

An aerial photograph of a winding asphalt road that curves through a dense, green forest. The road is light-colored and contrasts with the dark green trees. The forest appears to be a mix of deciduous and coniferous trees. The road starts from the bottom left and winds upwards and to the right, disappearing into the trees in the distance. The overall tone of the image is somewhat muted, with a slight blue/purple tint in some areas.

INTERACTIVE DIRECTION GIVING AGENT

Diana Persico and Lucie Galland

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INTRODUCTION



01

DIFFICULT TASK

Direction giving is a difficult task because of the ambiguity and versatility of the real world.

MAPS CAN BE MISLEADING

Maps can be difficult to read on a small screen and even dangerous if the user needs to interact with them

COMPREHENSION ISSUES

Incomprehension are common, and even more with synthetic voices. They often lead to a failure in the task in case of direction giving agent and need to be corrected

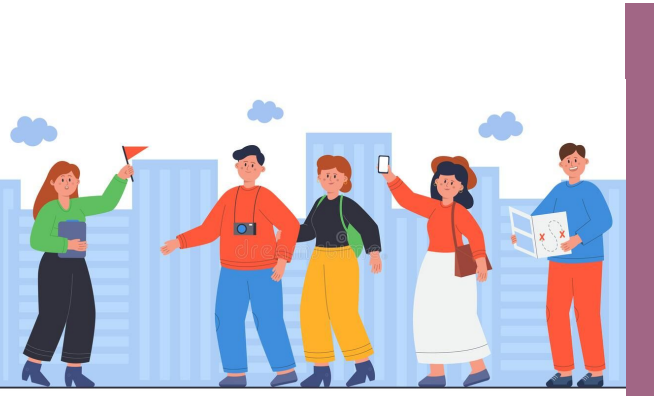
ENJOYABLE CONVERSATIONS

Most of the people don't enjoy looking at virtual map. Some have a preference for asking for indications. What if they could use the data of a map and at the same time enjoy an interaction with a conversational agent?

RESEARCH QUESTIONS

RESEARCH QUESTION 1

What grounding strategies do humans use to improve direction giving efficiency?



RESEARCH QUESTION 2

Can grounding strategies in a direction giving agent replace the use of a map?



