ID2209 – Distributed Artificial Intelligence and Intelligent Agents

Assignment 2

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In this assignment, the objective was to enhance the festival simulation initially developed in assignm -ent 1 by incorporating auction functionalities.

How to run

Run GAMA 1.9.2 and import the submission. To run the basic simulation, run asgmt2_base.gaml. Press main to run the simulation. To run the challenge version, run asgmt2_challenge1and2.gaml.

Species

Guest

The modifications predominantly revolve around the exchange of messages. A subset of guests, determined at random, expresses an interest in attending auctions and consequently receives correspondences from the auctioneer regarding upcoming events. Upon the initiation of an auction, the interested guests relocate to the auctioneer and, if punctual, append themselves to the auctioneer's roster of attendees.At the commencement of the auction, each guest is endowed with a distinct budget, computed by deducting a randomized amount from the initial auction price.

Dutch/Japanese/FirstPriceSealedBid Auctioneer

DutchAuctioneer and JapaneseAuctioneer: DutchAuctioneer conducts Dutch auctions where the price decreases from high to low. JapaneseAuctioneer conducts Japanese auctions where the price increases from low to high. Both two iinitialize auctions at specific times, receive bids, and determine auction outcomes.

FirstPriceSealedBidAuction: Conducts First-Price Sealed-Bid Auctions where bidders submit one-time bids.Invites bids at a certain time and announces the results after receiving bids.

Implementation

The implementation introduces the "initiate_auction" reflex in the above three Auctioneer species, utilizing FIPA requests to notify participants about the auction. The "receive_buyer_proposal" reflex handles the communication of opening and updated prices to the participants. The festival guest's functionality is enhanced, enabling it to navigate to the auctioneer and respond to messages.

Results

As you can see in the following pic, We successfully completes Challeng 1 and 2.

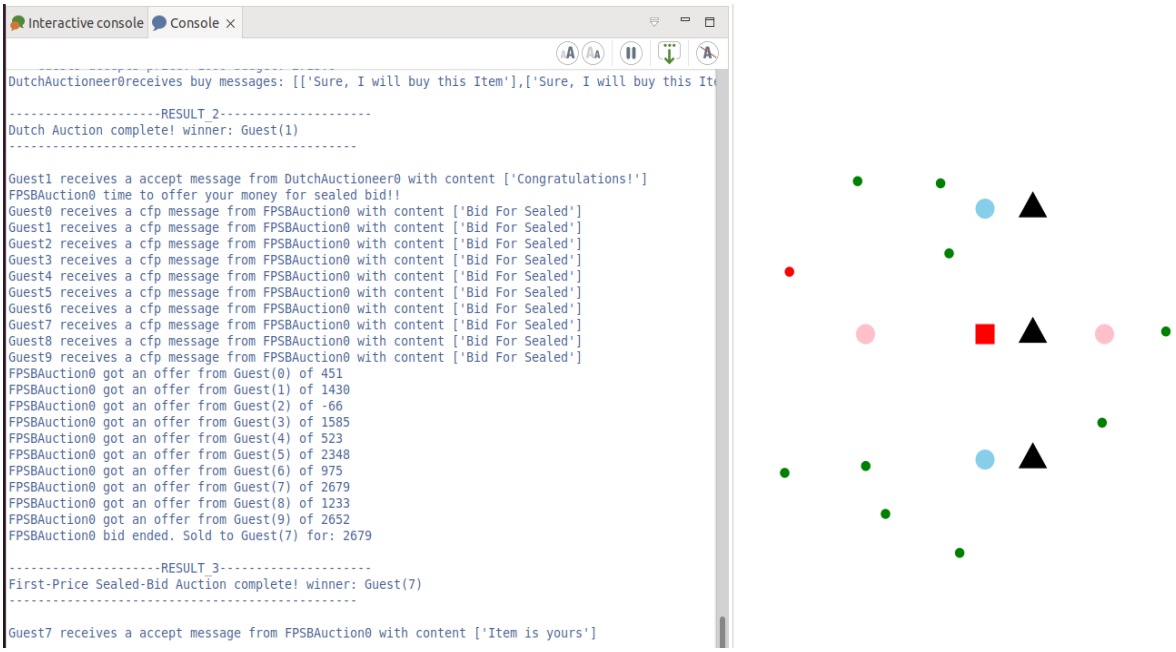

Figure 1: A screenshot of the final solution.

Challenge 1: Multiple auctions in the festival

The festive environment was enhanced to support simultaneous multiple auctions. Each three auctioneer was assigned a genre, and agents (Guests) were given preferences. Guests would only attend auctions if the items matched their interests. This added realism to the simulation by mimicking selective participation seen in real-world auctions.

Challenge 2: Different auction settings

Alongside the existing Dutch auction, two additional auction types were implemented:

1.English Auction: This classic auction format features ascending bid prices. Auctioneers announce the current highest bid, and participants can outbid each other until no higher bids are received.
2.First Price Sealed Bid Auction: Bidders submit a single bid without knowledge of other bids. The highest bid wins and the price paid is the second-highest bid (Vickrey auction) or the highest bid (First-Price Sealed-Bid Auction).

Upon running the simulation, data were collected on the final sale prices and the number of participating agents for each auction type. The analysis focused on the "gained value" for auctioneers (final sale price) and buyers (perceived value of the item minus the sale price).Findings are as follow:

1.Auctioneer Gains: The Dutch and English auctions typically resulted in higher sale prices than the Sealed Bid Auctions. This could be attributed to the open format, allowing bidders to respond to others' bids.
2.Buyer Satisfaction: Buyers in English auctions reported higher satisfaction, potentially due to the dynamic nature of bidding, which might align the final price more closely with their perceived value.
3.Efficiency: First Price Sealed Bid Auction, was found to be the most efficient in terms of economic theory, as it often leads to the true valuation of the item being revealed.

Discussion / Conclusion

The simulation demonstrated that while Dutch and English auctions tend to be more favorable for auctioneers in terms of revenue, English auctions strike a balance between auctioneer gains and buyer satisfaction. *First Price Sealed Bid Auction* proved to be efficient but did not consistently yield the highest prices for sellers.