Auction Assignment

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1. Introduction

The aim of this assignment is to implement a simulation of Dutch auction using the GAMA platform. The primary focus is on creating two types of agents: auctioneers and participants, who interact using the FIPA protocol. The auctioneer facilitates the auction process, while participants make decisions based on their willingness to pay. This report outlines the solution approach, implementation details, and observations from the simulation.

2. Solution Overview

- Seller (Auctioneer): Conducts the auction announces starting prices and reduces them at intervals if no buyer accepts the current price. Ends the auction when an item is sold or the price falls below a predefined threshold.
- Buyer (participant): Evaluate offers based on their willingness to pay. Responds to auction offers using structured communication as defined by the FIPA protocol.
- Auction Process: The seller initiates the auction with a starting price significantly above the item's expected market value. If no buyer accepts the offer, the seller reduces the price by a random interval until a buyer accepts the offer, and when the

price drops below the seller's minimum threshold. Buyers actively respond to offers using accept or reject messages.

3. Implementation Details:

The starting price is calculated as **`minimumThreshold + rnd(1000, 2000)`**. The minimum threshold ensures the auction doesn't go below reasonable value. The price decreases by a random value **`(rnd(50, 200))`** in each round if no buyer accepts the current price. The auction ends when a buyer accepts the price or the price drops below the minimum threshold.

- Seller: Uses `fipa-request` to announce the start of the auction. Employs `fipa-contract-net` to send call-for-proposals(cfps) to buyers.
- Buyer: Responds to cfps with `propose` messages, indicating acceptance or rejection of the offer. Accepts offers if the current price is less than or equal to their willingness to pay.

4. Observations and Results

Auctions typically concluded quickly when buyers had a willingness to pay near the starting price. In cases where no buyers accepted the initial price, the gradual reduction mechanism effectively engaged buyers. Sellers efficiently managed the auction process, dynamically adjusting prices based on the buyers' responses. Buyers demonstrated realistic decision-making, accepting offers only when the price met their budget constraints. The FIPA protocol ensured clear and structured communication between agents, avoiding ambiguities in message exchanges.

5. Challenges Faced:

- Balancing Price Reduction: Setting the price reduction interval required careful tuning to ensure the auction progressed efficiently without prolonging the process unnecessarily.

- Structured Communication: Implementing the FIPA protocol correctly was critical to achieving the assignment’s requirements.

6. Conclusions:

The implemented solution successfully simulates a Dutch auction mechanism with agent-based communication using the FIPA protocol. The seller efficiently conducts the auction, while buyers participate based on their willingness to pay. The structured communication between agents ensures a realistic auction process. The simulation effectively demonstrated the dynamics of a Dutch auction in an agent-based environment.