HUMAN-HUMAN CORPUS

02

2. HUMAN-HUMAN CORPUS

DATA COLLECTION

6 couples

ENS students

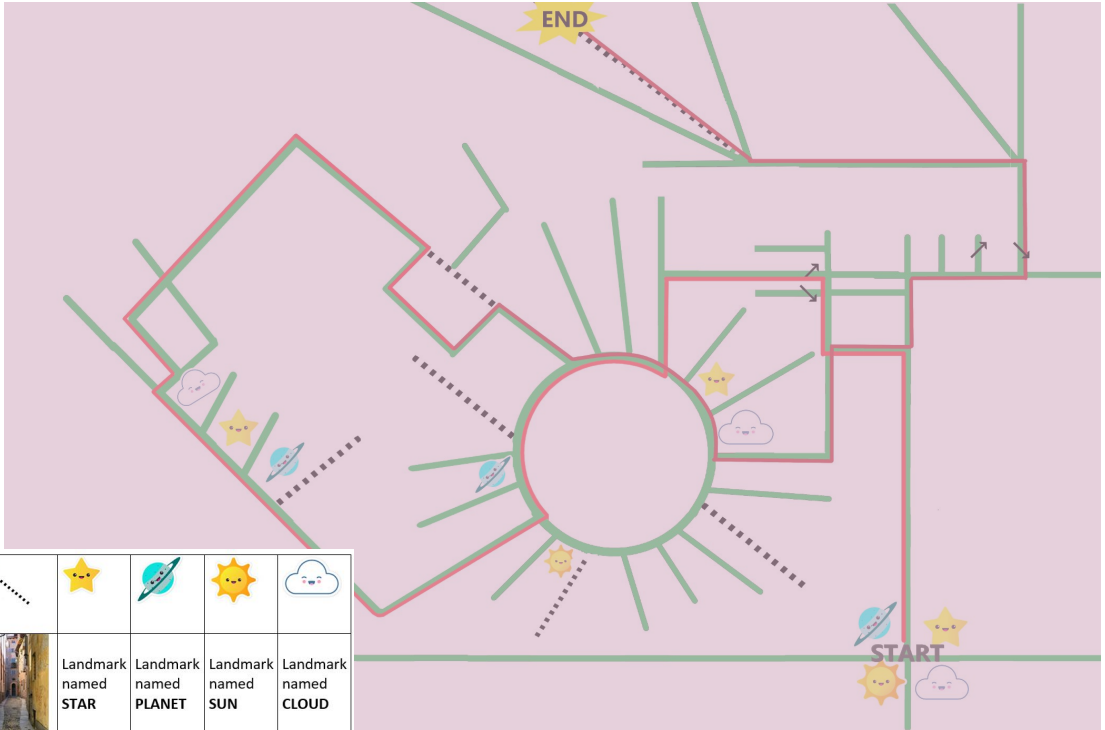
7 males and 5 females

5 different L1s, fluent

English L2

1 Direction giver

1 Direction taker



DATA COLLECTION

Transcripts:

- Alignment based on direction change

DG: After you have to go to the right.
DT: After the cloud?
DG: Yeah, yeah, there is a cloud. And after, go to the

DG: So, you continue, you have a planet, a star and a cloud.
DT: Okay.
DG: And at the intersection...

DG: You go... Almost all the way to the left.
DT: All right.
DG: Until the cloud
DT: the cloud. Okay.

DG: Yeah. And you go straight, until the end of the... like... you go past the cloud.
DT: Okay.
DG: You go past the cloud, then

DG: Another planet. Next to the planet there's a star. Next to the star there's a cloud. And then you take a right. And as soon as you reach near the cloud that

DG: Okay, and then you go straight. You just keep going, it will turn right. You just keep going. You will see a planet and a star then a cloud.

DATA INTERPRETATION

GUIDEES (→ users)

It is very rare that direction-takers don't take a turn after the new direction is given.

1. When understanding:
 - backchannels
 - repetition of the information
2. When not understanding or unsure:
 - rephrasing
 - ask for further information.



Q1.

What grounding strategies do humans use to improve direction giving efficiency?

DATA INTERPRETATION

GUIDES (→ agent)

- They usually wait for backchannels from their listeners (in 5 out of 6 couples), interrupting their own turn at every new direction.
- When reformulating instructions
→ Important role of landmarks

DT: right in the left, like...

DG: the one which is EXACTLY on the left!

DT: Okay! The left one, okay.

DG: After, you have to go to the right.

DT: After the cloud?

DG: Yeah, yeah, there is a cloud. And after, go to the right.

2. HUMAN-HUMAN CORPUS

Q1.
What grounding strategies do humans use to improve direction giving efficiency?



AGENT DESIGN

An illustration of a person with dark hair, wearing a brown short-sleeved shirt over a yellow long-sleeved shirt and dark blue pants, holding a blue rolling suitcase. They are standing next to a large, black-framed smartphone. The phone's screen displays a map with a blue route line and two red location pins. The background is light blue with faint map icons and a potted plant. A semi-transparent purple rectangle is overlaid on the left side of the image, containing the text 'AGENT DESIGN'.

03

INSTRUCTION DESIGN

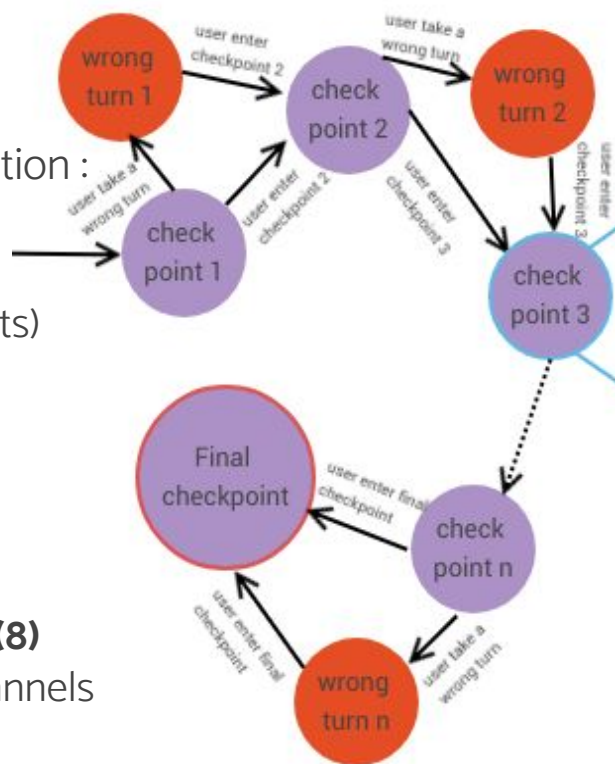
3. AGENT DESIGN

2 versions for each instruction :

