

How Turn-Taking Influences the Perception of a Suspect in Police Interviews

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ABSTRACT

We study turn-taking behaviour in non-cooperative dialogue for the development of believable characters in a serious game for conversational skill learning in the police interview context. We describe a perception study to see how participants perceive a suspect's interpersonal stance, rapport, face, and deception when the turn-taking of the subject varies. We influence the perception of the suspect's stance by altering the timing of the start of speech with respect to the ending of the interlocutor's speech. The results of the study contribute to the development of an embodied conversational agent capable of natural human-system conversation with appropriate turn-taking behaviour.

Author Keywords

Embodied Conversational Agent; Turn-Taking; Serious game; Social skill training; Police interview; Believable virtual humans; Experimental perception study

ACM Classification Keywords

I.2.7 Natural Language Processing

INTRODUCTION

In human conversation we try to adhere to a "one-at-a-time" approach. Sacks, Schegloff and Jefferson [15] proposed a systematic, offering a set of rules to provide next-turn allocation to one interlocutor and thereby minimizing gap and overlap. However, moments of overlapping speech or silences occur frequently in human conversation [16]. These silences and moments of overlapping speech are often communicative in their own right [5,11,14]. Emotions and the stance people take towards each other influence turn-taking behaviour. "A clash of opinions also means a clash of turn-taking" [12]. Contrary to the dynamic turn-taking behaviour in human conversation, turn-taking behaviour in current natural dialogue systems is often restricted by a "one-at-a-time" rule. Conversational agents (CAs) are limited to listening or speaking and listening is initiated either on a place predetermined by the system or whenever the user makes a sound, resulting in an unnatural human-

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system interaction. Exceptions are the dialogue systems that allow more free turn-taking behaviour [18].

In the context of the COMMIT P2 project we are working towards a computational model for human-like suspect turn-taking behaviour. This model supports the creation of a believable embodied conversational agent (ECA). This ECA will be used in a social skill training serious game for police officers that is currently under development. Rich CA turn-taking behaviour, including pauses, interrupts, and hesitation, is expected to support a more natural human-system interaction. A previous conversation analysis [2] showed that a factor such as the topic of conversation influences the interpersonal stance and the turn-taking behaviour of the suspect. Moreover, the stance of the suspect appeared to be related to the interpretation of suspect silences, e.g., a silent response from a suspect with a positive stance is interpreted as timidity while during a hostile stance it is related to withdrawal. Turn-taking strategies seem to have an effect on the perception of the agent [12,13].

The purpose of this study is to investigate how turn-taking behaviour influences the impression that observers get from a suspect in simulated police interviews. We look at the relation between turn-taking behaviour and perception of power, affiliation, rapport, face, and deception. We use extracts of police interviews in which we systematically vary turn-taking behaviour to study the influence of turn-taking on perception. This study focuses on the police interview setting. Police officers receive training on recognition and strategic use of interactional phenomena such as dominance [3]. Due to this experience, their perception of affective stance may be different from untrained people. The results of this work will inform the creation of a serious game that *police officers* will use to train their interview skills.

This paper is organized as follows. In the next section, we give a brief overview of relevant literature. Next, we present the Research Question and describe Methodology of the perception study. We conclude with a Discussion of the expectations of the results and the relevance of the results for the development of a conversational agent.

RELATED WORK

Literature on theoretical frameworks of and results from conversation analysis on turn-taking in police interviews provided us with some suggestions on which factors influence turn-taking behaviour in police interviews.

Yoong [24] showed that police officers interrupt suspects to prevent them from turn completion. These deliberate interruptions are considered signs of assertion of power

