KTH- ID 2209 – Distributed Artificial Intelligence and Autonomous Agents

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HOMEWORK 2 – Group3 : Alessio Russo, Mumtaz Fatima
Task 1,2

Task1

It's documented in HW1 since it was done in HW1. The only thing that was added is that now the TourGuideAgents build a tour based on the interests of the user, instead of sending every artifact in the tour.

To run the code just use these arguments:
-gui -agents
"user:homework1.Profiler(userprofile.txt);cur:homework1.Curator(museum1.txt);ag:homework1.TourGuideAgent"

Output:

0 name1 creator1 10/10/2010 sweden picture picturetype1 description1
1 name2 creator1 10/11/2009 sweden picture picturetype1 description2
2 name3 creator2 10/11/2000 sweden picture picturetype2 description3
3 name4 creator3 10/12/2000 sweden picture picturetype3 description4
Age: 20
Occupation: student
Gender: male
Interest: picturetype2
Interest: picturetype1
Artifact: name1
[PROFILER]DF: (agent-identifier :name ag@192.168.1.2:1099/JADE :addresses (sequence http://192.168.1.2:7778/acc))
[PROFILER] Added curator: (agent-identifier :name cur@192.168.1.2:1099/JADE :addresses (sequence http://192.168.1.2:7778/acc))
[PROFILER] Added tourguide: (agent-identifier :name ag@192.168.1.2:1099/JADE :addresses (sequence http://192.168.1.2:7778/acc))
[TOUR GUIDE AGENT]Added curator: (agent-identifier :name cur@192.168.1.2:1099/JADE :addresses (sequence http://192.168.1.2:7778/acc))
[PROFILER]Sending request to TOUR GUIDE
[TOUR GUIDE AGENT] Received request from profiler
[TOUR GUIDE AGENT] Building tour - phase 1
[TOUR GUIDE AGENT] Sending query to curator - phase 2
[CURATOR]Museum info sent
[TOUR GUIDE AGENT]Received response from curator - phase 3
[TOUR GUIDE AGENT] Built museum details - phase 4

[TOUR GUIDE AGENT] Preparing tour - phase 5
[TOUR GUIDE AGENT] Checking user interests - phase 6
[TOUR GUIDE AGENT] - Added element to tour - phase 7
[TOUR GUIDE AGENT] - Added element to tour - phase 7
[TOUR GUIDE AGENT] - Added element to tour - phase 7
[TOUR GUIDE AGENT]Tour sent! - phase 8
[PROFILER] Received tour!
[PROFILER] Tour museum: picturesmuseum
[PROFILER] Tour curator: cur@192.168.1.2:1099/JADE
[PROFILER]Tour arifact name: name3
[PROFILER]Tour arifact name: name2
[PROFILER]Tour arifact name: name1
[CURATOR]Artifact info sent
[CURATOR]Artifact info sent
[PROFILER] Tour Artifact details: 2-name3-creator2-10/11/2000-sweden-picture-picturetype2-description3
[CURATOR]Artifact info sent
[PROFILER] Tour Artifact details: 1-name2-creator1-10/11/2009-sweden-picture-picturetype1-description2
[PROFILER] Tour Artifact details: 0-name1-creator1-10/10/2010-sweden-picture-picturetype1-description1

Task2

In this task we implemented the Duch Auction between an Artist Manager (auctioneer) and some Curators (bidders).
This type of auction is very sensitive to a-priori information, specifically:

1. The market value for that item
2. The reserved price
3. How is going to reduce the price the auctioneer
4. What are other bidders thinking
5. Specific information regarding the item

Because of that it's very hard to establish a strategy. The most efficient strategy is to bid only when we think the price is the estimated market value.

We assume no knowledge about other bidders, and that every bidder has a different estimated market value for the item.
Moreover we assume that each bidder thinks that the auction after k_i rounds, where i identifies the bidder, will reach a value near the real market value.
Let then x_i be the estimated value for the i-eth bidder, I the initial price, R the total reduction, k the auction round, y the current price, then, if the estimate of the real value for the i-eth bidder it's not updated throughout the auction, the i-eth bidder will bid when the current price is such that: $y \leq x_i$.
Obviously this is not what happens in real life, and we can make an approximation and say that the new estimate $x_{i,new} = f(x_i, y, I, k_i, k)$, which means that our new estimate depends on the current price, the initial price, the old estimate, our estimate of the number of rounds, and the actual number of rounds. For simplicity we assume the number of rounds we estimated is not updated.

