



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE

# You're Doing It Wrong!

## Studying Unexpected Behaviours in Child-Robot Interaction

ICSR 2015 – Séverin Lemaignan, Julia Fink, Francesco Mondada, Pierre Dillenbourg

Presented by Alexis Jacq

Computer-Human Interaction  
for Learning and Instruction **EPFL**



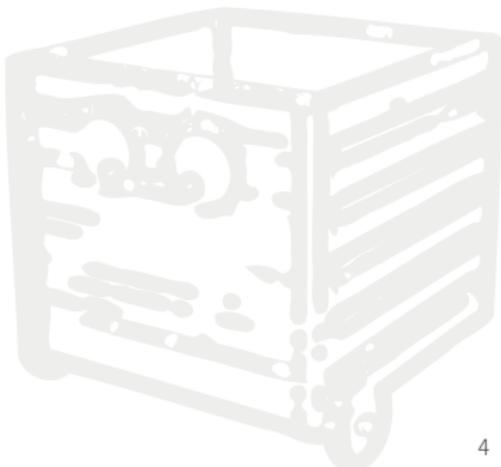
WHAT HAPPEN WHEN A ROBOT DOES  
NOT OBEY?

# NO, I DON'T WANT YOUR TILE!



## TWO HYPOTHESES

1. A robot that mis-behaves from time to time is more engaging



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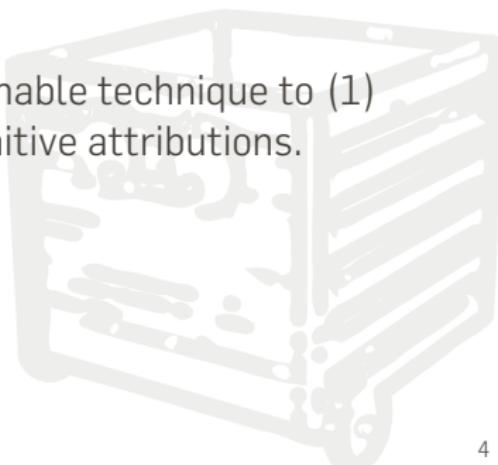
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2. The way the robot “mis-behaves” betrays its cognitive capabilities



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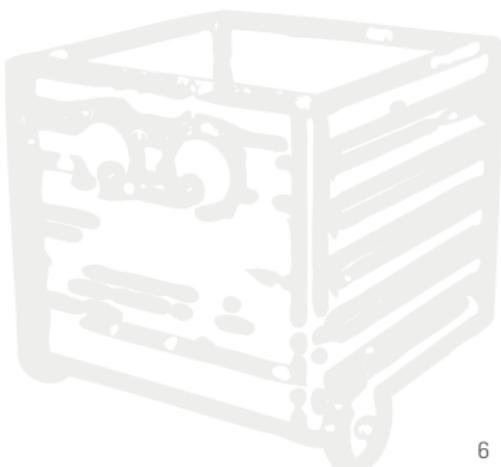
If that's indeed the case, we gain an actionable technique to (1) sustain engagement, (2) influence on cognitive attributions.



UNEXPECTED BEHAVIOUR, YOU SAID?

## DESIGN OF THREE BEHAVIOURS

1. the robot get **LOST**, for no visible reason;
2. the robot **DISOBEY**;
3. the robot makes a **MISTAKE**.



## LOST CONDITION

...induces the perception of a contingent malfunction  
(My robot has a **bug!**)



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**Hypothesis:** decreased attribution of human-likeness

## DISOBEY CONDITION

...induces the perception of a robot's **own will**



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...induces the perception of a robot's **own will**



**Hypothesis:** increased attribution of human-likeness

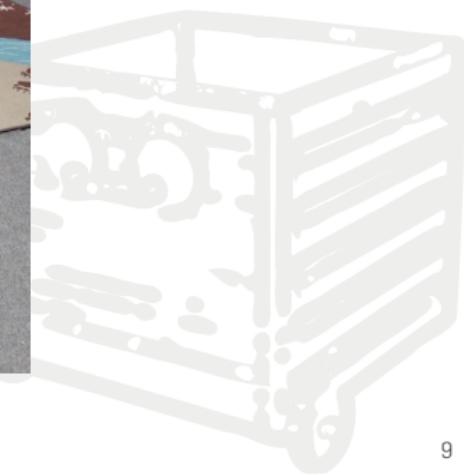
## MISTAKE CONDITION

The robot goes wrong, but recognizes the error and repairs.



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**To err is human.** And the robot is aware of its own state (introspection) and of the expected state of interaction.



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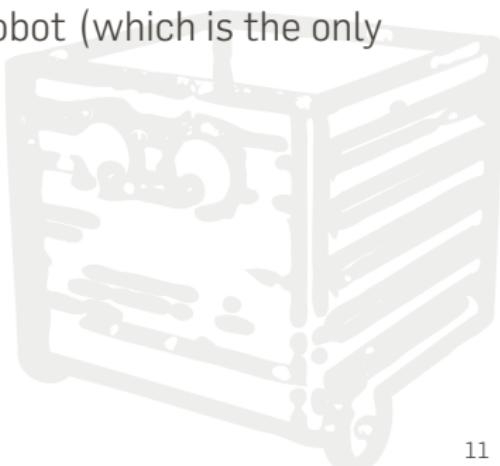
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# EXPERIMENTAL PROCEDURE: THE DOMINOS TASK

