1. Experimental design:

Our model of dialogue is capable to adapt the next utterance in function of the perceived relation of dominance with the other.

In order to understand better how the dominance can appear in the dialogue, we conducted an experiment in which we asked participants to read dialogues generated with our model.

Our model produces a dialogue of cooperative negotiation where two agents have to decide in which restaurant they will go dinner. The behavior of each agent is affected by its perception of his relation of dominance with the other agent. We designed our experiment model with two conditions.

Relation of dominance: we produce dialogues with two different setting of the relation of dominance; dialogues in which agents have *peer* relation of dominance, and dialogues where the first agent is *dominant* and the second one is *submissive.*

Agent preferences: because the preferences affect directly the flow of the negotiation. We defined our agents with two different model of preferences: agent having *similar* preferences and agent having *different* preferences.

2. Hypotheses:

We developed three theories from the principals used to define agent behaviors in the dialogue:

- **H1:** Participants will perceive submissive agent as more interested to the other preferences in decision making whle dominant agent will be perceived a self-centered.
- **H2:** A dominant agent is perceived as more demanding than the submissive one.
- **H3:** A dominant agent is perceived as the leader of the dialogue.

3. Primary results:

We conducted a first pre-experiment with two dialogues. The first dialogue was defined with Agent A as dominant and agent B as submissive. They were defined with different preferences. The results provide support for two of three hypotheses. The results are explained bellow:

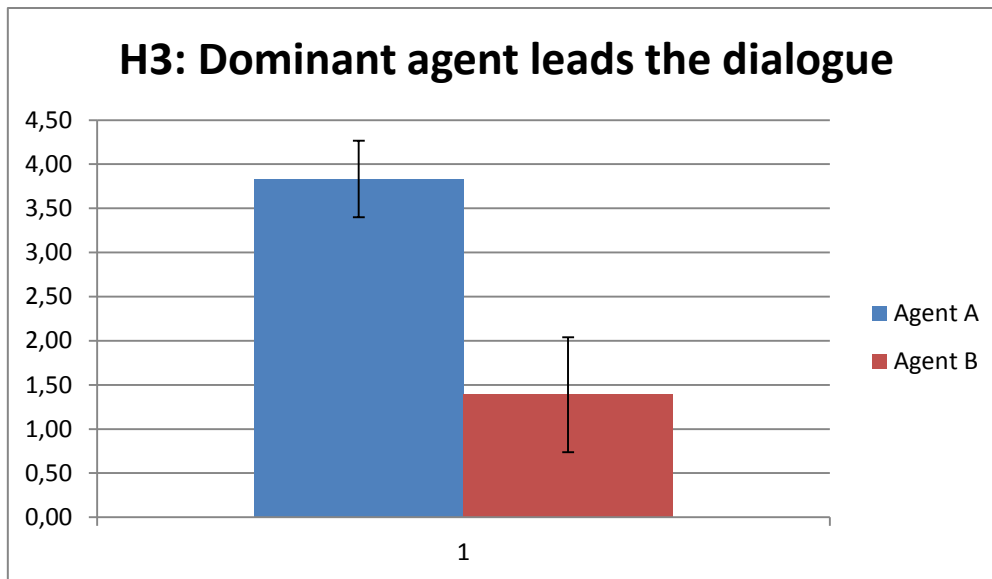## Dialogue1: Agent A dominant, Agent B submissive:

For this dialogue we excluded one participant that didn't correctly answered to the manipulation check questions. The statistics are calculated with 9 participants.

