Law-Governed Peer-to-Peer Auction
By Marcus Fontoura, Mihail Ionescu, Naftaly Minsky
IBM Almaden Research Center
Department of Computer Science
Rutgers University

Paper Code P2P-5
Paper Review by Manyu Tang

Overview
- Law governed interaction paradigm
- De-centralized, peer-to-peer auction system
- Rule based operation

Related Work
Current auction system --- Centralized
- C2C
  - www.ebay.com
- B2C
  - www.egghead.com

Law Governed Interaction (LGI)
LGI is a message-exchanged mechanism that allows an open group of distributed agents to engage in a mode of interaction governed by an explicitly specified policy

Interaction's elements
- Where: community
- How: message
- Who: agent

What is the Law?
- Law is a function that returns a ruling for any possible regulated event that might occur at any one of its members in the community
What does the law do?

- Regulate the exchange of messages between the members of a community
- Modify the control state of a agent (buyer or seller)
- Monitor the result of message exchange (transaction)

The form of the Law

Prolog-like

-goal

1. Sensor-goal
2. Do-goal

-rules

Example of Law 1 of 3

Initializations
R1. Directory(auditor, auditor@enterprise.com)
R2. Authority(au URL(http://annis.cs.rutgers.edu:9020))
R3. InitialCS([])

Certification
R4. certified(X, certificate(issue(ca), subject(Y), attributed([seller(N)]))) :-
   do(deliver(X, certificate(issue(ca), subject(Y), attributed([seller(N)])), X)),
   do(+ certified), do(+ role(seller)), repeat Obligation(end certified(X)),
   impose Obligation(end certified(X), 100),
   do(deliver(X, attributed([seller(N)]), auditor))

Example of Law 2 of 3

Seller starts the auction
R5. sent(X, start(P, T, X)) :-
   certified(CS, role(seller)(CS), do(+ P), do(+ max(P)),
   do(+ winnner(X)), do(accept(X)), do(offer(P, M), X),
   do(offer(X, accepted(T, X), auditor)),
   do(offer(Y, outbid(M, Z)), do(deliver(Y, outsided(T, Z), auditor))

Example of Law 3 of 3

R6. sent(X, offer(P, M, Y)) :-
   certified(CS, role(buyer)(CS), do(forward(X, offer(P, M, Y))),
   do(deliver(X, offer(P, M, Y), auditor))
R7. arrived(X, offer(P, M, Y)) :-
   role(buyer)(CS, max(P, O), CS, winnner(Z), CS, M > O, not
   role(buyer)(CS, do(+ max(P, O)), do(+ wminer(P, M)),
   do(+ winnner(P, X), do(forward(Y, accepted(P, M, X))),
   do(deliver(Y, accepted(T, X), auditor)),
   do(forward(Y, outbid(M, Z)), do(deliver(Y, outsided(T, Z), auditor))

Law and its enforcement

Control State

- Associated with an agent
- Keeping the record
**Certification**

- Used as ID for the agent
- Decide the level of agent

**Become an agent**

- Find and LGI controller
- Send CERTIFIED message for joining
- Controller checks the message against Law, then makes decision

**LGI-based Auction System**

- Auction registry
  - a separate agent that holds the selling offers as a tuple and regarding information
- Seller
- Buyer

**Auction Pipe Line**

- Seller
- P2P interaction
- Buyer
- Find about auction
- Register auction

- Register auction registry
- Find about auctions
- Auction registry
- Auction pipe line
Extra Service  Auditing and Grievance

- Operated by the third party
- Not directly involved in the auction but has right to access the messages of the auction in order to make proper judgement

Future work

- Definition of the law
- Integration with web service paradigm
- Simplifying the user interface

Strengths

- Present new idea of de-centralized auction system
- Making auction parameters more flexible
- Take advantage of distributed nature of Internet

Weakness

- Law enforcement
- Certification issue
- Security

Questions

1. What is Peer-to-Peer Auction?
2. What is the law in the P2P auction system?
3. What is the functionality of the auction registry?
4. How does the control state work in the auction?
5. Why does a user need certificate to join the auction community?