

Measuring Personality Adaptation in Task-Oriented Dialogs

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1 Introduction

Decades of research on human communication provides substantial evidence that human conversants in dialogue adjust their language to their conversational partner: conversants adapt to particular ways of referring to things (Brennan and Clark, 1996), mimic the partner’s lexical diversity (Coulpland et al., 1988) and entrain to their vocabulary choices (Parent and Eskenazi, 2010). For example, for the question “Do I make a left at Pacific Ave?”, an adaptive response could be “Yes, make a left at Pacific Avenue.”, while a non-adaptive response might change the verb and referring expression: “Yes, turn left at Pacific.”

Conversants also adapt to each other’s personality through gestures (Tolins et al., 2013): in a conversation involving two extraverted speakers, both became more stylistically extraverted over time by increasing gesture expansion and broadness. However, little work has addressed linguistic adaptation in terms of personality. For example, will two extraverted speakers use more words that exhibit extraversion as their dialog progresses (e.g. words of positive emotions: “happy”)? In this paper, we propose a method to calculate adaptation score for a dialog. We apply our method on two task oriented dialog corpora and show that as the dialogs progress, the adaptation score for extraversion related LIWC features (1) displays a distinct trend compared to all LIWC features, and (2) differs between two corpora.

2 Datasets

We measure two task-oriented, direction-giving dialog corpora in our paper:

ArtWalk Corpus (AWC). The ArtWalk Corpus (Liu et al., 2016) contains 48 dialogs each with around 450 turns. Every dialog involves a director on campus, and a follower downtown, communi-

cating by phone. The director provided directions to help the follower find 10 public art such as sculptures, mosaics or murals in downtown. The director had access to Google Earth views of the follower’s route and a map with locations and pictures of art pieces.

Walking Around Corpus (WAC). The Walking Around Corpus (Brennan et al., 2013) contains 36 dialogs each with around 550 turns. Every dialog involves a director navigating a follower using a mobile phone to 18 destinations on a medium-sized campus. Followers carry a cell phone with GPS, and a camera in order to take pictures of the destinations they visit. Directors have access to a digital map marked with followers’ real time location, and target destinations’ photos and labels (e.g. “ship sculpture”).

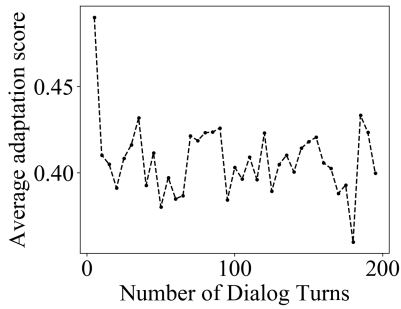
3 Adaptation Measure and Results

Measures on adaptation focus on prime-target pairs: (p, t) . We consider every pair of adjacent utterances in a dialog with different speakers as a pair. In our setting, both Director adapting to Follower and Follower adapting to Director are studied simultaneously. In the following equation, n is the number of prime-target pairs, $FC_i(p \wedge t)$ is the count of features present both in prime p and target t , similarly, $FC_i(p)$ is the count of features present in p . With these, we propose Dialog Adaptation Score (DAS):

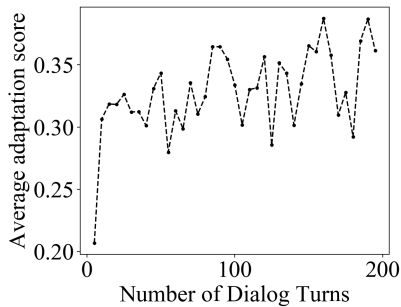
$$DAS = \frac{1}{n} \sum_{i=1}^n \frac{FC_i(p \wedge t)}{FC_i(p)}$$

We aim to capture how “adapted” a dialog is using DAS measure. To explore how DAS changes over the course of the dialog, we divide each dialog into 5-utterance segments, compute DAS for each segment, and take an average of DAS across all the dialogs in the corpus for each segment.

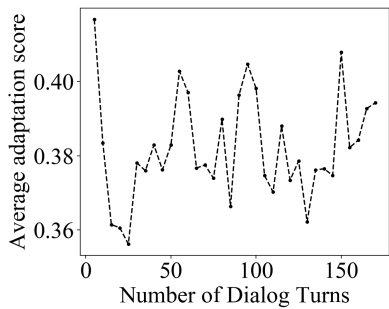
LIWC (Pennebaker et al., 2001) is a text analysis program that counts words in over 80 linguistic



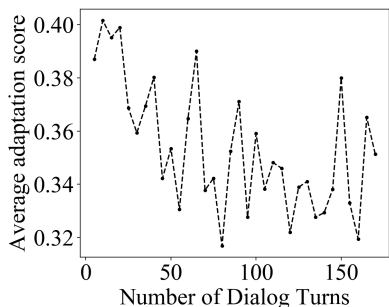
(a) AWC all LIWC features



(b) AWC extraversion LIWC features



(c) WAC all LIWC features



(d) WAC extraversion LIWC features

Figure 1: Plots of average DAS as the dialogs progress, using all LIWC features vs. extraversion LIWC features.

(e.g., pronouns, conjunctions), psychological (e.g., anger, positive emotion), and topical (e.g., leisure, money) categories. In this paper, we focus on the extraversion personality because it’s the most studied personality in previous research. We use LIWC features highly correlated with extraversion, described in [Mairesse et al. \(2007\)](#): Affective Processes, Anger, Assent, Metaphysical Issues, Negative Emotion, Physical States and Functions, Positive Feelings, Positive Emotion, Religion, Swear Words, Articles, Ingestion, Family, Feel, Sexual.

Fig. 1 shows plots of DAS trends as the dialogs progress. For both corpora, average DAS displays different trends between all LIWC features and extraversion LIWC features: for AWC, the former decreases as dialogs progress, while the latter clearly increases, see Fig. 1(a) and 1(b); for WAC, the former does not show an obvious trend, while the latter decreases over time, see Fig. 1(c) and 1(d). Interestingly, average DAS for extraversion LIWC features displays entirely opposite trends between two corpora, see Fig. 1(b) and 1(d). We suspect the reason being the fact that WAC comes from more controlled experiments than AWC: for example, directors were provided names for targets, which could shorten the process of referring expression adaptation in dialogs. From our observation, WAC also contains less “small talk” than AWC, potentially making the corpus more task-focused and less personal.

4 Discussion and Future Work

To measure linguistic adaptation, a lot of methods focus on individual features ([Church, 2000](#); [Stenchikova and Stent, 2007](#); [Danescu-Niculescu-Mizil et al., 2012](#)). This paper proposes Dialog Adaptation Score (DAS) measure, which aims to capture how “adapted” a dialog is. Previous work has also looked into LIWC features together with adaptation, but did not focus on personality ([Danescu-Niculescu-Mizil et al., 2012](#)). This paper shows that as the dialogs progress, the average DAS for extraversion related LIWC features displays a distinct trend compared to all LIWC features, and differs between two task-oriented dialog corpora. For future work, we want to explore personality adaptation trend in dialogs using measures for individual features, such as linguistic coordination ([Danescu-Niculescu-Mizil et al., 2012](#)) and adaptation ratio ([Stenchikova and Stent, 2007](#)).

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