1. **Simple version**
(first input for the participants)

2. **Complex version**
(extracted from the corpus)

+ users' **backchannels** (8)
→ assistant's backchannels



Enter state :

Agent : Simple instruction

User ask for reformulation :

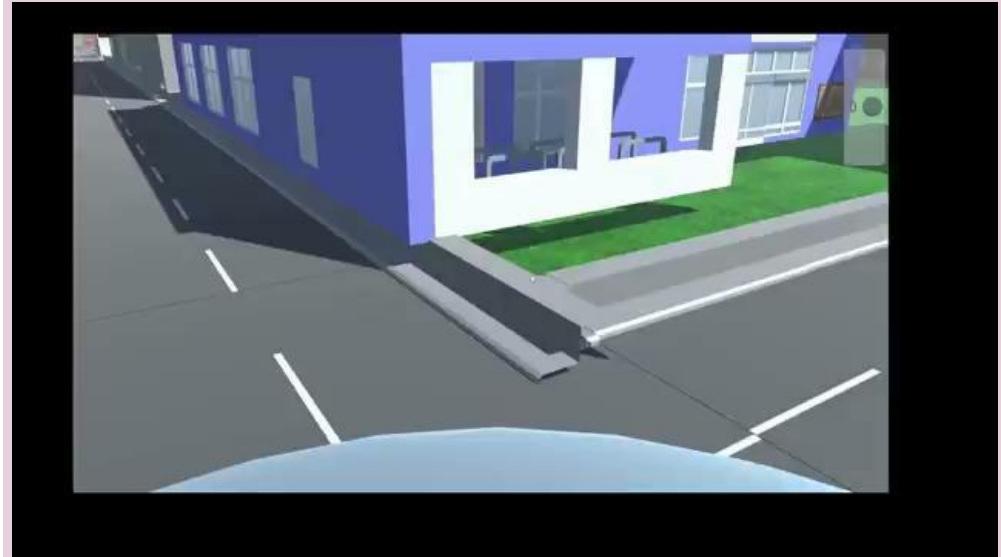
Agent : Complex instruction

User perform a backchannel :

Agent : Backchannel

IMPLEMENTATION

- **Unity Game engine** and **Microsoft Azure**
- No language understanding module
(**list of possible backchannels** inferred from the corpus)



USER STUDY

Go

Ok



04

PRE-QUESTIONNAIRE

- Sex
- Familiarity with videogames
- Relationship with assistants (frequency, liking, usefulness)

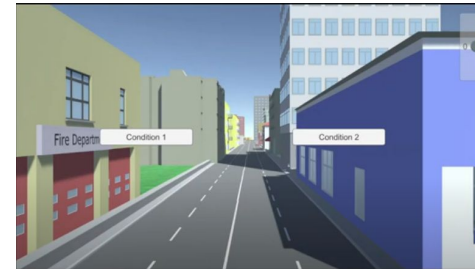
SIMULATION

- 10 participants
- 2 conditions : interactive and map based
- instructions (get the coins, reach the end quickly, map and interaction possibility when appropriate)

POST-QUESTIONNAIRE

- Perception of the interaction
- Perception of the agent
- Open feedback

4. USER STUDY



VIDEO GAME ABILITY



- May have an impact on the command use
- Significantly unequally distributed across conditions

SEX



- May have an impact on the agent use
 - Significantly unequally distributed across conditions
- May have an impact on navigation
 - Equally distributed across conditions

ASSISTANT PERCEPTION



4. USER STUDY

CONTROL VARIABLES

RQ2.

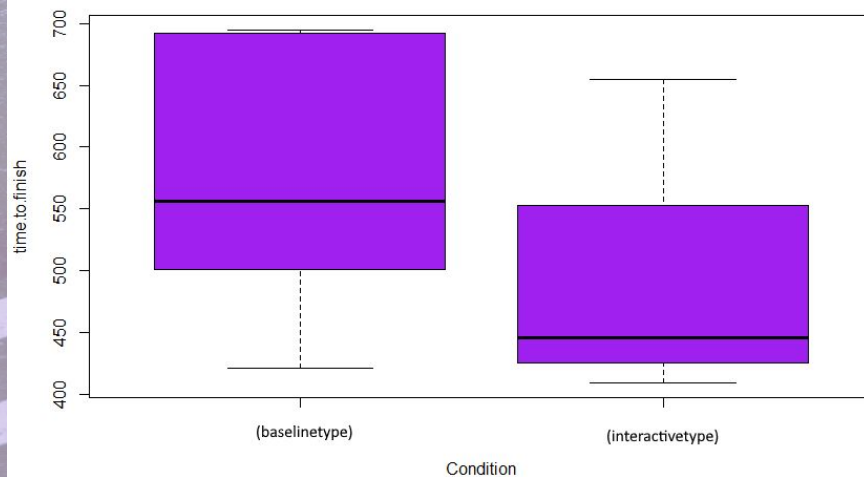
Can grounding strategies in a direction giving agent replace the use of a map ?