With a linear approximation we can say:
$x_i = I - k_i R_i I$
thus $R_i = (I - x_i)/(k_i I)$
Let r be the real reduction, y the current price and k denote the k-eth step of the auction.
Then in a similar way:
$y = I - krI \Rightarrow r = (I - y)/(kI)$

In our system the bidders start with an initial knowledge $x_{i,}$, k and x_i is automatically updated based on the reduction imposed by the auctioneer after every round , but how do we calculate this?
The rationale is that an agent expects the real value to be reached after a certain number of rounds, implying that there should be a certain reduction value. If the real reduction value is different, we need to adjust our guess in order so to have $r \sim R$. To do so we need to increase x_i if $r < R$, otherwise reduce.
We assume that for each bidder the increment/decrement is the same in order to not overcomplicate the experiment.
The update is done in the following way: $x_{i,new} = x_i + I\varepsilon : |\varepsilon| < 1$

To run the program use the following arguments line:
-gui -agents
"S1:hw2.ArtistManager(100,1.5,0.1,0);B1:hw2.Curator(0,4,0);B2:hw2.Curator(1,5,1);B3:hw2.Curator(2,4,2);B4:hw2.Curator(3,3,3);"

ArtistManager(x,y,z) : x is the real value of the item, 1.5 is a factor that multiplied by the real value of the item gives the starting value of the auction. z is the strategy of the auctioneer, which means how much should he decrease each round

Curator(x,y,z): x denotes the strategy to adopt to guess the initial value. y is k_i, z is the id of the curator.

With those settings Curator0 estimates at the beginning that the estimated value is 0.5 times the initial price and that the auction will last 4 rounds.
With those settings Curator1 estimates at the beginning that the estimated value is 0.6 times the initial price and that the auction will last 5 rounds.
With those settings Curator2 estimates at the beginning that the estimated value is 0.7 times the initial price and that the auction will last 4 rounds.
With those settings Curator3 estimates at the beginning that the estimated value is 0.55 times the initial price and that the auction will last 3 rounds.

With those settings,without an automatic update, curator2 wins but suffers of the winner's curse.This happens because of a wrong a priori estimate of the item value (70% of the starting price)
[Curator2-buyer] wins auction at price: 175.0 - Estimated real price: 175.0
[Curator1-buyer] loses auction at price: 175.0 - Estimated real price: 150.0
[Curator0-buyer] loses auction at price: 175.0 - Estimated real price: 125.0
[Curator3-buyer] loses auction at price: 175.0 - Estimated real price: 137.5

With an automatic update of the real price, with $\varepsilon = 0.05$ (after 3 steps):
[Curator1-buyer] loses auction at price: 175.0 - Estimated real price: 125.0
[Curator3-buyer] wins auction at price: 175.0 - Estimated real price: 175.0
[Curator2-buyer] loses auction at price: 175.0 - Estimated real price: 150.0
[Curator0-buyer] loses auction at price: 175.0 - Estimated real price: 150.0

This is interesting because without the automatic update Curator3 was estimating a real price of 137.5. This happens because the auction price remains very high in the first 3 rounds, moreover epsilon is very small thus $r < R_i$ because $I \approx y$ and $x_i < I$ in those first rounds.

With $\varepsilon = 0.1$ it gets a little better, but we still see Curator3 suffer from a low estimate of the number of rounds.
[Curator2-buyer] wins auction at price: 150.0 - Estimated real price: 150.0
[Curator1-buyer] loses auction at price: 150.0 - Estimated real price: 125.0

Curator3 estiamates around 180 and Curator0 150.

From that we understand that we also need a way to update our estimate about the number of rounds k_i ,otherwise updating our estimate may be wrong.For curator2 since the estimate of the number of rounds is better he sees an improvement between using the update of x_i and not using it, as seen in the experiments.