H1: Consider other preferences
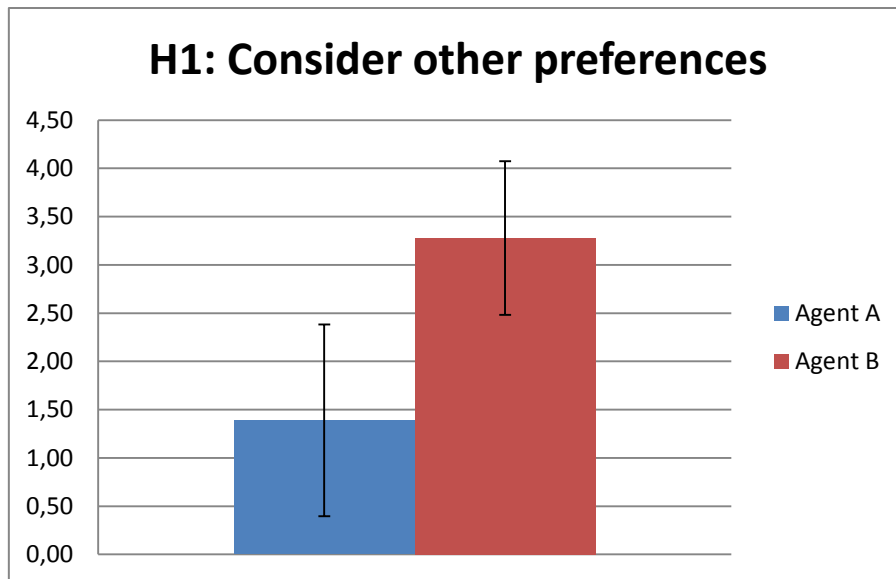
On average, participants agree that the agent B take in account the preferences of agent A in decision making. While agent A is perceived as more self-centered. Indeed 88% of participants consider that Agent A consider only his preferences for the choice of the restaurant. In contrary, 66% of participants find that agent B takes the other preferences in consideration to choose a restaurant. The error bars don't overlap for this principal. We can conclude that the first principal can be confirmed.

H2: Dominat agent is more demanding
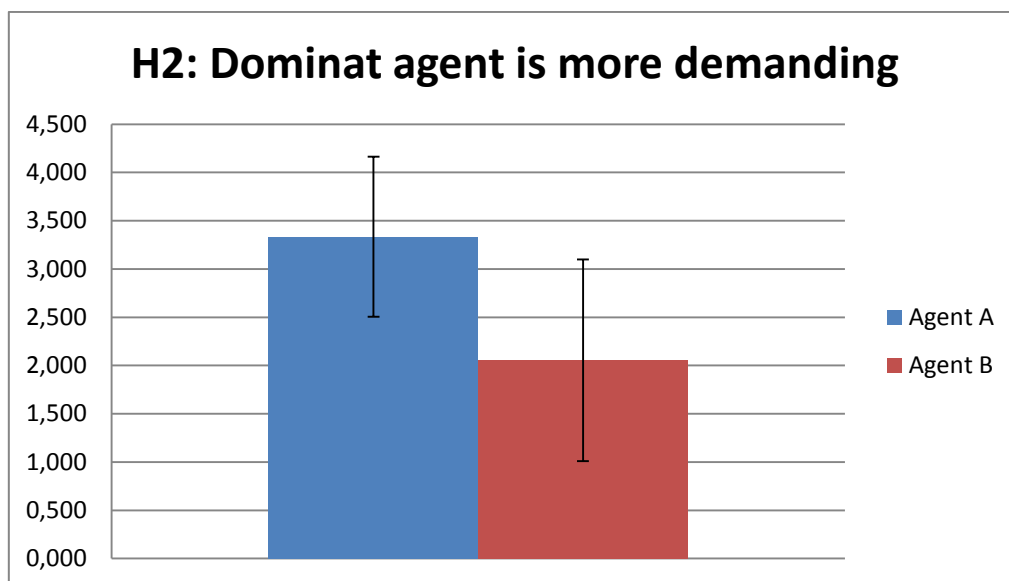
Participants perceive agent A as being more demanding than agent B. However, looking to the error bars we conclude that participant's perception veries on a wide range. 33% find that both agents are demanding. 44% find that agent A is dominant and only 1 participant consider that agent A is less demanding than agent B. The last participant find that neither agent A nor B are demanding. We might consider reviewing the questions related to this principal for the rest of the experiment.

