A Framework for Robot-Generated Mixed-Reality Deixis

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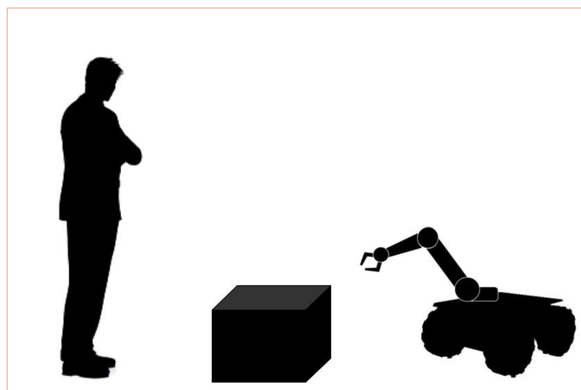
Introduction

Human-robot interaction conducted in *pure reality* has well-explored the use of deictic gestures to complement robots' natural language utterances.

But these physical gestures are just one category of deictic gesture available in *mixed reality.*

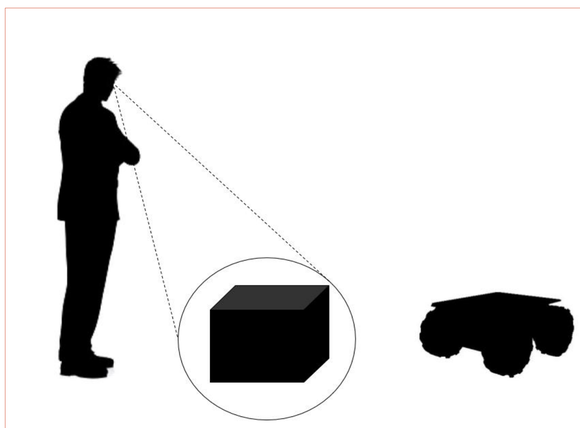
In this work we present a framework for categorizing mixed-reality deictic gestures and explore differences between these categories along several dimensions.

Egocentric Gesture



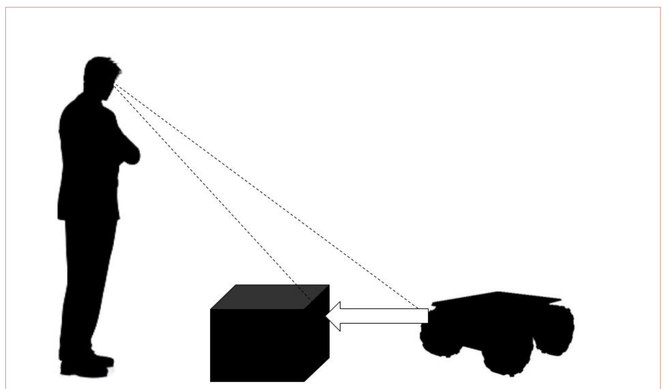
- *Egocentric* gestures are issued from the generator's perspective.
- Example: pointing *to* an object.

Allocentric Gesture



- *Allocentric* gestures are issued from the perspective of the generator's intended interlocutor.
- Example: circling an object *withinin* a teammate's field of view.

Multi-Perspective Gesture



- *Multi-perspective* gestures require the connection of multiple perspectives.
- Example: drawing an arrow *from* the robot *to* an object *within* a teammate's field of view.

Category	Required Perspective	Embodiment	Capability	Dynamic Legibility	Static Legibility	Generation Cost	Maintenance Cost	Privacy
{E}	Robot	Yes	Yes	Low	Low	High	Low	Low
{A}	Human	No	No	High	High	Low	High	High
{M}	Human	Yes	No	Low	High	Low	High	High
{E,A}	Both	Yes	Yes	High	High	High	High	Low
{E.M}	Both	Yes	Yes	Low	High	High	High	Low
{A,M}	Human	Yes	No	High	High	Low	High	High
{E,A.M}	Both	Yes	Yes	High	High	High	High	Low

We analyze these three categories and the combinations thereof, across eight sample framework dimensions: Whose perspective is required to generate the gesture? Does the generator need to be embodied? Does the generator need physical gestural capabilities? Is the gesture legible while it's being executed? Is the gesture legible once complete? How expensive is the gesture to generate? How expensive is the gesture to maintain? And is the gesture visible to bystanders?

References

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