# "I like this painting too": when an ECA shares appreciations to engage users

# (Extended Abstract)

Sabrina Campano
Institut Mines-Télécom, Télécom-ParisTech
CNRS-LTCI
Paris, France
sabrina.campano@telecom-paristech.fr

Chloé Clavel
Institut Mines-Télécom, Télécom-ParisTech
CNRS-LTCI
Paris, France
chloe.clavel@telecom-paristech.fr

Catherine Pelachaud
CNRS-LTCI, Télécom-ParisTech
Paris, France
catherine.pelachaud@telecom-paristech.fr

## ABSTRACT

Fostering user engagement is an important process in human-agent interaction. To this end, we present a computational model that endows an Embodied Conversational Agent with the ability to choose when to share appreciations with a user, according to his/her level of engagement.

## Categories and Subject Descriptors

H.1.2 [**Information Systems**]: Models and Principles—*User / Machine Systems*

## Keywords

engagement, talkativeness, emotional stance, appreciation, embodied conversational agent

## 1. INTRODUCTION

While interacting with an agent, a disengaged user may leave the interaction too early, and prevents the agent from completing its task. Building agent models able to increase users engagement can benefit this issue. More specifically, our work is conducted in the framework of a project in which a human-size Embodied Conversational Agent (ECA) is being developed, with the goal to set the ECA as a visitor in a museum. In our work, we adopt a definition of engagement linked to emotional involvement [5] and social *rapport* [3], which is: "the value that a participant in an interaction attributes to the goal of being together with the other participant(s) and of continuing the interaction" [6].

The model presented in this paper focuses on the expression of *appreciations* [4], and more specifically, on appreciations as evaluations of aesthetic properties. We give hereinafter an example of a sharing of appreciations between the ECA and a user. The current topic discussed is the artwork "Balloon Dog" by Jeff Koons.

*agent*: This contemporary artwork was on show at the Château de Versailles. How do you like it?

*user*: Er... I like it.

*agent*: Really, you think that the "Balloon Dog" is nice?

*user*: Absolutely. The contrast with the castle is very funny.

Appreciations are useful to catch user interest, and make him/her speak more [8]. Our goal is to enable an ECA with the ability to share appreciations with a user in a human-agent interaction context. In this paper, we present an adaptive model able to determine when to share appreciations with the user given the current level of user's engagement.

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## 2. MODEL

Our model is implemented in the GRETA architecture [2], that controls the verbal and non verbal behaviours of the ECA. Figure 1 presents the different modules of the general architecture. The main module is the *Dialogue Manager*, that selects and triggers the verbal and non verbal behaviours of the ECA during an interaction with a user. The *Generation Module* was defined in a previous work [1]. It provides an ECA with the ability to express emotional stances by repeating the words of a user (*other-repetitions*) in expressing *appreciations* [4]. In this framework, the dialogue scenario is encoded within a *Hierarchical Task Network Manager* [7]. A HTN is a planification method handling tasks. Each task of the HTN is executed sequentially, and the task plan can be changed during the interaction.

In the current study, we focus on the *User's History*, the *Detection of User's Engagement Module* and the *Decision Module*. Our goal is to increase user's engagement, by triggering *at the right time* an exchange of appreciations between an ECA and a user (*Decision Module*). This exchange is an *appreciation task*, and it is added on the fly in the dialogue plan when the user shows a low level of engagement while interacting with the ECA. The *Detection of User's Engagement Module* focuses on one of the cues of engagement, which is the duration of user's speaking turns. The length of the speaking turns of a user $u$ are recorded in the *User's History* $hist_u = \{turn_0 ... turn_n\}$. Each time after $u$ terminates his/her current speaking turn, the turn length is added at the end of $hist_u$. The engagement level of $u$ is denoted as $LOE_u \in \{low, high\}$.We use two methods to assess user's engagement in real-time. The first method relies on *Pearson's correlation coefficient* and *Student's t-test*. It is able to determine if there is an increase or a decrease of

