

Human-aware Robot Social Behaviour Dynamic for Trustworthy Human-Robot Interaction

Chuang Yu

Department of Computer Science
University of Manchester
Manchester, United Kingdom
chuang.yu@manchester.ac.uk

Helen Hastie

Department of Computer Science
Heriot-Watt University
Edinburgh, United Kingdom
h.hastie@hw.ac.uk

Angelo Cangelosi

Department of Computer Science
University of Manchester
Manchester, United Kingdom
angelo.cangelosi@manchester.ac.uk

Abstract—Robots with multimodal social cues can be widely applied for natural human-robot interaction. The physical presence of those robots can be used to explore whether or how the robot can relieve the loneliness and social isolation of older adults. Natural and trustworthy interpersonal communication involves multimodal social cues with verbal and nonverbal behaviors, for example, speech, body language, facial expression, and the gaze. Humans always take the attention, intention, and preference of the interactor into consideration to adjust behaviors dynamically. Accordingly, a social robot should factor in human states into the loop to generate and conduct multimodal behaviors in a natural and trustworthy human-robot interaction setting. In this abstract, we explore how we can endow a social robot with dynamical social behaviors with the human in the loop and whether the human-aware robot social behavior dynamics make a difference in trustworthy human-robot interaction.

Index Terms—multimodal social behavior, human-in-the-loop

I. INTRODUCTION

Can human-aware robot social behavior dynamics make a difference in trustworthy HRI? We will explore human-aware multimodal robot behavior generation models. Namely, the robot behavior generation will also take human behavior into consideration. Multimodal robot behavior includes verbal (age/gender controllable robot speech) and nonverbal behavior (speech-driven robot gesture and facial expressions). The pipeline is shown in Fig. 1. Those models will be integrated into the robot behavior architecture to validate the related effects on human-robot trust.

II. METHODOLOGY AND DISCUSSION

With regards non-verbal behavior, we will explore the interactive robot speech-driven gesture/face generation with the human state in the loop. Most of the past works only utilized robot speech to guide the robot gesture/face generation without consideration of the human interactor states [2]. However, in real-time human-human interaction, the human cognitive load, emotion, attention, preference, and multimodal behaviors will reflect interactor behavior patterns. Similarly, the human-in-the-loop robot gesture generation model may make a difference for a trustworthy human-robot interaction. This work can be built based on our past speaking robot gesture generation work [4] to explore the effectiveness.

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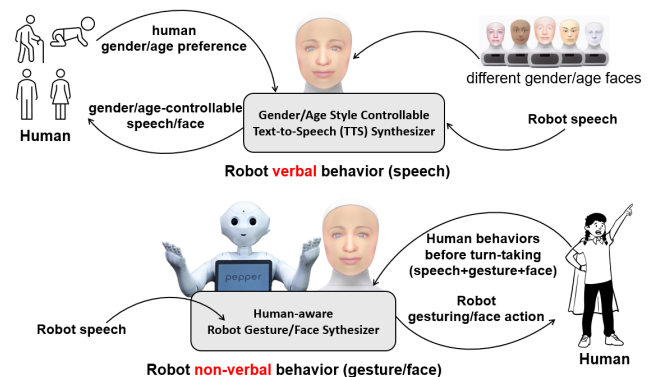


Fig. 1. Pipeline of human-in-the-loop robot behavior dynamics.

With regards verbal behaviour, we focus on speech synthesis, specifically gender-style-controllable robot speech that takes into consideration both human preference and robot gender characteristics. Firstly, the robot's gender identity based on its physical appearance includes male, female, or non-binary [1]. The robot speech generation should consider appearance-based gender identity for gender style dynamics. Secondly, the robot's gender identity is very subjective to each human interactor. So the gender-based speech generation also should regard the human preference dynamic. The work will be upgraded from our past genderless robot speech generation work [3].

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