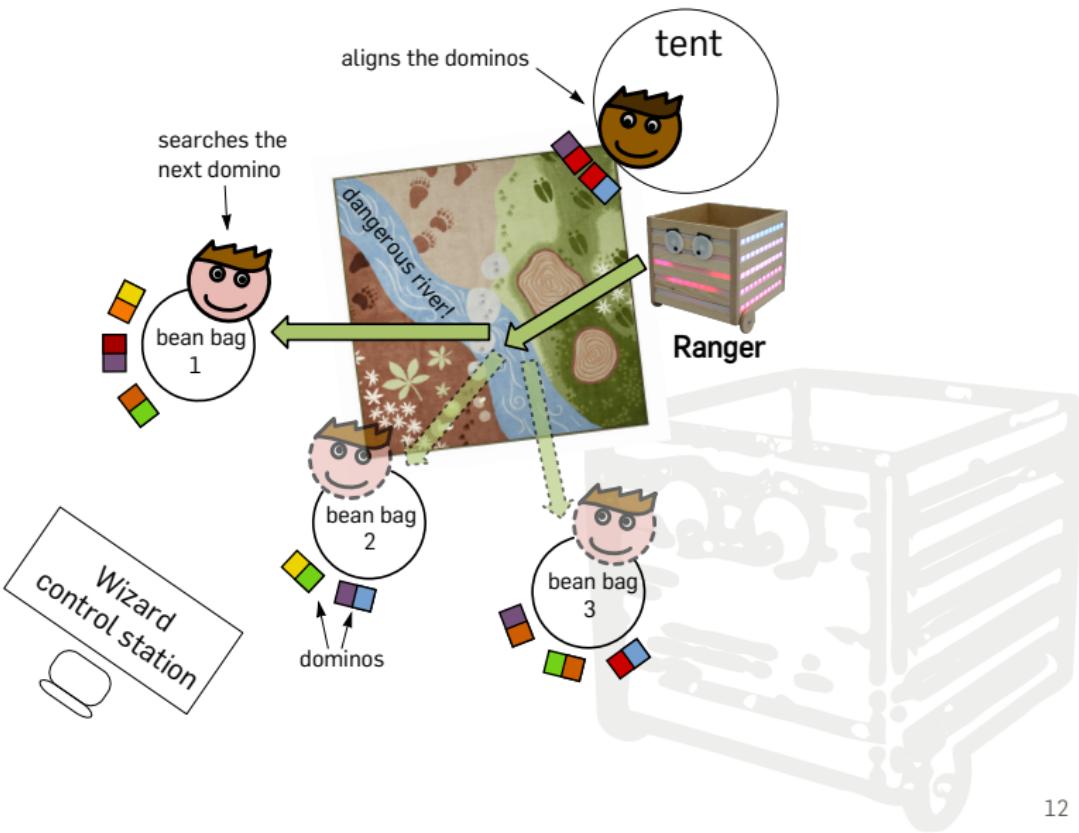
## THE DOMINOS TASK

One child has to align the dominos, and at each turn, he/she ask for the next one.

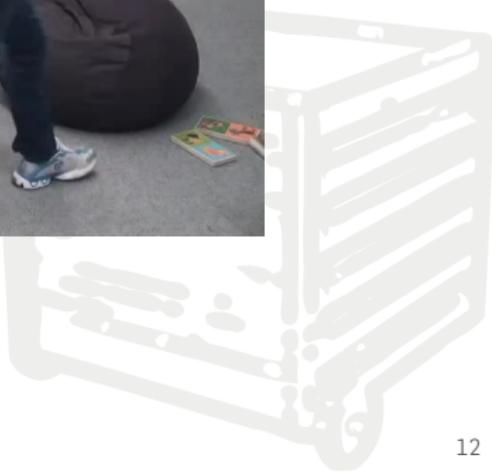
But the dominos are hidden in the room: the second child needs to find the requested one, and give it to the robot (which is the only one allowed to cross the dangerous river!)



# CORRECT BEHAVIOUR



## CORRECT BEHAVIOUR



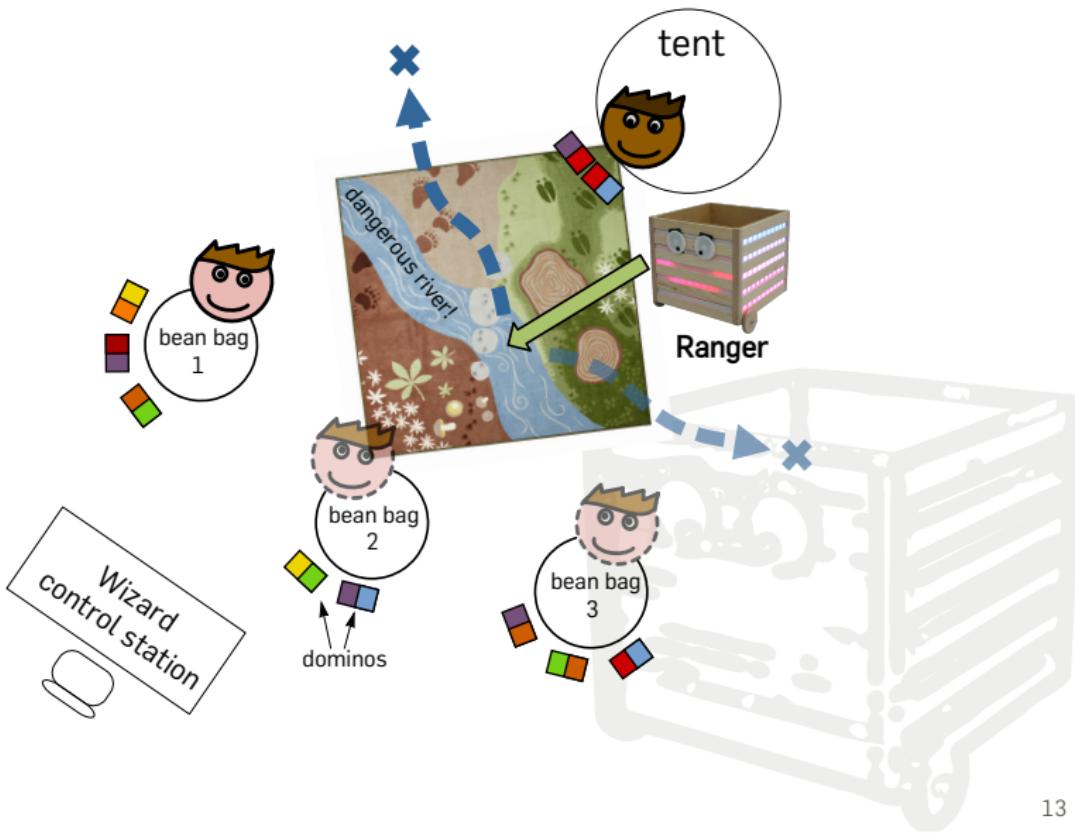
## CORRECT BEHAVIOUR

Note the non-verbal interaction cues:

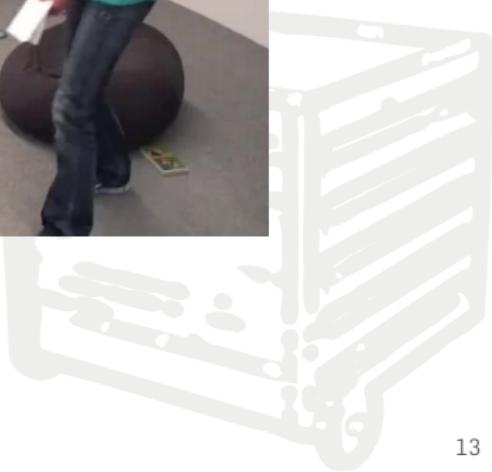
- light patterns (yellow blink: "Give me a domino!", green pattern: "I got it!")
- sounds (different sounds for "I got it!" or "Domino removed!")



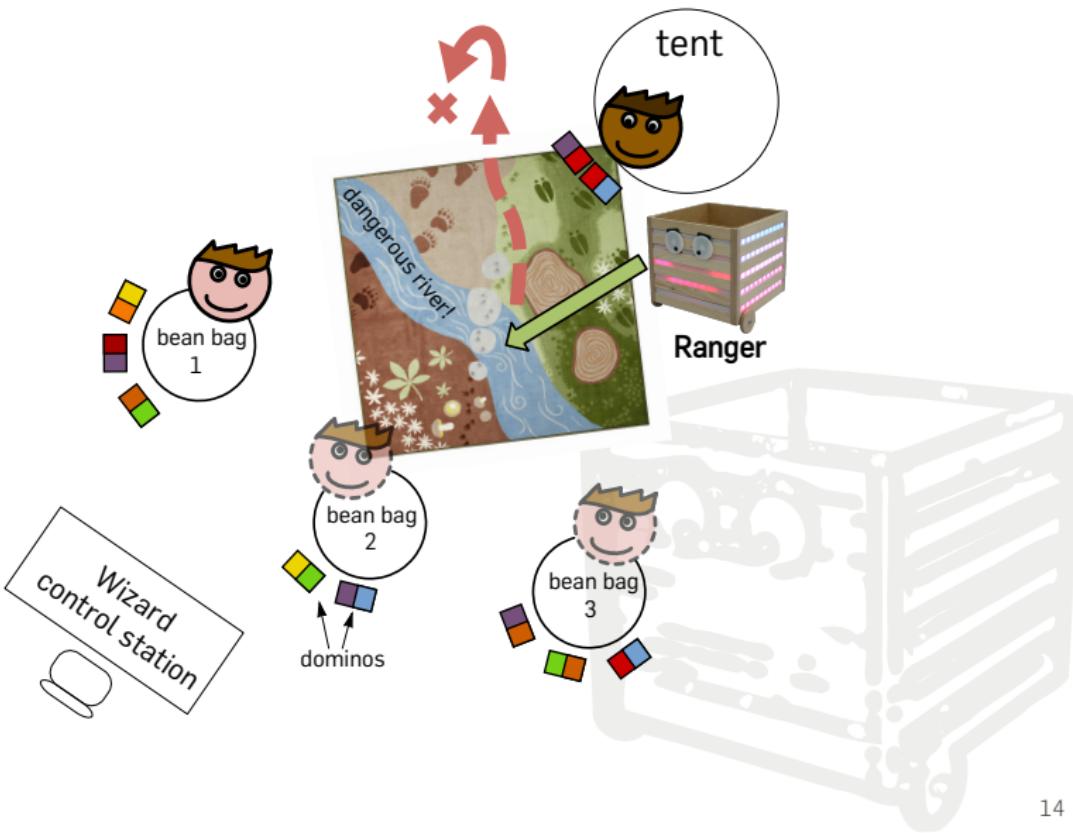
## LOST CONDITION



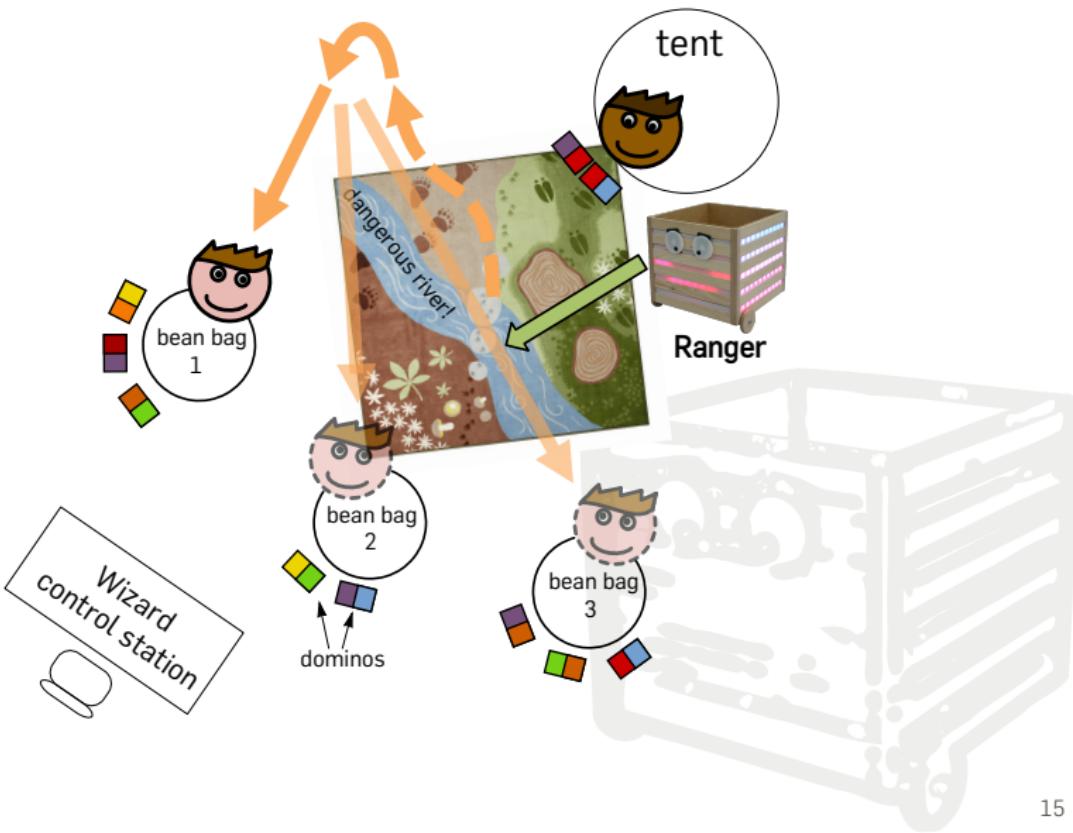
## LOST CONDITION



## DISOBEY CONDITION



# MISTAKE CONDITION

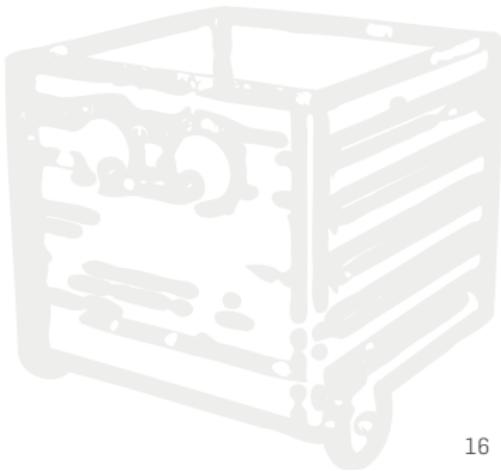


## MISTAKE CONDITION



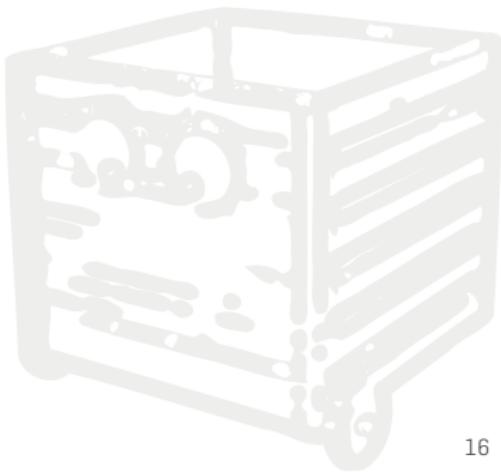
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- Wizard-of-Oz protocol;