H3: Dominant agent leads the dialogue

Most of participants (99%) agree that agent A leads the dialogue and agent B follow the agent A during the negotiation. This confirms our theory for the third principal.

Dialogue2: Agent A and Agent B are peer:

For this dialogue, we excluded three participants which didn't correctly answer to all the manipulation check questions. The statistics presented bellows are calculated with 7 participants:

H1: Agents consider other preferences
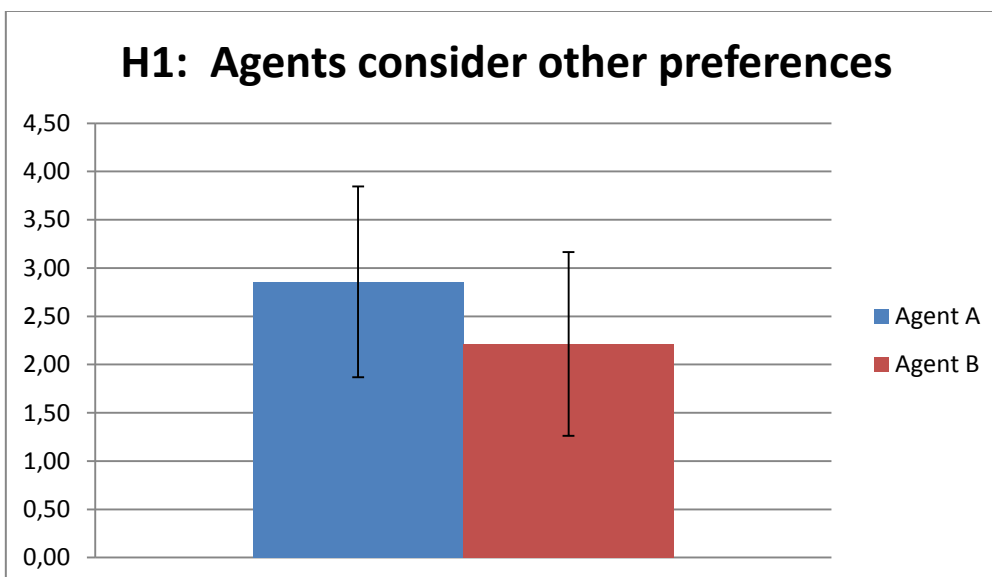
We can observe that on the average participants perceive agent A and B in equivalent manner. They both don't consider that both agents take in account the preferences of other to choose a restaurant. However, due to the large variation of answers we calculated that 71 % of participants find that agent A takes the preferences of other. At the same time 40 % of them find that agent A also consider his own preferences.
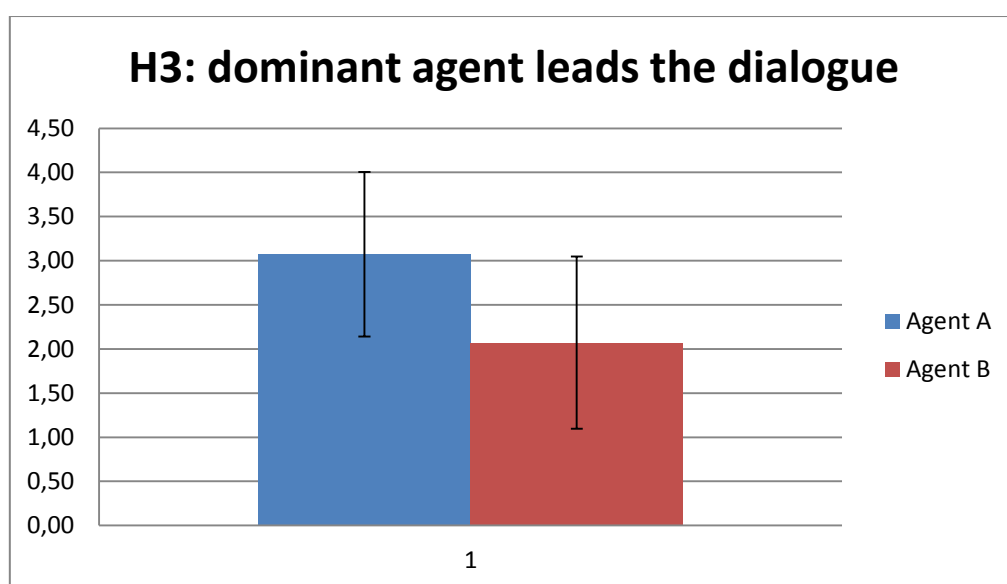
Only 28 % of participants consider that Agent B take into account the preferences of other. 71 % of them find that agent B thinks only about his own preferences.

