

Empathy Display Influence on Human-Robot Interactions

A Pilot Study

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CONTEXT: A PILOT STUDY

- ▶ A small-scale experiment for following experiments:
 - to make relevant hypothesis
 - to improve the experiment's design
- ▶ An α set to 20%: used as a filter.
- ▶ 63 measures \implies high probability of false positives
- ▶ Here: significant differences \neq real differences.

EMPATHY IN THIS STUDY

- ▶ Empathy is a complex process whereby one understands and/or shares one's emotional state and/or **mental states**.
- ▶ Focus on the **communication** of an **empathic understanding**.
- ▶ The empathic understanding is limited to one of the three factors of the interaction involvement: **attention**.

THE ATTENTION MODULE

- ▶ A background process
- ▶ Uses a deep-learning model to evaluate the user's attention
- ▶ Whenever a loss of attention is detected:
 - triggers an animation; and
 - makes the robot say sentences such as "You must be attentive".

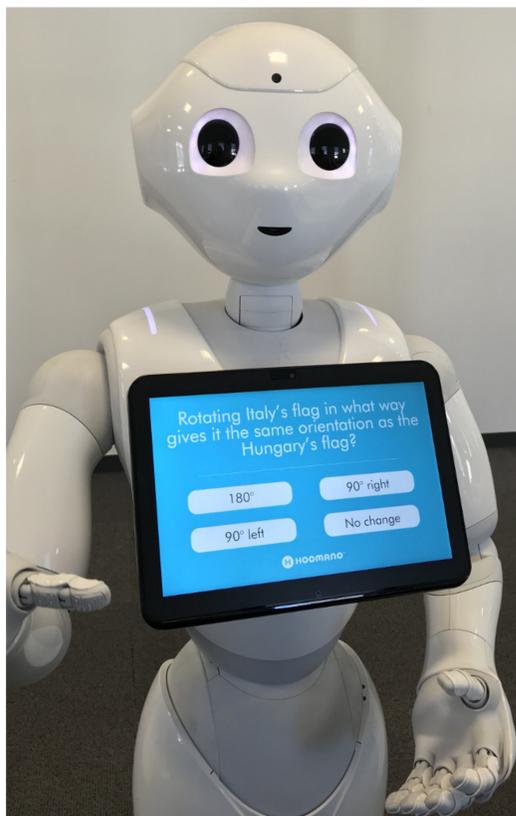


Figure: Example of a question in our quiz. The robot could give clues to the user after a fixed time. And, after giving the answer, tell anecdotes about each answer.

TAKE AWAY MESSAGE

- ▶ 9 metrics were affected—7 if we remove the two correlations.
- ▶ The empathy display should be more subtle.
- ▶ The subjective questionnaires should be shorter and adapted.
- ▶ Our empathy measure should be adapted to HRI.
- ▶ The questionnaires and quiz questions should be translated in the user's native language instead of English.

EXPERIMENTAL SETUP

- ▶ A Pepper robot asking questions very much like the "Who Wants to Be a Millionaire?" TV show.
- ▶ A NAO robot used as a hidden camera.
- ▶ 36 subjects divided in 2 groups—9M/9F for each group. One with the Attention Module, one without.
- ▶ Subjects tested on personality, empathy quotient, and robot acceptability.
- ▶ Subjects did not know that they were passing the real experiment.

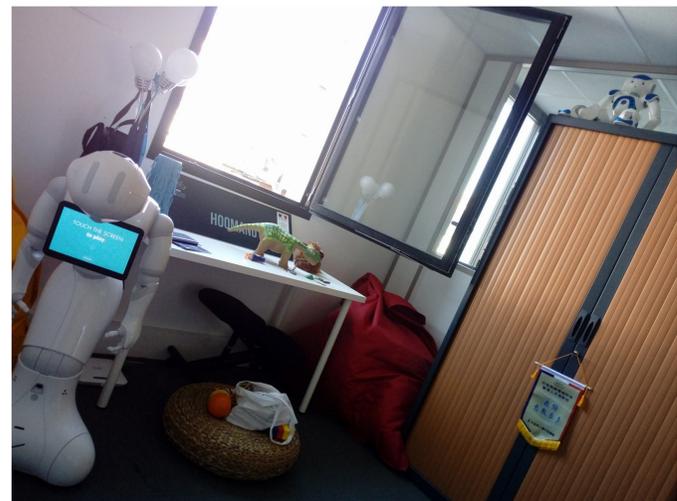


Figure: A picture of the room where the experiment took place.

RESULTS REGARDING THE INTERACTION

Metric	p	Empathy condition	No-Empathy condition
Duration	.044	14.98m \pm 8.44m	> 11.39m \pm 9.29m
Disengagements	.087	12.89 \pm 9.11	> 8.72 \pm 9.14
Comfortable	.142	6.67 \pm 1.91	< 7.50 \pm 1.20
Engaging	.188	7.22 \pm 1.56	> 6.28 \pm 2.32

The difference in the number of disengagements can be explained by its weak-to-moderate positive correlation with the duration: ($r_s = .39, p = .109$) for the Empathy condition, and ($r_s = .512, p = .03$) for the No-Empathy condition.

RESULTS REGARDING THE ROBOT

Metric	p	Empathy condition	No-Empathy condition
Trustworthy – Untrustworthy	.059	3.17 \pm 2.33	< 3.61 \pm 1.20
Empathy	.106	-.89 \pm 6.88	> -3.56 \pm 6.44
How do you feel you know Pepper?	.113	6.39 \pm 2.09	> 5.39 \pm 2.03
Perceived intelligence	.136	17.00 \pm 3.65	< 18.67 \pm 2.85
Knowledgeable	.149	7.11 \pm 2.08	< 8.11 \pm 1.53

The Perceived Intelligence and Knowledgeable scales have a moderate positive correlation: ($r_s = .52, p = .027$) for the Empathy condition, and ($r_s = .731, p = .001$) for the No-Empathy condition.