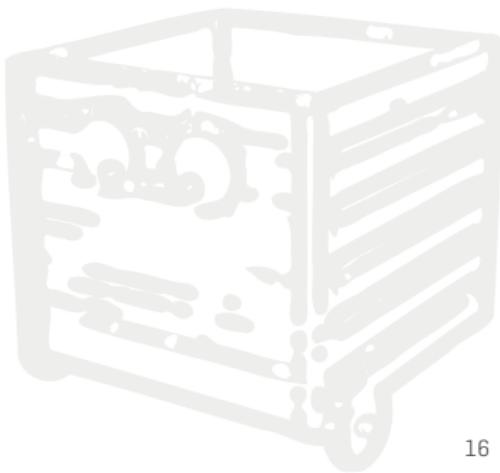
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- Wizard-of-Oz protocol;
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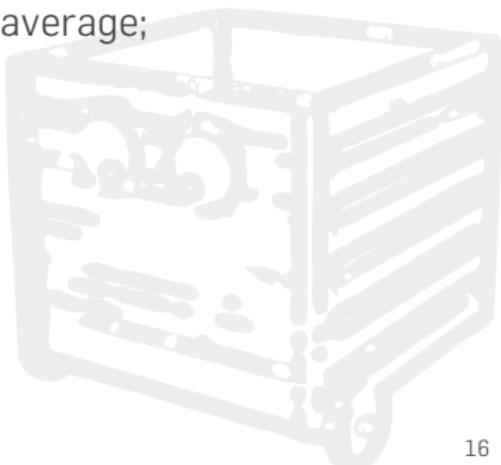
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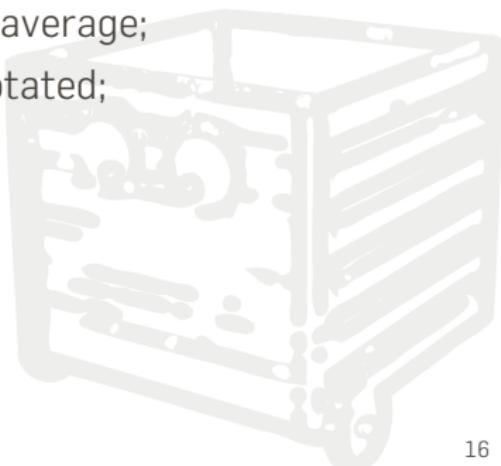
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- Wizard-of-Oz protocol;
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- 14 turns per pair, alternating correct behaviours with mis-behaviours – 14 min per group in average;