This results infirm our first hypothesis, because less dominant agents should consider the preferences of other to take a decision. This behavior was observed for the agent A but not for the agent B.
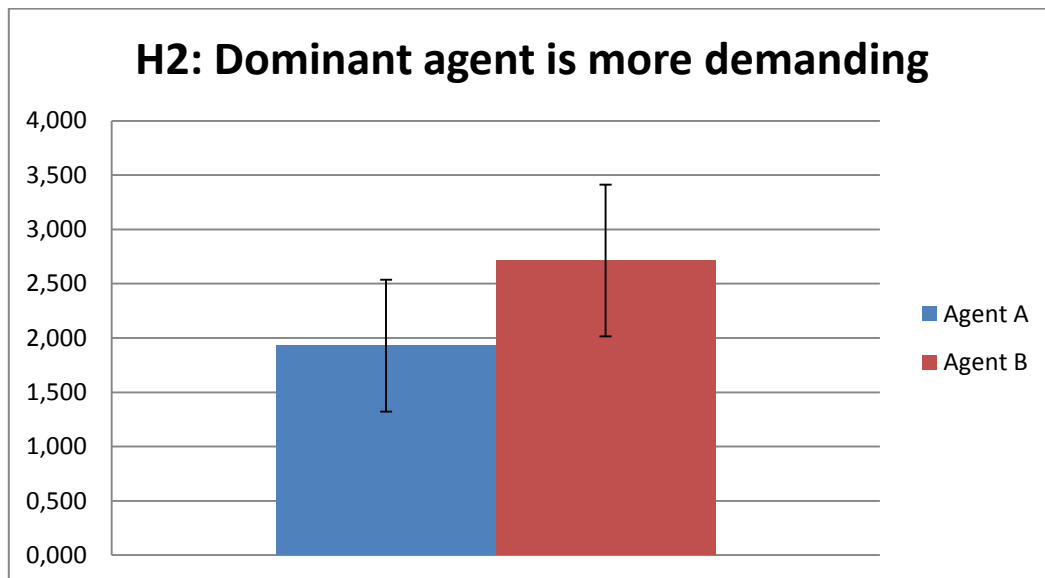
Participants consider that both agents are not demanding concerning the choice of the restaurant. However looking in more details to the results 100 % of participants find that agent B is not flexible, in the same time 57% of participants find that agent B is also not demanding. 85 % of participants find that agent A is flexible and 42% of participants think that agent A is demanding.

I think that the notion of "demand" is not really clear for participants and we should rephrase the questions.

On average, participants consider that none of the agents leads the dialogue. We have few participants which accentuate the gap in the error bars. For example, 71% find that agent A

leads the dialogue, while 57% finds that the agent A is being lead in the dialogue. Only 14% of participants think that agent B lead the dialogue, while 57% find that agent B is being lead.

For the moment, this confirms our hypothesis, Peer agents don't aim to take the control of the flow of the conversation. However, we still need to run additional tests to confirm this behavior.

