# Exploring the Role of Laughter in Multiparty Conversation

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We report ongoing work on laughter in task-based and social multiparty human conversation, outlining work to date on laughter around topic change, annotation procedures developed and current and future work on laughter in relation to topic change, multimodality, and biosignals.

## 1 Introduction

Conversation is widely studied through corpus analysis, often concentrating on 'task-based' interactions such as information gap activities (map-tasks [1], spot the difference [2], ranking items [3]) and real or staged business meetings [4], [5]. This task-based dialogue (on which spoken dialogue technology is based [6]) relies heavily on verbal information exchange. However, the immediate task in natural conversation is often not so clear and the purpose of some interaction may be best described as social bonding.

Laughter is universally observed in human interaction. It is multimodal: a stereotyped exhalation from the mouth in conjunction with rhythmic head and body movement [7]. It is part of the gesture call system, older than language [8], predominantly social rather than solo, and aiding social bonding [9]. It punctuates speech [10], and manifests in a range of forms [11]. We investigate laughter *in situ*, using corpora of non-scripted (spontaneous) multiparty interaction: the task-oriented AMI meetings corpus [5], and the conversational TableTalk [12], d64 [13], and DANS corpora. We address laughter and topic change, multimodal aspects of laughter, and the interplay of laughter and bio-signals.

In earlier work on topic change in AMI and TableTalk we found that laughter, and especially shared laughter, is likely near topic change in both corpora, with a stronger effect in TableTalk, and that the number of people laughing together grows with proximity to topic change in TableTalk [14], [15]. These results on multiparty interaction reflect the literature on laughter in two-party dialogue [16], [17], which points towards discourse functions for laughter as a topic termination mechanism. To investigate whether these findings reflect a general phenomenon we extend this temporal analysis to the DANS Corpus. We speculate that laughter may function as a strategy to instigate a topic change, or as a marker of topic exhaustion providing a buffer against an embarrassing silence. We are examining laughter in terms of speaker role (who speaks/laughs first and last, etc.) and turn-taking activity to better understand its function. Our work on multimodality investigates the perception of audio and visual laughter cues by naïve annotators, to investigate whether they can reliably spot unimodally. We are also exploring the interplay of laughter and electro-dermal activity (EDA), linked to levels of emotional arousal [18] and to cognitive load [19]. Social chat has been linked to implicit processing, which is reported to involve lower cognitive load [20], while laughter has been observed to be more frequent in social than in task-based dialogue [21].

## 2 Annotation of Corpora

The AMI and TableTalk corpora have been annotated previously for laughter. The use of existing annotations is attractive, but some of the annotations exhibited problems outlined in the literature [22], [23], including mixtures of point and interval annotation, laughter annotated on the transcription tier at insufficient granularity – e.g. segmented only to the utterance level rather than to word level, and no method for dealing with laughter when it co-occurs with speech. To address these problems we created a new annotation scheme using Elan [24] with separate laugh tracks for each speaker which we used to re-annotate the TableTalk laughter, using MUMIN [25]. We also noted that some laughs were not sounded, or too quiet to be picked up by microphone. To explore this 'silent' laughter, we expanded our annotation scheme adding two unimodal laughter tiers. In this scheme audio and video laughter is annotated separately - for the video only ('silent') passes, annotators mark laughter intervals on silent video, while the audio only version is created by annotators marking

sound recordings of the data. A third annotation is made using both audio and video.

## 3 DANS Corpus Study

The DANS corpus comprises three sessions of informal English conversation among five participants: two women and three men, four native English speakers and one near-native speaker. The sessions were recorded in a living-room like setting with participants free to speak about any topic. Between two and four participants were on screen at any time. The corpus includes video, audio, and EDA measurements from wrist worn Q-sensors [24]. Laughter annotation was performed as described above. The corpus was also segmented into and turns, topics on the basis of content, and annotated for pauses, gaps, and backchannels. Below we describe preliminary results of our analysis of topic transition relevance and multimodality of laughter in a one-hour section three-party conversation.

## 4 Results of DANS Corpus study

In the annotations of the three-party one-hour segment of DANS there were 241 laughs of which 49 were solo, with the remaining 192 individual laughs making up 96 shared laughs. There was shared laughter in 92% of topics. The distance from the topic change to the last shared laugh ranged from 10.2 to 0 seconds with 81% of topic changes occurring within 5 seconds of shared laughter.

**Table 1 Video (V) and Audio (A) annotation agreement by Participant (P)**

| P | A and V (%) | A not V (%) | V not A (%) | Agree |
|---|---|---|---|---|
| **1** | 66(73%) | 14 (21%) | 11 (16%) | 89% |
| **2** | 51(54%) | 2 (2%) | 40 (43%) | 94% |
| **3** | 59(83%) | 1 (1%) | 11 (16%) | 93% |

We compared silent and sounded laughter annotations in categorical terms; looking at raters' agreement on the incidence rather than the duration of laughter. Table 1 shows the per-speaker (P) results of the laughter annotations. The final column shows the level of annotation by speaker.
We found that most cases where annotations were made on video audio (V not A) involve a combination of head tilting (pitch) and a wide or toothy grin (particularly in Speaker 2). In annotations on the audio but not video (A not V), most involve laughter co-occurring with speech (in Speaker1) with a much smaller number of cases where the annotation was of a short phrase initial or final laugh or snort.

## 5 Discussion and Conclusions

The results of the topic transition analysis on a section of the DANS corpus are consistent with those obtained in our earlier analysis of AMI and Tabletalk, with a marked preponderance of shared laughter in multiparty social dialogue; this is also in line with reports in the literature on the social nature of laughter. The strong likelihood of laughter before topic change points found in our analysis of DANS echoes the results of our work on TableTalk and AMI, adding further evidence to our claim that laughter is prevalent preceding topic change in social talk. Once completed, our current analysis of participant role around topic change in terms of speaking and laughing will be used to further illuminate the role of laughter around topic change.
The results on multimodality indicate that careful annotation on the audio channel picks up most stereotypical sounded laughter. Humans watching silent video pick up the vast bulk of audio laughter, but can also identify head nods accompanied by a wide grin as laughter. Automatic identification of laughter on the audio stream is possible for stereotypical laughter [27] but requires clean near field audio signals - a limitation for real-world use. Identification on video data is an attractive idea. From our preliminary studies, it appears that humans can identify the incidence of laughter on video alone with high recall but that precision may be an issue. The audio results suggest that a clear distinction needs to be made in our scheme between laughter alone and laughter co-occurring with speech
We have noted the need to re-annotate, and then expand our annotation scheme in view of observations during manual annotation. While data annotation is time-consuming and labour-intensive work, it is invaluable for a fuller understanding of the dynamics of human interaction. Indeed, close examination of data has revealed subtleties that may have been missed had we simply used pre-existing annotations. We have explored laughter in relation to topic change in three different corpora, and have begun to investigate whether laughter can be identified from video or audio alone; a question highly pertinent to social signal processing.

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