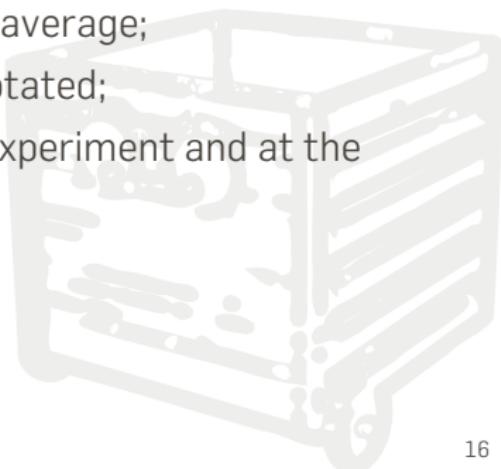
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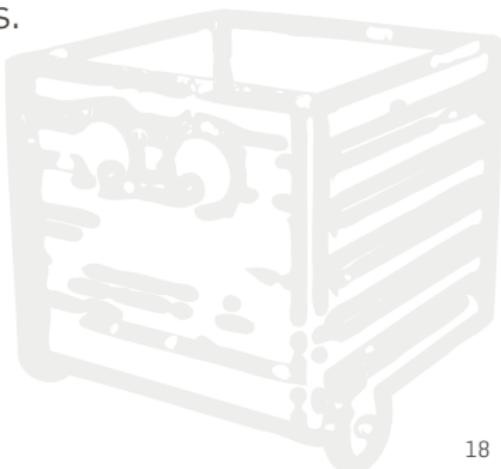
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- 14 turns per pair, alternating correct behaviours with mis-behaviours – 14 min per group in average;
- Interactions video-recorded and annotated;
- Two interviews, in the middle of the experiment and at the end.



# ANALYSIS

## TWO DIMENSIONS

- Analyse of the **behaviour**: actions towards the robot, measured by annotating the videos;
- Analyse of the **perception**: interviews.

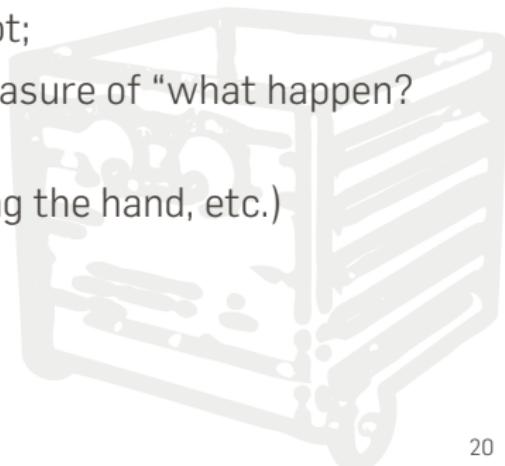




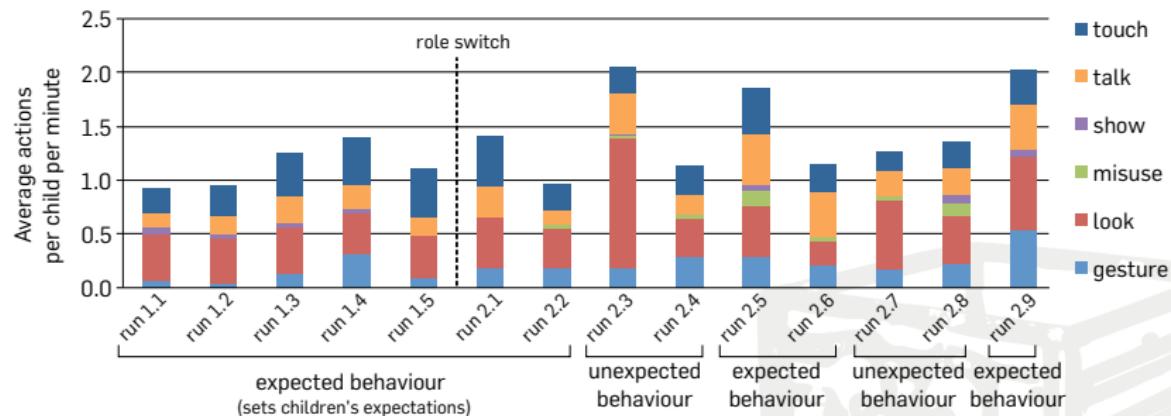
## BEHAVIOUR TOWARDS THE ROBOT

Manual annotation of the video records:

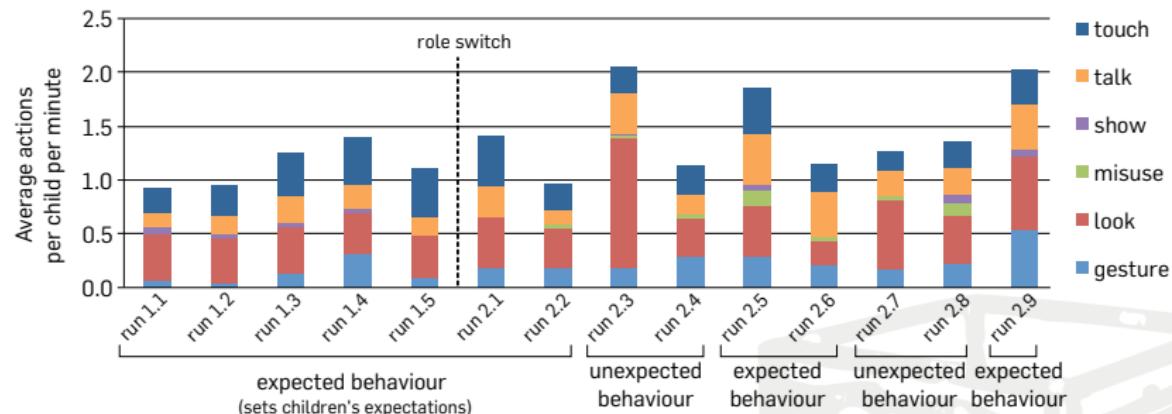
- Touching the robot;
- Talking to the robot;
- Showing objects to the robot;
- Mis-using/mis-behaving with the robot;
- Looking at the experimenter (as a measure of “what happen? what's wrong with the robot?”);
- Gesturing in front of the robot (waving the hand, etc.)