[14,24]. Due to the asymmetric question/answer adjacency pairing, a police interview is structured to provide the officer with control over the conversation [4]. Haworth [7] claimed that power is under constant negotiation and reported recognition interrupts, minimal responses, taking extended turns, and interruptions of question as techniques used by suspects to access control in police interviews. Vrij [22] suggest that truth tellers adopt a “tell all” approach resulting in a talkative mood opposed to liars who adopt the “keep it simple” approach resulting in a less talkative mood. A more in-depth analysis of silence during stages of deception and truthfulness is given by Komter [10] who suggests that resistance by evasion or defence is a sign of deception and silences after a statement or question are associated with a non-contradicting position of the suspect. This absence of denial is often highlighted by an officer by allowing a long silence. To be considered relevant, denial should be provided immediately following or interrupt an accusation [9]. Rapport is considered a critical step in eliciting trust and building a relationship in professional interaction and therefore a prerequisite for techniques used in police interviews, e.g., to get cooperation from the interviewee [1,23]. Suspects tend to talk more openly in harmonious interactions and cooperation and agreement are increased. Discomfort –considered a lack of rapport– is displayed by stretches, fillers and pauses in the speech of the suspect [6]. In turn-taking we adhere to the terminology proposed by Heldner and Edlund [8], distinguishing two silences: gap and pause, two overlaps: between and within speaker, and bridged turn transitions: a smooth transition with no discernable silence (less than 0.18s) (see Figure 1). The type of question can influence the perception of an utterance. For example, a question directly addressing the suspect requires a response while this is not necessary for a statement. Also, an open-ended question is expected to be followed by an extensive response while yes or no are satisfactory responses for a closed question [17]. The type of question asked is related to the function of a question, e.g., information seeking for open-ended questions and conformation seeking for closed questions [20]. Moreover, case-related question may be more sensitive than small talk.

Ter Maat et al. [12,13] show that the manipulation of turn-taking strategies can lead to different perceptions of an agent on personality scales, interpersonal scales, and emotional scales. They conclude that these strategies can be used in the repertoire of expressive behaviours of agents reflecting these dimensions. We extend on this perception study. Based on the literature review, we hypothesize there is a relation between turn-taking behaviour and perception of power, affiliation, rapport, face, and deception.

RESEARCH QUESTION

To support the development of a computational model for turn-taking behaviour of a virtual suspect agent we evaluate the suggestions presented in the literature review: we assess if turn-taking behaviour is indeed related to the perception of interpersonal stance and investigate possible interaction between factors of interpersonal stance. The main research question is: ‘*What influence do variations in turn-taking behaviour have on the perception of power, affiliation,*

rapport, face and deception of a virtual suspect?’. We formulated hypotheses following the same pattern for each of these factors: a turn-taking feature influences the factor. For deception (the other factors are omitted to conserve space):

In interactions with audible pause between sequential suspect turns, the suspect is perceived as more deceptive than in latched sequential turns.

In interactions with a gap between a question from an officer and the answer by a suspect, the suspect is perceived as more deceptive than in latched or overlapping question/answer adjacency pairs.

In interaction with a gap between a statement by an officer and a denial by a suspect, the suspect is perceived as more deceptive than in latched or overlapping denial.

METHODOLOGY

We selected extracts from our police interview corpus [2] and generated them with variance in timing of the start of speech with respect to the ending of the speech of the other interlocutor. These extracts are presented to participants who are asked to fill in a short survey on their perception on the personality, emotional state and interpersonal stance of the suspect after each extract. A pilot study is conducted to evaluate the stimuli and survey.

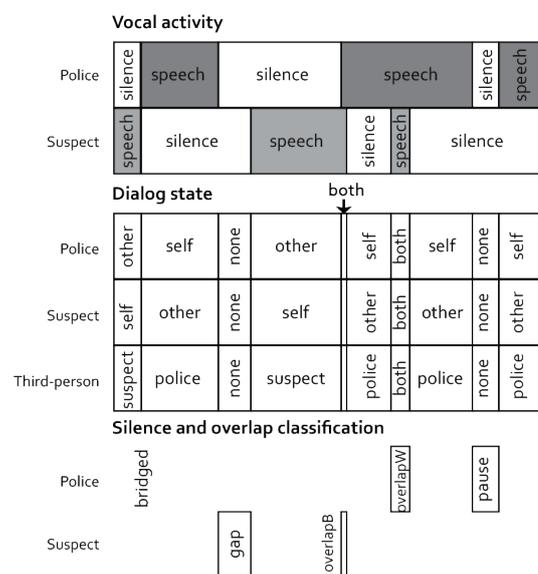


Figure 1: Top: Vocal activity of two speakers. Middle: The dialogue state shows who is speaking (depending on the perspective). Bottom: Classifications of the dialogue state: gap, pause, between-speaker overlap, within-speaker overlap, and bridged speaker transitions.

Participants

Police officers or police trainees are our participants (n=30) as their perception of affective stance may be different from untrained people due to their experience. Participants need to be native or proficient Dutch language users as all stimuli are in Dutch.

