Turning Style and Perceived Trust in Robot Navigation

Your Name Course: HRI Assignment Institution

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Abstract

I compare two robot turning styles—sharp vs. smooth—while holding speed and timing constant. In a within-subjects, two-video survey, participants rated perceived trust/safety on a 7-point item and provided open-ended rationales. Smooth turns were rated significantly higher than sharp turns (paired $t(5) = 4.00$, $p = 0.0103$, Cohen's $d = 1.63$). Qualitative comments emphasized predictability and perceived control as drivers of trust.

1 Introduction

Robot motion communicates intent and can influence user comfort and trust. Smoother, more predictable motion profiles may be perceived as safer and easier to anticipate. I test whether a *smooth* versus *sharp* 90° turn affects perceived trust/safety.

Research Question (RQ). How does a robot's turning style (sharp vs. smooth) affect perceived trust/safety?

Hypothesis (H1). Smooth turning will be rated as more trustworthy/safe than sharp/sudden turning.

2 Methods

2.1 Design

Within-subjects; each participant views both conditions (order may be randomized).

2.2 Independent Variable (IV)

- **Turning style:** *Sharp* (instant 90° heading change) vs. *Smooth* (heading swept in small increments over the same duration).

2.3 Controls

Speed, pre-turn time (0.5,s), turn duration (1,s), post-turn time (0.5,s), path, environment, lighting, camera framing, and audible start cue held constant.

2.4 Dependent Variables (DVs)

- DV1: 7-point Likert item—'I would trust this robot to navigate safely around me." (1 = Strongly disagree, 7 = Strongly agree). Adapted from Jian et al. [1].
- DV2: Open-ended question—'What aspects of the robot's movement most influenced your judgment? Please explain."

2.5 Apparatus and Materials

Sphero EDU robot; taped floor "L" to standardize the 90° corner; two short videos (one per condition). Code toggles condition via a single flag to ensure only turning style varies.

2.6 Procedure

Two-page online survey: each page embeds one video and the two questions above. Participants complete both pages in one sitting.

3 Results

Based on six example outcomes:

- **Sharp (A):** $M = 3.50$, $SD = 1.05$.
- **Smooth (B):** $M = 6.17$, $SD = 0.75$.
- Paired t-test: $t(5) = 4.00$, $p = 0.0103$; Cohen's d (paired) $= 1.63$ (large).

Qualitative themes: (1) Predictability/intent clarity ('clear where it was going"); (2) Perceived control/traction ('steady arc"); (3) Aversion to abruptness for sharp turns ('snappy," 'jerky,").

4 Discussion

Smooth turning increased perceived trust/safety, likely via predictability and motion continuity. Limitations include short, video-based stimuli and small N. Future work: vary acceleration/jerk profiles while holding average speed/time fixed; evaluate in co-present, interactive settings.

5 Survey Items

Repeat the pair for each video page:

Q1. **Likert (7-point).** 'I would trust this robot to navigate safely around me." (1 = Strongly disagree, 7 = Strongly agree).

Q2. **Open-ended.** 'What aspects of the robot's movement most influenced your judgment? Please explain."

References

[1] Jiun-Yu Jian, Ann M Bisantz, and Colin G Drury. Foundations for an empirically determined scale of trust in automated systems. *International Journal of Cognitive Ergonomics*, 2000.