# RESULTS

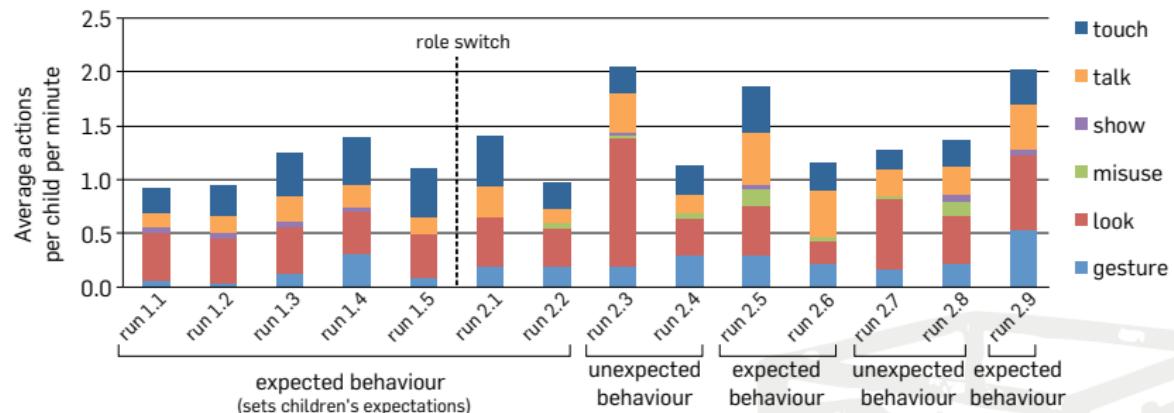


# RESULTS



Significantly more actions toward the robot once the robot starts to mis-behave. This is expected.

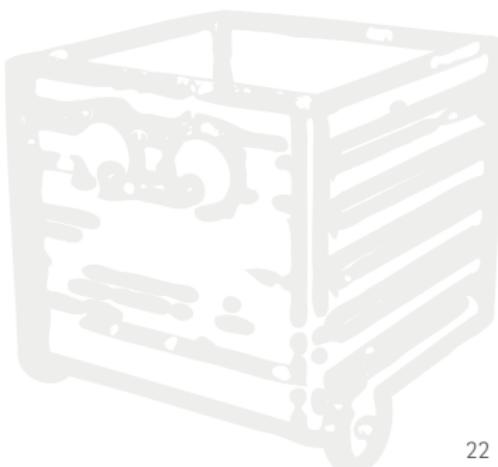
# RESULTS



No significant differences between conditions:  
we do not measure a change of children's attitude with different kind of mis-behaviours.

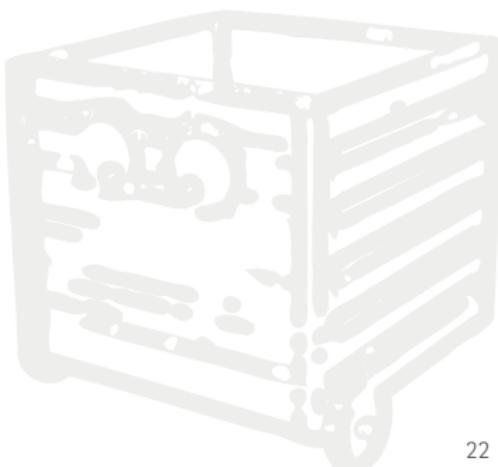
## PERCEPTION OF THE ROBOT: INTERVIEWS

- One interview after familiarization, but before introducing mis-behaviours;



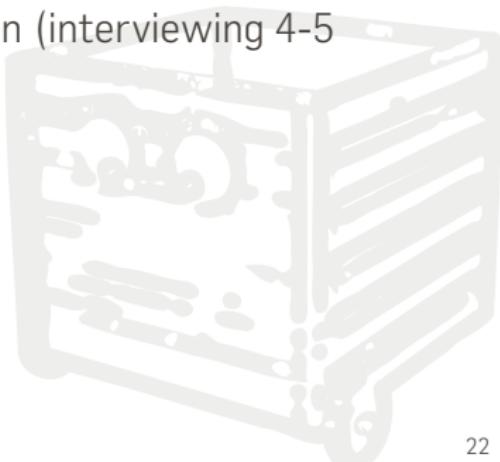
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## PERCEPTION OF THE ROBOT: INTERVIEWS

- One interview after familiarization, but before introducing mis-behaviours;
- One interview at the end;
- Semi-structured, "informal" discussion (interviewing 4-5 years old is a challenge!).



# CONSTRUCTS AND QUESTIONS

## **Expectations**

How do you imagine a robot?  
 What could it look like?  
 Have you ever seen a robot before?

## **Impression**

When you first saw R, what did you think?  
 Is R a robot? How do you know?  
 Did you expect R would come over to you when you call it?  
 What happened when you put the domino in the box?

## **Ascribe intention**

Do you think R could go out the door all by itself?  
 Does R always obey / come over to you?  
 Could R do something silly?  
 Why did R not come over to you when you called it?

## **Ascribe perceptual capabilities**

Here is a domino. Do you think R can see it?  
 When I say "Hello R!", do you think R can hear it?