Annex:

The Likert scale was converted using the following table

Label	Value
Strongly agree	5
Agree	4
Neither agree or disagree	3
Disagree	2
Strongly disagree	1

Dialogue 1:

In this dialogue, speaker A is **dominant**, and speaker B is **submissive**. In addition they have *different* preferences. One participant was removed. Thus I kept *9 participants*

First step:
For each question, I calculated the average and the standard deviation of the obtained results:

Principal 1:

- *speaker (a/b) takes the preferences of the other speaker into account in choosing a restaurant*

	Speaker A	Speaker B
Average agreement	2,33	3,44
Standard deviation(of agreement)	1,58	1,13

- *speaker (a/b) only considers his/her own preferences in choosing a restaurant*

	Speaker A	Speaker B
Average agreement	4,56	1,89
Standard deviation(of agreement)	0,73	0,60

Principal 2:

- *speaker (a/b) is demanding concerning the choice of the restaurant*

	Speaker A	Speaker B
Average agreement	3,556	3
Standard deviation(of agreement)	1,236	1,414

- *speaker (a/b) is flexible in the choice of the restaurant*

	Speaker A	Speaker B
Average agreement	1,889	3,889
Standard deviation(of agreement)	1,269	1,054

Principal 3:

- *Speaker(a/b) leads the dialogue:*

	Speaker A	Speaker B
Average agreement	4,44	1,78
Standard deviation(of agreement)	0,73	0,66

This is means that participants agree that speaker A leads the dialogue while speaker b is not leading the dialogue.

- *speaker (a/b) is being guided by the other speaker during the dialogue*

	Speaker A	Speaker B
Average agreement	1,78	4
Standard deviation(of agreement)	0,67	0,87

Second Step:

For each principal, I calculated the average level of dominance. For each principal, we defined a question (*Q*) and its reverse (*Q'*).

The average dominance is calculated as follows:

Dominance = Average(Q, negation(Q')).

Principal 1: How much agents take the preferences of the other agent to choose a restaurant?

	Speaker A	Speaker B
Average	0,889	2,78
Standard deviation	0,99	0,79

Principal 2: The level of demand of each agent?

	Speaker A	Speaker B
Average	3,33	2,056
Standard deviation	0,83	1,04

	Speaker A	Speaker B
Average	3,83	1,39
Standard deviation	0,43	0,65

Dialogue 2:

In this dialogue, speaker A is **peer**, and speaker B is **peer** also. In addition they have *similar* preferences. 3 participants were removed. Thus we only have 7 participants for this dialogue.

First step:

Principal 1:

- *speaker (a/b) takes the preferences of the other speaker into account in choosing a restaurant*

	Speaker A	Speaker B
Average agreement	3,71	2,71
Standard deviation(of agreement)	0,95	0,95

- *speaker (a/b) only considers his/her own preferences in choosing a restaurant*

	Speaker A	Speaker B
Average agreement	3	3,29
Standard deviation(of agreement)	1,41	1,11

Principal 2:

- *speaker (a/b) is demanding concerning the choice of the restaurant*

	Speaker A	Speaker B
Average agreement	3,143	2,857
Standard deviation(of agreement)	1,215	1,215

- *speaker (a/b) is flexible in the choice of the restaurant*

	Speaker A	Speaker B
Average agreement	4,286	2,429
Standard deviation(of agreement)	0,756	0,535

Principal 3:

- *Speaker(a/b) leads the dialogue:*

	Speaker A	Speaker B
Average agreement	4,14	2,71
Standard deviation(of agreement)	0,90	0,95

This is means that participants agree that speaker A leads the dialogue while speaker b is not leading the dialogue.

- *speaker (a/b) is being guided by the other speaker during the dialogue*

	Speaker A	Speaker B
Average agreement	3	3,57
Standard deviation(of agreement)	1,15	1,51

Second Step:

For each principal I calculated the average level of dominance. For each principal, we defined a question (Q) and its reverse (Q').

The average dominance is calculated as follows:

$$Dominance = Average(Q, negation(Q')).$$

Principal 1: How much agents take the preferences of the other agent to choose a restaurant?

	Speaker A	Speaker B
Average	2,86	2,21
Standard deviation	0,99	0,95

Principal 2: The level of demand of each agent?

	Speaker A	Speaker B
Average	1,929	2,714
Standard deviation	0,607	0,699

Principal 3: How each agent controlled the flow the conversation?

	Speaker A	Speaker B
Average	3,07	2,07
Standard deviation	0,93	0,98