Law-Governed Peer-to-Peer Auction

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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(ca,URL(http://aramis.cs.rutgers.edu:9020))
R3. InitialCS([])

Certification
R4. certified(X,certificate(issuer(ca),subject(Y),attributes([seller(N)]))) :-
    do(deliver(X,certificate(issuer(ca),subject(Y),attributes([seller(N)])),X)),
    do(+certified),do(+role(seller)),repealObligation(endCertified(X)),
    imposeObligation(endCertified(X),100),
    do(deliver(X,attributes([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,0)),
    do(+winner(P,X)), do(imposeObligation(timeout(P),T)),
    do(deliver(X,start(P,T),auditor)
```

Example of Law 3 of 3

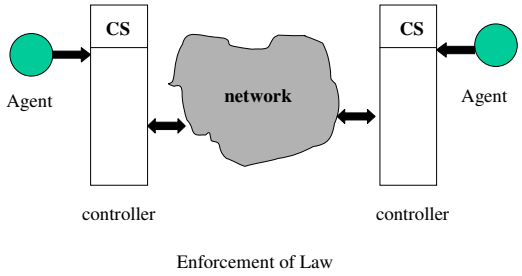
```
R6. sent(X,offer(P,M),Y) :-
    certified@CS, role(buyer)@CS, do(forward(X,offer(P,M),Y)),
    do(deliver(X,offer(P,M,Y),auditor)

R7. arrived(X,offer(P,M),Y) :-
     role(seller)@CS, max(P,Q)@CS,winner(P,Z)@CS, M>Q, not
    role(buyer)@CS, do(-max(P,Q)), do(+max(P,M)), do(-winner(P,Z)),
    do(+winner(P,X)), do(forward(Y,accepted(P,M),X)),
    do(deliver(Y, accepted(P,T,X),auditor),
    do(forward(Y,outbid(P,M),Z)), do(deliver(Y,outbid(P,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

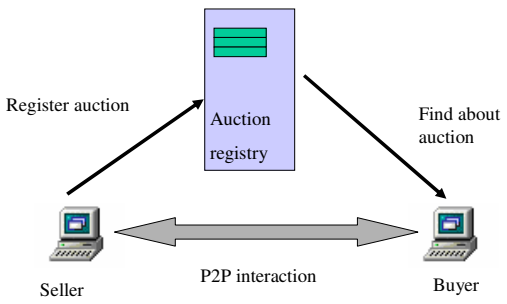
LGI-based Auction System

. Auction registry

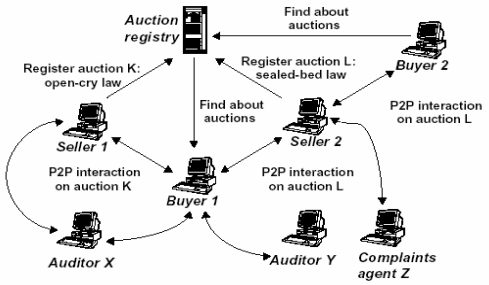
a separate agent that holds the selling offers as a tuple and regarding information

. Seller

. Buyer



Auction Pipe Line



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?