Stimuli

The stimuli, extracts from the corpus of Dutch police interview training videos [2], are generated using Ivona (ivona.com) text to speech. To maximize recognition of both speakers they are of opposing gender and the gender of the officer and the suspect are counterbalanced over all stimuli. All stimuli are generated using a single male and a single female voice. The extracts selected from the corpus demonstrate –or contradict– one interpersonal factor, see Figure 2. For each extract an altered version is created in which the turn-taking behaviour is adjusted while maintaining the content of the conversation as much as possible. Names are replaced by fictive names of similar length. Utterances are recorded and edited to vary the turn-taking using Audacity (audacity.sourceforge.net).

Design and Procedure

Participants are seated in front of a computer with loudspeakers. On the computer an online survey is presented. The participant is provided with information about the study and ensured confidentiality of their data. On each page the participant plays an audio file. Each file consists of an extract of a simulated conversation between an officer and a suspect. To distinguish between the officer and the suspect both interlocutors are of opposing gender.

To gather how a suspect is perceived, a survey is presented after each stimulus. The survey is the same for each stimulus –except for gender that is altered to comply with the gender of the speakers in the extract under assessment– and consists of opposing statements pairs to be rated on a 7 point semantic difference scale for: *dominance, friendliness, togetherness, cooperativeness, positivity, agreeability, attentiveness, politeness, respectfulness, autonomy, closeness, resistance, compliance* and *deceptiveness*. The chosen scales include the characteristics of interpersonal stance [3] and the factors of rapport [19]. Questions are counterbalanced for polarity where possible.

DISCUSSION

Previous research investigating police interviews included some aspects of silence or interruption and provided us with

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410 P till what time?=  
412 S =till eeeh twelve o'clock I had lessons  
    (0.7)  
414 P hmm hmm  
    (0.4)  
416 S ·Hhhh, then, eh, I went into the city for  
    a bit with a classmate  
    (.)  
418 P ok  
    (.)  
420 S because eh  
    (0.52)  
422 yeah we also eh kind of eh needed things  
    for in hair, I also do hairstyling, so we  
    also needed things to put in hair and then  
    I went home
```

Figure 2: Example of the transcription (translated from Dutch) of one stimulus for deception demonstrating the “tell all” approach. The officer asks a question (line 410) a response is immediately provided by the suspect (line 412), the suspect volunteers extended information and repeatedly self-selects (lines 416, 420-422).

suggestions on how personality, emotional state, and interpersonal stance influence turn-taking behaviour in a police interview setting [1,4,6,7,9,10,14,22,23,24]. However, these studies included turn-taking as one aspect within overall suspect behaviour and where not directed at the development of a model for turn-taking behaviour of a suspect. In this study we investigate if the factors influencing turn-taking according to the literature hold for a suspect in Dutch police interviews. We investigate whether variations in turn-taking behaviour lead to differences in the perception of the suspect. The first results will be presented at the Chi Sparks conference.

We expect the results of the study to contribute to the understanding of underlying factors influencing the (unconscious) choices a suspect makes if and when to speak. This understanding of underlying factors is needed to create an embodied conversational agent capable of mimicking human-like turn-taking behaviour which will support a more natural conversation between a human and an ECA. It can show its internal state by showing the appropriate turn-taking behaviour. For example, a virtual suspect in a dominant stance will display behaviour such as interrupts or when the agent has a deceptive stance it will take shorter turns and longer pauses in storytelling. See for an example of this type of agent [21]. The current study will try to determine what appropriate turn-taking behaviour is given the internal state of the agent that it tries to convey.

A potential limitation of our study is the usage of auditory-only stimuli. This removes the interference of non-verbal behaviour. However, non-verbal behaviour is undoubtedly important for the perception of an agent and will be available in the intended game environment. Studies on the perception of ECAs that incorporate verbal and non-verbal agent behaviour are required in the police domain. Also, all stimuli are short extracts (between 25 and 40 sec). However, longer extracts might be necessary for observers to form a consistent perception of the speakers. To the best of our knowledge, no research is done to investigate the relation between vocal stimuli length and perception agreement. In [2] we saw that inter-annotator agreement was low for short fragments, but we showed that global patterns become evident over longer periods.

By investigating the influence of turn-taking behaviour on the perception of a virtual suspect in police interview we aim to support the development of a virtual suspect for use in a social skill training serious game for police officers. By assessing the influence of turn-taking behaviour on the perception we gather knowledge about the extent of importance to model turn-taking behaviour and the appropriate behaviour given a desired interpersonal stance.

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