Body Language in Human-Robot Interaction

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Problem Statement

Body language can enhance an interaction by adding social information. Measuring the honest signals: mimicry, activity, and consistency [2], and applying the affective grounding [1] in order to achieve affective human-robot interaction.

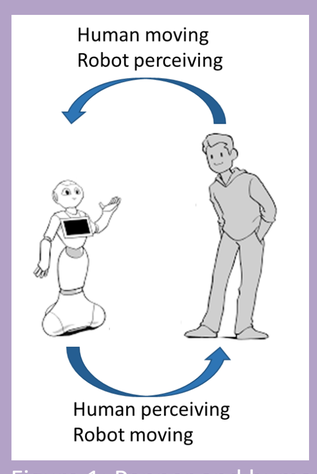

Figure 1: Pepper and human expressive interaction

Taken from and modified: http://doc.aldebaran.com/download/Pepper_B2BD_guidelines_Sept_V1.5.pdf

Objective

- To perform research on how body movements and gestures contribute affective information to an interaction between social robot and human
- Design, implement and evaluate a system capable of **recognizing** and **responding affect** through **body movements** using the humanoid robot Pepper and improve the robot's perceived social capabilities, **trustworthiness**, and reliability

Research Questions

- What is the bodily information that is necessary for affective communication in social human-robot interaction?
  - Will adding information from whole-body movement dynamics to body postures improve the accuracy of the bodily affect recognition?
  - How can one use the twelve animation principles [3] to design affect-expressive robot responses readable by humans?
  - How does one specify requirements for a database in order to investigate the purposed research questions?

Methodology

- Experiment with available datasets in order to research the fusion of static and dynamic body information
- Build a database for affect recognition in emotionally relevant interaction


Figure 2: Pepper, the robot

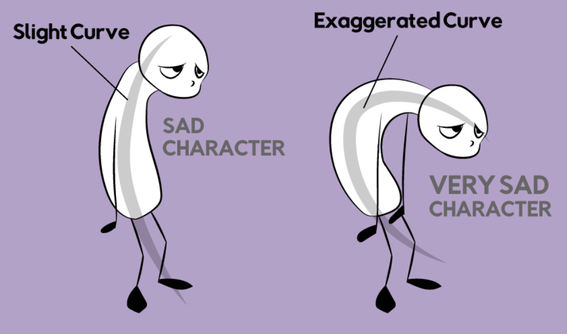

Figure 3: One of the 12 principles of animation: exaggeration

Taken from: https://newvitruvian.com/explore/exaggerated-drawing-animation/

- Implement expressive body movement on Pepper
- Test and evaluate the readability of the movement

Ongoing Work



Figure 4 and 5: Part of the dance performance, https://h-a-u-s.org/index.php/2019/06/29/posthuman-flux-2/

- Worked on a dance performance
- Transformation model of human body movements to Pepper

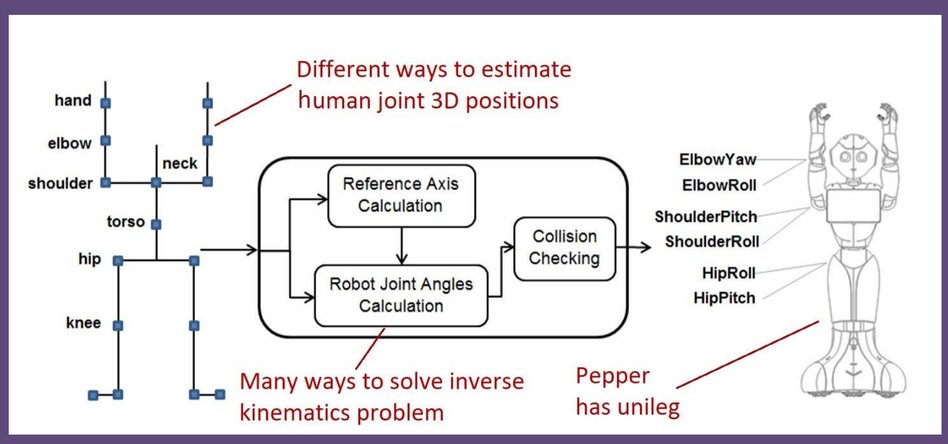

Figure 6: Mapping of Pepper's pose onto human's (taken from [4] and modified)

1. M. F. Jung, "Affective Grounding in Human-Robot Interaction," in *The 2017 ACM/IEEE International Conference on Human-Robot Interaction - HRI '17*, Vienna, Austria, 2017, pp. 263–273.
2. A. Pentland, *Honest signals: how they shape our world*. MIT press, 2008.
3. F. Thomas and O. Johnston, *The illusion of life: Disney animation*. Hyperion, 1995.
4. N. T. V. Tuyen, S. Jeong, and N. Y. Chong, "Emotional Bodily Expressions for Culturally Competent Robots through Long Term Human-Robot Interaction," *in 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018, pp. 2008–2013.