Un modèle affectif pour un recruteur virtuel dans le contexte de simulation d'entretiens d'embauches

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Résumé :
Le nombre de jeunes sans emploi et sans formation augmente en Europe. Ces jeunes manquent souvent de confiance en eux et ne maîtrisent pas les compétences sociales requises pour trouver du travail (le « savoir être » en entretien d'embauche). Le projet TARDIS [1] a pour objectif de réaliser un jeu sérieux de simulation d'entretien d'embauche à la première personne, pour permettre à ces jeunes de pratiquer et d'améliorer leurs compétences.
Dans cet article, nous nous intéressons plus particulièrement au modèle affectif de l'agent virtuel qui joue le rôle du recruteur. Notre objectif est de définir un modèle réaliste dans le cadre d'un entretien d'embauche. Il est composé d'émotions, d'humeur et d'attitudes sociales avec des dynamiques à court terme et à moyen terme afin de créer un recruteur virtuel émotionnellement réaliste. Nous présentons les différentes dimensions considérées et nous montrons ses propriétés sur quelques exemples simples. Ce modèle est actuellement en cours d'intégration dans le moteur de simulation du projet TARDIS.

Mots-clés : Modèle affectif, Émotions, Humeurs, Attitudes sociales, Entretien d'embauche.

Abstract:
The number of young people not in employment, education or training is increasing across Europe. These youngsters often lack self-confidence and the essential social skills needed to seek and secure employment. The TARDIS project aims to build a scenario-based serious-game simulation platform for young people at risk of exclusion to improve their social skills.
This paper presents a model for a socio-emotionally realistic virtual agent in the context of job interview simulations. Our model of affects is composed of emotions, moods, social attitudes and personality in order to create a realistic virtual recruiter.

Keywords: Affective model, Emotions, Moods, Social attitudes, Job interview.

1 Introduction

The number of NEETs [2] is increasing across Europe. According to Eurostat, in march 2012, 5.5 million of European youngster (16 to 25 years old) were unemployed meaning that 22.6% of the youngster global population in European union is unemployed. This unemployment percentage is 10 points superior to the whole population showing that the employment of NEETs is a real problem in Europe.

Current research reveals that NEETs often lack self-confidence and the essential social skills needed to seek and secure employment [3]. To help those young people to access jobs, youth inclusion organisations across Europe provide social coaching programmes, in order to help young people acquire and improve their social competencies, especially in the context of job interviews. The TARDIS project, funded by FP7, aims at building a serious game for NEETs and employment/inclusion organisations which supports social training and coaching in the context of job interviews. Youngsters (aged 18 to 25) will be able to explore, practice and improve their social skills in a diverse range of possible interview situations. Using serious gaming for job interview simulations shows two advantages : 1) repeatable experience can be modulated to suit the individual needs and ; 2) technologies are intrinsically motivating for the young [14] and shall help to remove the many barriers that real-life situations may pose, in particular the stress associated with engaging in unfamiliar interactions with others.

In the TARDIS project, the youngster faces a virtual agent acting as a recruiter. This paper presents an Artificial Intelligence model for such socio-emotionally realistic virtual agents. Our model is used to decide which attitude, emotion and mood should be displayed by the virtual agent, and to control the selection of relevant responses, using an internal representation of the user and the recruiter's mental states.

Indeed, it has been proven that the socio-emotional aspect is one of the key feature that

1. TARDIS stands for Training young Adult's Regulation of emotions and Development of social Interaction Skills. url : www.tardis-project.eu

2. NEET is a government acronym for young people not in employment, education or training.

distinguishes a machine from a believable agent [20]. Based on that, numerous tutor applications based on educational agents have been proposed [9, 18, 19] and this research domain, called *Affective Computing* [21], is still in expansion. One core issue in this domain is to build agents that react in a coherent manner : based on the non-verbal inputs (smiles, emotion expressions, body movements), the agent must select relevant verbal and non-verbal responses. The model presented in this paper tries to consider all the different dimensions of the socio-affective interaction, in the context of the job interview situation.

Many job interviews focus on the personality of the applicant. This has been encouraged by the fact that some personality traits predict job performance [2]. However, in a face to face job interview, the personality of the applicant is inferred by the recruiter according to the mood, the emotions and the social attitudes he expressed [8]. Furthermore, it has been proven that visual and vocal perceptions affect interviewers' judgements during an employment interview [5]. For these reasons, the affective model of the youngster in our work is composed of emotions, moods and social attitudes to evaluate the quality of the applicant performance. In order to have a believable simulation, the virtual recruiter must have a credible way to interact with the applicant. The use of affects in the model of our virtual recruiter allows this credibility.

This paper is organised as follows. Section 2 presents existing cognitive architectures in Affective Computing related to our goal and gives the motivation of our work. Section 3 briefly describes the architecture of the TARDIS affective model and its relation to the other project components. Section 4 detailed the affective model of the virtual recruiter and section 5 shows how theses values evolve over time and influence the agent's behaviour. Section 6 illustrates the model on a job interview scenario. The last section concludes the paper by presenting the project's next stages.

2 State of the art

In [23], a study shows that people who tried to suppress or hide negative emotions during a job interview are considered more competent by evaluators. Thus, emotion regulation is a key element to obtain a job. Emotions expression are regulated by situative norms according to social display rules [6]. Similarly, Tiedens [25] shows that anger and sadness play an important role in the job interview.

Several models have been proposed in the domain of affective computing [3] to build credible virtual human based on cognitive models of emotions [17, 9], personality [22] and social relations [16]. However, to our best knowledge, no computational model of social attitude have been proposed. Social attitudes are the expression of the personality of an agent through its behaviour and its emotional expressions, in the context of social norms. For example, in the context of a job interview, the social attitudes tells the recruiter a lot about the interviewee's personality and feelings about the job. This information will influence the way of leading the interview for the virtual recruiter and might decide for a *yes* or a *no* at the end. In that sense, it raises questions that are being studied in Theory of Mind [13] and reverse appraisal [8].

