Linguistic Style Improvisation for Lifelike Computer Characters

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Just because you are a character doesn't mean that you have character. (Wolf to Raquel in *Pulp Fiction*, Q. Tarantino)

Abstract

This paper introduces Linguistic Style Improvisation, a theory and algorithms for improvisation of spoken utterances by artificial agents, with applications to interactive story and dialogue systems. We argue that linguistic style is a key aspect of character, and show how speech act representations common in AI can provide abstract representations from which computer characters can improvise. We show that the mechanisms proposed introduce the possibility of socially oriented agents, meet the requirements that lifelike characters be believable, and satisfy particular criteria for improvisation proposed by Hayes-Roth.

1 Introduction

Recent work on interactive drama systems attempts to create virtual environments for learning or entertainment in which humans and lifelike computer characters engage in interesting and emotionally evocative play [Loyall and Bates, 1995, Rich *et al.*, 1994, Maes *et al.*, 1994]. Previous work suggests that the key requirements for these characters include believability, the ability to represent and express emotion, and the ability to respond to human users in an interpretable way. In addition, it is desirable for a character to be able to IMPROVISE on an abstract specification of an act that it intends to perform, either by its own volition or under the direction of another agent [Hayes-Roth and Brownston, 1994, Hayes-Roth *et al.*, 1995]. Here, we argue that linguistic style is a key aspect of character, previously ignored, and present a theory of, and algorithms for, Linguistic Style Improvisation by computer characters.

Linguistic Style Improvisation (henceforth LSI) concerns the choices a speaker makes about the SEMANTIC CONTENT, SYNTACTIC FORM and ACOUSTICAL REALIZATION of their spoken utterances. As an example of how linguistic style can convey character, consider Laszlo's request for two cointreaux in 1, from the *Casablanca* screenplay in Figure 1. In the film, this request is delivered in pleasant tones.

(Laszlo and Ilsa enter Rick's Cafe)
Headwaiter: Yes, M'sieur?
Laszlo: I reserved a table. Victor Laszlo.
Waiter: Yes, M'sieur Laszlo. Right this way.
(Laszlo and Ilsa follow the waiter to a table)
Laszlo: Two cointreaux, please.
Waiter: Yes, M'sieur.
Laszlo: (to Ilsa) I saw no one of Ugarte's description.
Ilsa: Victor, I feel somehow we shouldn't stay here.

Figure 1: Excerpt from the *Casablanca* script.

(1) a. Two cointreaux, please.

We show how it is possible, given an abstract plan-based representation of Laszlo's utterance as a speech act, to automatically improvise any of the alternative stylistic realizations in 2 for requesting two cointreaux:

(2) a. Bring us two cointreaux, right away.
b. You must bring us two cointreaux.
c. We don't have two cointreaux, yet.
d. You wouldn't want to bring us two cointreaux, would you?

Clearly, speakers make such stylistic choices when they realize their communicative intentions, and these stylistic realizations express the speaker's character and personality. Furthermore, listeners draw inferences about the character and the personality of a speaker based on the speaker's choices. According to theories of social interaction a speaker's choice is controlled by social and affective variables [Goffman, 1983, Brown and Levinson, 1987]. For example, the *power* variable can affect Laszlo's choice among the forms in 2; if he believes he is more powerful than the waiter he may say 2a or 2b; but if he believes he is less powerful he may say 2d.

Our work on Linguistic Style Improvisation is most similar to Hayes-Roth's work on directed improvisation [Hayes-Roth and Brownston, 1994, Hayes-Roth *et al.*, 1995]. In her work, directions to computer characters are abstract representations of acts that the characters can improvise on and

*This research was supported in part by Hewlett Packard Laboratories U.K., by the University of Pennsylvania, by Mitsubishi Electric Research Laboratories, by the MIT Media Laboratory, and by ATT Research Laboratories .