## **Ascribe emotional state**

Does R have feelings? Can R be happy or sad sometimes?

## **Social acceptance**

Do you like R? Why (not)?  
 What do you (not) like about it?  
 Would you like to have R at home?

## **Companionship**

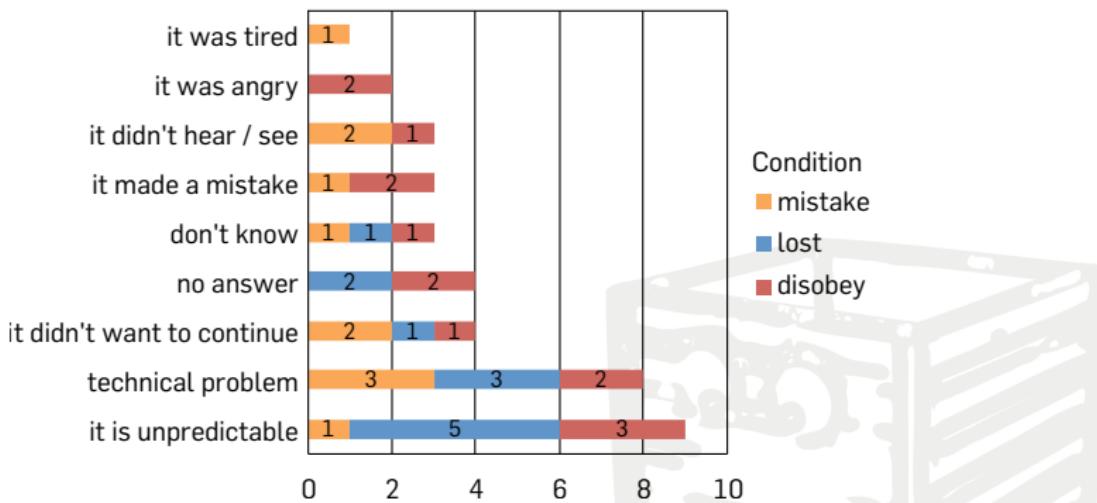
Could R be your friend? Why (not)?

## **Ascribe moral standing**

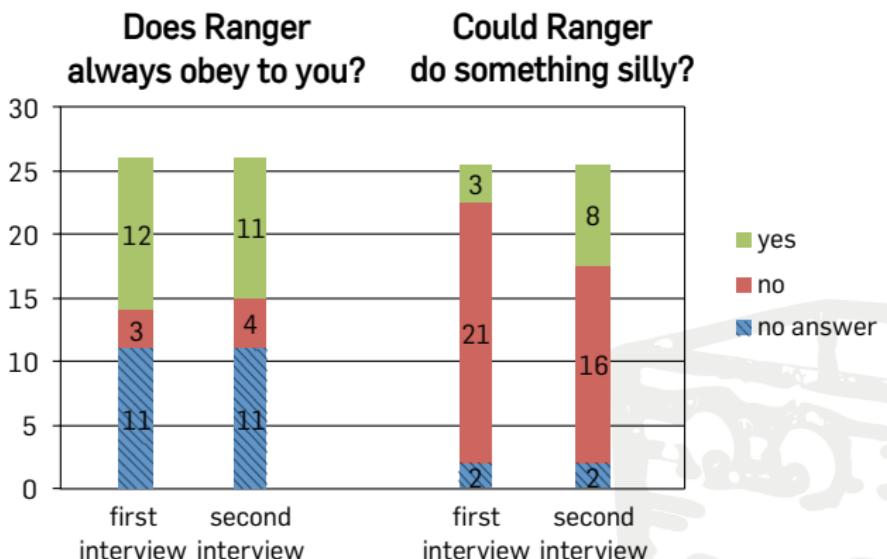
Assume you go on a holiday for two weeks. Is it alright to leave R alone at home? Why (not)?

# RESULTS

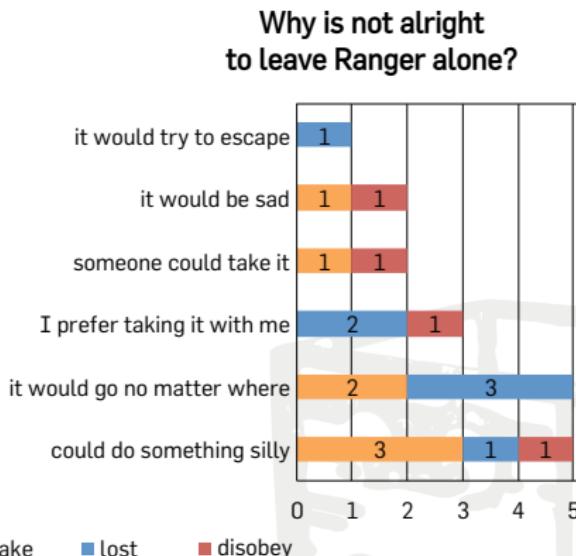
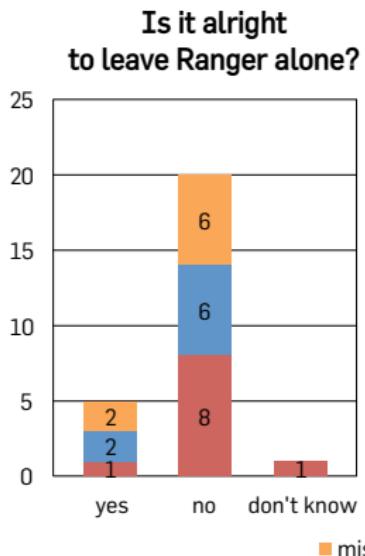
## Why did Ranger not come over?



