Expressing agents personality through ambient modalities

J. P. Sansonnet⋆   Y. Bellik⋆
jps@limsi.fr   bellik@limsi.fr

⋆LIMSI-CNRS BP 133 F-91403 Orsay cedex

Abstract:
In this study, we explore the possibility to express the emotions and personality traits of an ambient assistant agent through the specific output modalities of the ambient environment as an alternative to the modalities provided by an animated graphic character.

Keywords: Ambient modalities, Personality expression.

1 Agents in an ambient room

In previous work, we have implemented Conversational Assistant Agents (CAA) in an ambient environment, namely the IRoom project at LIMSI-CNRS [1]. Presently, two main modalities support the agent/user interactions:
— *Natural language* for control/command and assistance is based on Speech Recognition (SR) and Text to Speech (TTS) output.
— *Personification* is based on the display of animated characters on various screens, as illustrated by the layout, shown in Figure 1.
For the user, the agent is viewed as consubstantial of the 'ambient as a person' (say the *agent-room*), entailing that beyond rational assistance about control/command, the user expects the agent to reveal a psychological behavior. Although, natural language and graphic animation provide a straightforward basis for expressing the psychology of the agent, one can look for **alternative modalities** as a support for it support. Such alternative modalities can be provided by ambient devices listed in Table 1-middle that provide 'atmosphere components' such as described in Table 1-bottom.

2 Agent's personality expression

Research on human psychology has exhibited two main criteria for classifying personality descriptors: first intrinsic features *vs* interpersonal relations and second static traits *vs* dymanic emotional states. Here, we will restrict to **intrinsic descriptors** and consider both the expression of emotional states and trait handling, in the context of ambient output modalities.

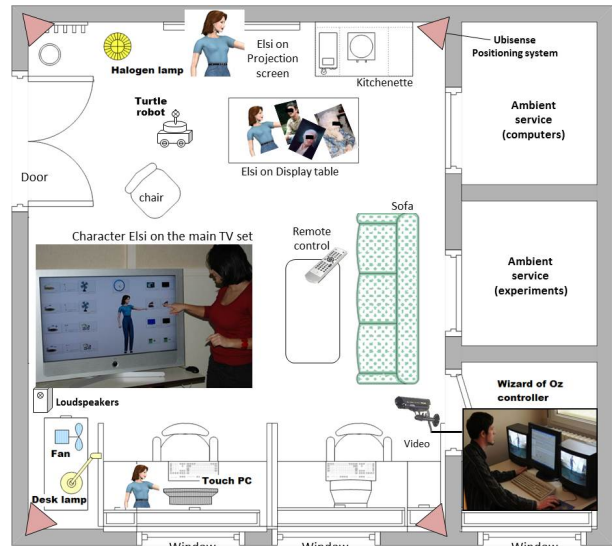**Emotions** Typically, emotional states refer to Paul Ekman's six basic emotions (see Table 2-

Figure 1: Layout of LIMSI IRoom project.

Table 1: Output modalities of the IRoom.

Character display	*also used for information display*
Text to Speech	Agents' oral expression
Screens	TV, mural screen, touch PC *etc.*
Devices	*producing an output effect*
Air control	fan, heater, cooler*, scent dispenser*
Light control	lamps, electric curtains*
Sound control	music loudspeakers, alarms
Static appliances*	coffee-machine, cooker, fridge *etc.*
Robots	autonomous moving machines
Atmosphere	*main components*
Luminance	level, color (hot, cold, red, green. . .) and dynamics (waves, flash)
Music *(backgd)*	level and mood (chill, cheer, sad . . .)
Alarm	level, type and dynamics (bip, honk. . .)
Temperature*	level
Scent*	level and theme (spring, gas, sweat. . .)
Devices	force and specific action

*Not yet implemented.

left) even if other authors, *e.g.* Frijda, have proposed distinct models.

