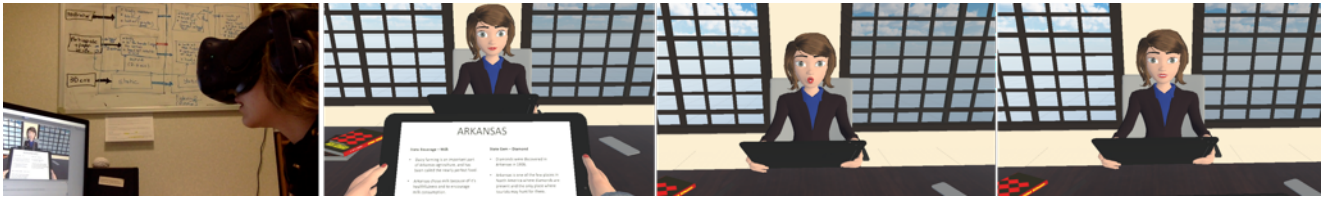


Being with a Virtual Character: Nonverbal Communication in Virtual Reality

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Using Virtual Reality (VR) in a social interaction experiment. The participant, represented as a virtual human, took part in information sharing and discussion activities with a programmed female virtual character called Anna. We aim at investigating how nonverbal cues in a conversational context influences social closeness between the participants and their virtual co-participants.

Abstract—Real-time face-to-face social conversation involves complex coordination of nonverbal cues such as head movement (nodding), gaze (i.e. eye contact), facial expressions and gestures. In this research, we investigate how coordination in such subtle nonverbal communication can have effects over closeness and trust.

Index Terms—Social coordination, Virtual reality, Mimicry, Synchronization, Nonverbal

I. INTRODUCTION

There is increased research interest in how and why non-verbal social coordination occurs, and an increased need to generate realistic conversation behaviors in artificial characters for virtual reality [1]. In this research, we investigate how coordination in such subtle nonverbal communication can have effects over closeness and trust. Virtual Reality (VR) provides a high level of social presence with conversation patterns that are very similar to face-to-face interaction. Therefore, we employ VR to understand how coordination influences social bonding and strongly perceived similarities in personality. We focus our study on head nodding as social signals, in which the head-mounted display in the VR system allows us to detect the participants nodding during the interaction experiment. In our experiments, participants are represented as virtual humans, and engaged in structured conversations with another programmed virtual character. The conversation consists of 4 trials, alternating turns between the participant and virtual

character. Each trial has 45 seconds of monologue during of which sharing information takes place, followed by 35 seconds of dialogue between the participant and the virtual character.

Based on the wavelet analysis results on our high resolution data, we generate an interactive avatar with full facial motion which can engage with a nave participant (Fig. 1). We decided to use a virtual avatar that has a middle shape between stylized and realistic looking avatar. That's to avoid any effect might cause uncanny reactions [2]. We employ Virtual Reality (VR) to understand how coordination influences social bonding and strongly perceived similarities in personality. In the listening mode, we programmed the virtual character: 1) to mimic the low frequency (0.2-1.1 Hz) head nodding of the participant to varying degrees of accuracy with a delay of 600 ms. 2) to periodically perform anti-synchronised high frequency fast nodding (4.5-6.5 Hz).

The participants evaluate the virtual characters personality, attractiveness, and rate their feelings of similarity, rapport and trust toward the virtual character. Our data reveals that synchrony at low frequency (0.2 1.1 Hz) nodding has positive coherence between the participant and the virtual character, compared to the situations of non-synchrony. This coherence is linked to mimicry behavior, and therefore in range is a plausible signature of the mimicry of the participants head movement by the virtual character. This research potentially confirms that synchrony in conversations is a positive social signal and indicates to greater liking and trust.

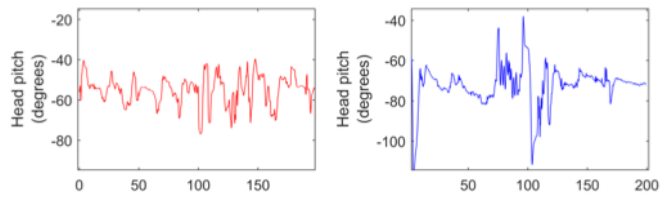


Fig. 1. Using wavelet analysis, we found some surprising ways patterns in the way people naturally coordinate with one another. As well as mimicking, we found that people also decoupled their head movements more than we would expect by chance [3].

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