# RESULTS

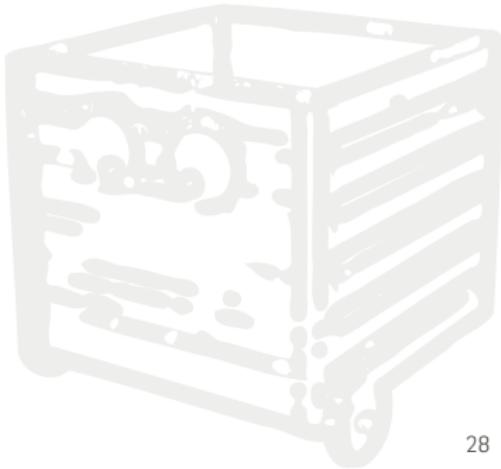


# RESULTS



# COMPOUND ANTHROPOMORPHISM INDEX?

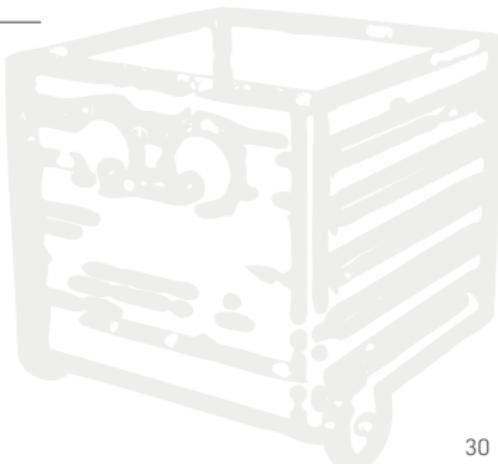
# INDEX OF ANTHROPOMORPHISM



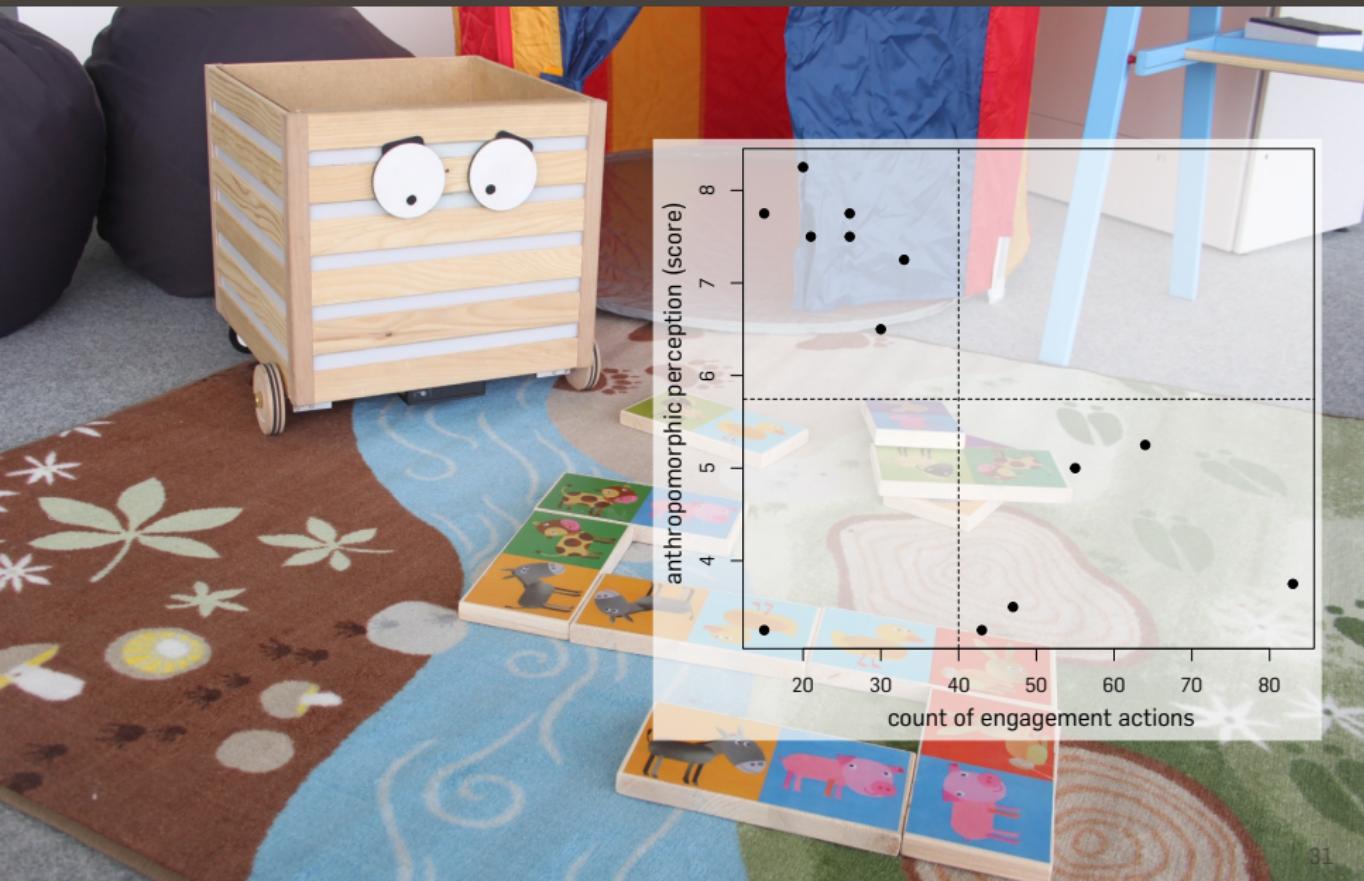
TAKE HOME MESSAGE?

# UNEXPECTED BEHAVIOURS

	Unplanned by the robot	Planned by the robot
Perceived as non- intentional	A	B
Perceived as intentional	C	D



# ANTHROPOMORPHISM != ENGAGEMENT



Thank you!

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