Agents are traders: they can both buy and sell multiple goods

Initial state:

- initial → bidRound ∧ payment(i) = 0 ∧ trade(i,j) = 0

Update rule:

- does(β1, ..., βm) → ◯ (trade(i) = win(i,β1, ..., βm, x1,1, ..., xnm))

**Benefit of CEDL**

We derive properties:

- Termination, playability
- Individual rationality and budget balance

**Future Work**

We intend to explore the bidders’ perspective: strategic reasoning about knowledge, preferences and rationality

**References**


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Check our paper on ArXiv!