EFFICIENCY : TIME

- Linear regression to take controls into account
- interactive condition 100s faster than baseline
- no significant effect ($p=0,4$)

4. USER STUDY

H1 : The interactive condition is **more efficient** than the baseline condition.



RQ2.

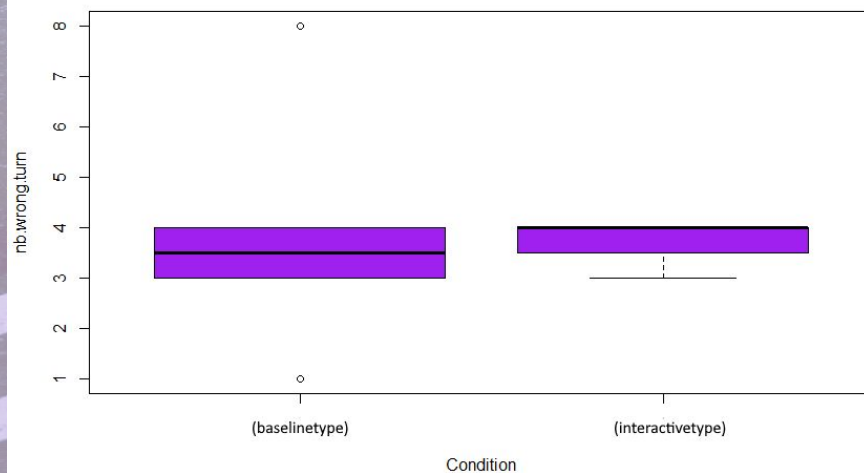
Can grounding strategies in a direction giving agent replace the use of a map ?

EFFICIENCY : WRONG TURNS

- Linear regression to take controls into account
- interactive condition : -0,16 ($p=0,91$)
- significant videogame ability effect : -0,79 ($p=0,1$)

4. USER STUDY

H1 : The interactive condition is **more efficient** than the baseline condition



RQ2.

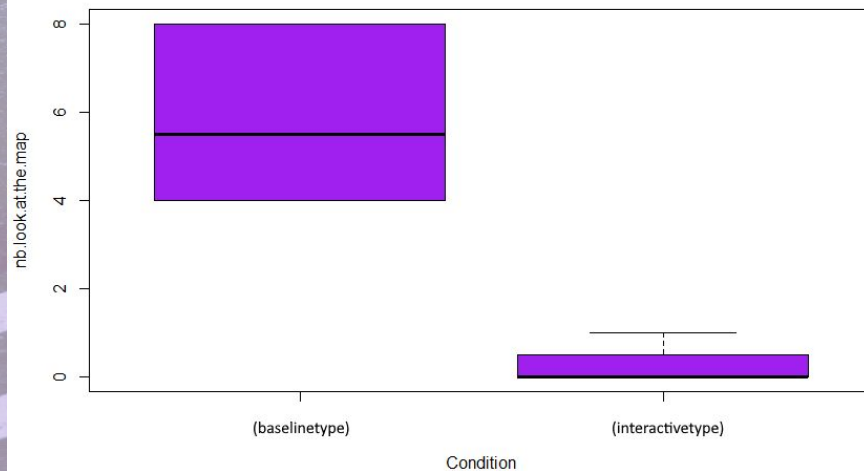
Can grounding strategies in a direction giving agent replace the use of a map ?

EFFICIENCY : LOOK AT THE MAP

- Linear regression to take controls into account
- significant interactive condition effect : -5,75 ($p=0,01$)

4. USER STUDY

H1 : The interactive condition is **more efficient** than the baseline condition



RQ2.