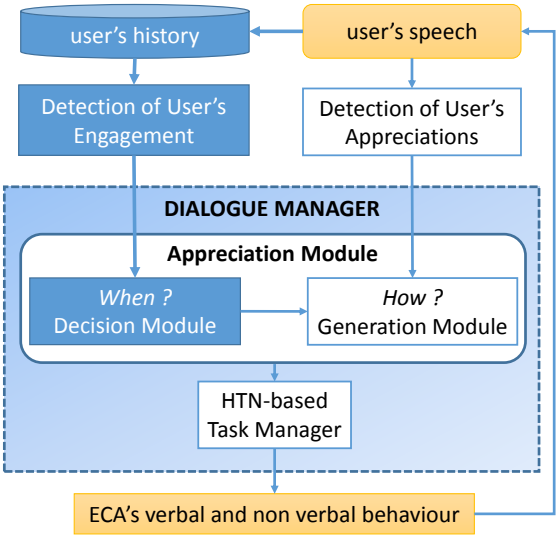


**Figure 1: General architecture of the appreciation module**

user's talkativeness, in taking as input samples from $hist_u$. $LOE_u$ is set to *low* when a decrease is detected. The second method performs a comparison between a threshold $\theta$ set by an expert, and the mean of user $u$'s talkativeness level. The mean is computed on a sample issued from $hist_u$. $LOE_u$ is set to *low* when user's talkativeness level is below $\theta$. These two methods are used independently. The first method is able to automatically adapt to a specific user's profile (propensity to talk), while the second method could be adapted in order to take into account what the ECA just said before, such as a *yes-no question*. During the interaction, the method, chosen at the start of the interaction, is called just after a new user's turn is added to $hist_u$, and $LOE_u$ is set accordingly.

## 3. APPLICATION OF THE MODEL

In this section, we report how the implemented model behaved during several human-agent interaction that took place in our laboratory. Some video fragments can be watched at http://youtu.be/682gkxogPV8. 3 users took part in this demonstration. We simulated a small museum, and we explained to each that he/she will talk with Leonard, a virtual character who is also visiting the museum. Leonard provided some information about different topics, and asked questions to the user. Our model could trigger an appreciation task on the current topic at any moment in the interaction, depending on the level of user's engagement that was computed in real-time. When Leonard expressed an appreciation, it was accompanied by specific non verbal behaviours conveying an emotion (negative, positive, or surprise).

Each of the 3 users had 2 interactions with Leonard. The mean length of the interactions was 06:27 minutes, with an average of 33 speaking turns of 4.75 seconds each. The number of appreciation tasks triggered by our model varied from 3 to 5 for each interaction, depending on user's engagement level. For all these interactions, the model successfully triggered appreciation tasks when user's engagement level, as computed by our model, was estimated to *low*. For example, during the first half of an interaction, appreciation tasks were triggered for each discussion topic because user's engagement was *low*. When user's engagement level changed to $mediumHigh$, during the second half of the interaction, the triggering of appreciation tasks stopped. During another interaction, the user answered with short answers when the discussion was about a painting. As the detected user's engagement level was *low* for this part, the model triggered an appreciation task. During the appreciation task, the user talked more on this topic, and reported that she likes the painting, and that it is an interesting artwork. As a result, user's engagement level changed from *low* to $mediumHigh$.

## 4. CONCLUSION

We presented a computational model that endows an Embodied Conversational Agent with the ability to choose when to share appreciations with a user. It is intended to increase user engagement. The implementation of this model in a dialogue between an ECA and a user in a museum setting showed that the ECA is able to trigger an effective sharing of appreciations with the user, when user engagement is computed as being low. The users expressed appreciations when the ECA asked for their opinion, and commented Leonard's own appreciations. For future work, we plan to conduct an evaluation of the model.

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