Traits For more than 20 years, research on personality traits [3] focuses on the classification of psychological notions. Presently the prevalent paradigm is the Five Factor Model (FFM) [2], resulting in five large classes of traits called *factors* (also noted in short, O.C.E.A.N.).

Table 2: Expression of emotional states.

Mental states	Luminance	Music	Alarm	Temp.	Scent	Device
None	= neutral	= chill	0	=	0	= unspecific
Joy	+ hot	+ cheer	0	=	+ spring	+ Robot.move
Sadness	- cold	- sad	0	-	0	- Robot.move
Fear	+ red *blink*	0	+ danger *rep*	+	+ gaz	+ Robot.hide
Surprise	+ neutral *flash*	0	+ oops *once*	=	0	0 Robot.stop; Fan.stop
Anger	+ red	+ harsh	+ rap *rep*	+/-	+ sweat	+ Fan.run
Disgust	- Gloomygreen	0	0	-	0	= unspecific

0 is none = is neutral (as set by user) + is higher than neutral or none (- is lower) rep is repetitive.

Expression of emotional states Considering the output modalities of the IRoom, we fill the features (level, theme, type, *etc.*) of the atmosphere components (defined in Table 1-bottom) in order to express Ekman's emotions as illustrated in Table 2. A given emotion can be expressed either in redundant mode (all features of the atmosphere components are activated) or in partial mode (at least one feature is activated). Table 2 reveals two main results: a) any atmosphere component is used, at least three times b) any emotion can rely on several modalities (at least three). This shows that ambient output modalities can support a form of expression for basic emotions. *Note:* that it does not imply that people would actually perceive them.

Expression of personality traits In the R&B architecture [4] we have proposed a framework to express traits in terms of their various influences/alterations over the rational process of an agent achieving a plan. We will just give an illustration of this approach though the example of a common personality adjective like '*lazy*' that can classified in the FFM model as part of the factor **C** (standing for Conscientiousness). The main Wordnet gloss of *lazy* = "*shy of work or exertion*" indicates that a lazy agent is subject to the four following influences on its rational behavior:
1) *Plan modification* to avoid performing a required action, either by providing the user with a rational **Rebuke** or with a less hard to perform **Alternative** action.
2) *Action modality* to perform a required action in a **Partial** manner or in a **Slack** manner.

Table 3 gives the values of the four influences associated with *lazy*. The four actions can be altered by one or more influences; respectively, each influence is activated, at least in two cases. This example shows how one can proceed from personality adjectives to rational process alterations.

3 Further work

There has been a lot of works about expressing emotions through embodied (especially human) characters. The issue raised here was: can emotions be expressed in non-humanlike modalities? If proved it could bring an interesting light for ECA research itself. Moreover, this preliminary proposition is an incentive for building experiments in the IRoom project in order to evaluate the actual perception of the subjects, especially the level of modal redundancy required.

References

[1] Y. Bellik, I. Rebaï, E. Machrouh, Y. Barzaj, C. Jacquet, G. Pruvost, and J. P. Sansonnet. Multimodal interaction within ambient environments: an exploratory study. *In Proc. of INTERACT 2009*, 5727(1):89–92, 2009.

[2] L. R. Goldberg. An alternative "description of personality": The big-five factor structure. *Journal of Personality and Social Psychology*, 59:1216–1229, 1990.

[3] Oliver P. John, Richard W. Robins, and Lawrence A. Pervin, editors. *Handbook of personality*. The Guilford Press, third edition edition, 2008.

[4] Jean Paul Sansonnet and François Bouchet. Joint handling of rational and behavioral reactions in assistant conversational agents. In *European Conference on Artificial Intelligence ECAI'10*, Lisbon, 2010.

Table 3: Influences of *lazy* on four actions.

Actions	Rebuke	Altern.	Partial	Slack
Open curtains	too shiny!	lamp on	yes	yes
Play music	.	.	yes	.
Set timeout	.	post it	.	.
Clean floor	bag full battery low	.	yes	yes