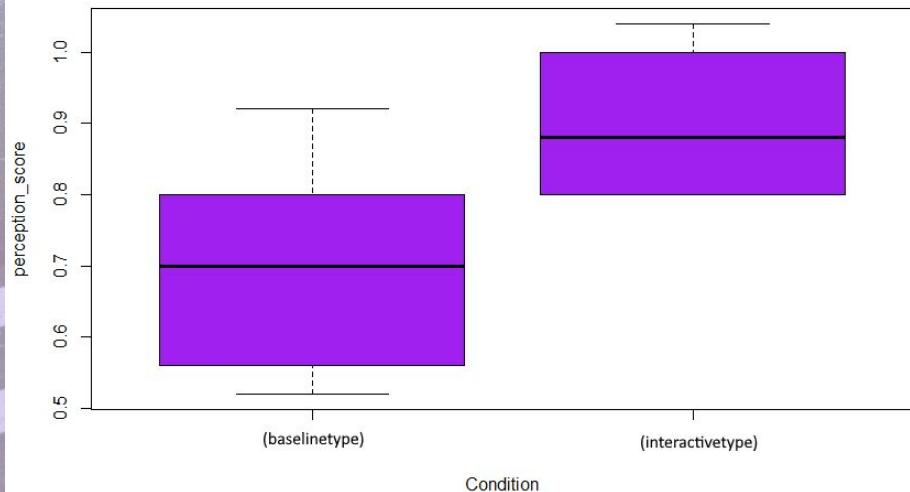
Can grounding strategies in a direction giving agent replace the use of a map ?

PERCEPTION :

- Linear regression to take controls into account
- significant interactive condition effect : 0,37 ($p=0,007$)

4. USER STUDY

H2 : The interactive condition is **better perceived** than the baseline condition





5. CONCLUSION

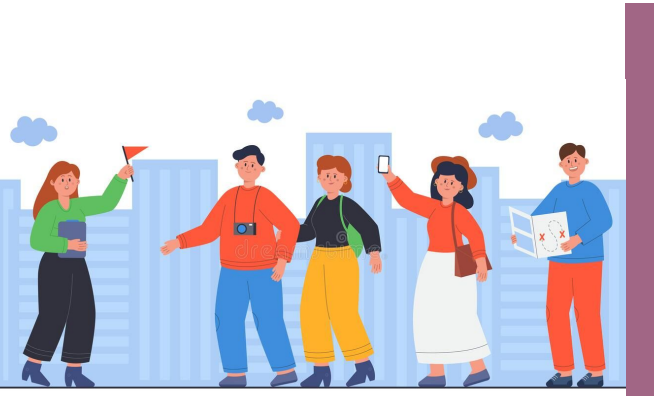
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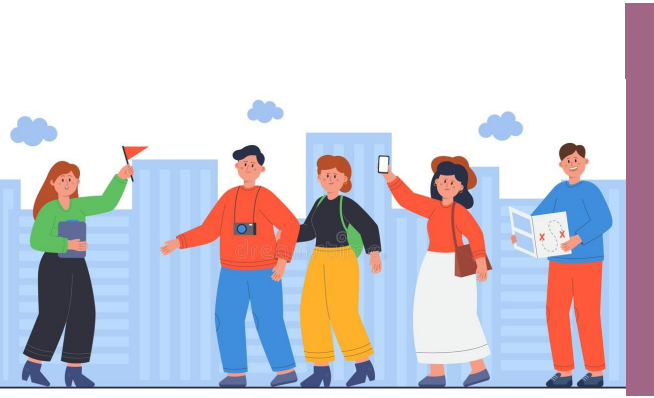


5. CONCLUSION

RESEARCH QUESTIONS

RESEARCH QUESTION 1

What grounding strategies do humans use to improve direction giving efficiency?



Guided :

Signal understanding through **backchannels**

Ask for confirmation

Ask for **further instructions**

Guide :

Wait for **backchannels**

Repeat or **reformulate instructions**

5. CONCLUSION

- ❑ Interactive agent is **perceived significantly better** than a map based application
- ❑ Interactive agent **seems to be more efficient** than a map based application
 - » need a bigger user study

RESEARCH QUESTIONS



RESEARCH QUESTION 2

Can grounding strategies in a direction giving agent replace the use of a map?

LIMITATIONS

- **Size** of the user study
- **Bugs** in the program that should have been corrected with a pre-run
- **Simplification of the strategies** and no ability to answer precise questions

FUTURE WORKS

- Take the **frequency/the presence of backchannels** into account
- Add a **language understanding module**
- **Bigger user study**

QUESTIONS TIME!

POSSIBLE DISCUSSION TOPICS :

1. Interacting with a direction-giving conversational agent could someday be a similar experience to asking directions to a person in the street?
2. Would personally use it? Why and if yes, in which occasion (walking, driving, riding a bike...)?



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