In our model, we use an emotion appraisal model based on OCC [17]. As will be shown in section 4, we only consider a limited subset of emotions that are relevant in the context of job interviews and that are compatible with the TARDIS emotion recognition system.

Baron showed the importance of the interviewer's mood during the interview and its impact to the applicant [1]. The evaluation of the applicant is also influenced by interviewer's mood. In the TARDIS project, we want learners to be able to detect these change of moods and to adapt their social attitude accordingly. For this reason, we require an accurate model of mood-behaviour influence. Our model for moods is based on the ALMA model [7]. According to [15], emotions are one of the factor that is able to change moods in human.

For the personality of the virtual recruiter, we rely on the big five model [10] that considers 5 quantitative dimensions (Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism) because some links between 5-factors personality and moods have ever been identified by Mehrabian [11].

In the TARDIS project, we require a computational model of social attitudes for the virtual recruiter. This model must encompasses most (if not all) dimensions mentioned above. The next sections present this model.

3. See the Humaine project : `emotion-research.net`

3 Architecture overview

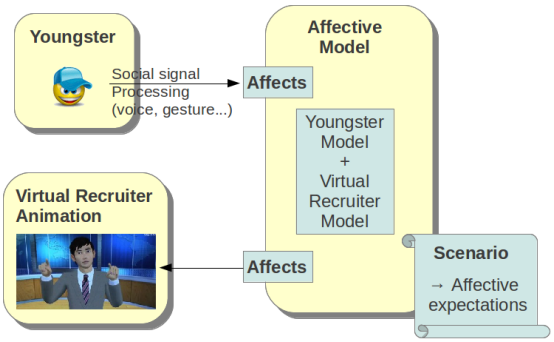

FIGURE 1 – Global architecture

The TARDIS architecture considers four main components :

- The Social Signal Interpretation module provides the affective model with information about the youngster's emotions and social attitude that are detected by the system.
- The Scenario module tells the virtual recruiter the expectation in terms of emotions and attitudes, depending on the interview progress. In the current version of TARDIS, the agent has no understanding of the youngster's actual answers to the questions. It simply follows a predetermined scenario, while focusing on the affective recognition and adaptation.
- The Animation module is responsible for expressing the virtual recruiter's affective state through its behaviour.
- The Affective Model, which is presented in this paper, is responsible for determining the agent's internal state (output) depending on the recognized affects and scenario expectations (inputs).

Figure 1 gives an overview of this architecture.

The Affective Model has two main computation functions :

- It will periodically compute the new affective states for the Virtual Recruited Model, based on the perceptions, expectations from the scenario and current affective states. The differences between expected affective states and expressed affective states from the youngster are the key element in the update of the virtual recruiter affective state (see next section).
- It will select actions in the scenario. This part is not presented in this paper.

4 Virtual recruiter affective Model

Our affective model is based on the youngster detected and expected affects and the internal states of the virtual recruiter. Emotions, moods and social attitudes are defined on $[0, 1]$ interval.

4.1 Youngster detected affects

This module relies on the affective outputs given by the real-time social signal interpretation of the youngster. We focus on three affective categories : emotions, moods and attitudes that will be given with a level of confidence. These detected youngster affects will be denoted as $E_d(emotion)$ for emotions, $A_d(attitude)$ for attitudes and $M_d(mood)$ for moods ("d" stands for *detected*). Table 1 summarize relevant affects in the context of a job interview. Note that emotions, moods and attitudes are organized as positive and negative. This does not necessarily mean that Distress, Anxiety or Agitation are not good in the context of a job interview, but it depends on the context (given by the scenario's expectations).

We note Ev^+ the set of positive affects (joy, focused, etc) and Ev^- the set of negative ones (distress, anxious, etc).

	Positive	Negative
Emotions	Joy	Distress
		Anger
Moods	Relaxed	Anxious
		Exuberant
		Bored
Attitudes	Focused	Inattentive
	Calm	Agitated
		Aggressive

TABLE 1 – Youngster affects

4.2 Youngster expected affects

These states will be given by the scenario context, each question in the scenario is marked with expectations about the impact of the question on youngster emotions and attitudes. As our model rely on the comparison of detected affects and expected affects, expected affects stick to the list given by social signal interpretation (table 1). If this list increases in the future, the new affects will be added in the expected list and will be considered by the scenario. Expected emotions and attitudes will be denoted as

$E_e(emotion)$ and $A_e(attitude)$ with the same set of emotions and attitudes than for the detected affect ("e" stands for *expected*).

4.3 Internal affective model

The internal affective model contains emotions, moods, personality and attitudes of the virtual recruiter. Personality is static and will not evolve during the simulation but it will influence the dynamics of other affects. We model emotions as a short-term timing affect and mood as a middle-term timing affect.

The affects of the virtual recruiter (i.e. felt emotions, attitude and mood) will be denoted as E_f, A_f and M_f ("f" stands for *felt*). The personality of the virtual recruiter is not dynamic and will be denoted as $P_f(personality)$.

	Positive	Negative
Emotions	Joy	Distress
	Relief	Disappointment
	Admiration	Anger
	Hope	Fear
Moods	Relaxed	Hostile
	Exuberant	Bored
		Disdainful
Attitudes	Friendly	Aggressive
	Supportive	
		Dominant
	Attentive	Inattentive
		Gossip

TABLE 2 – Recruiter affects

Moods are affects with medium term evolution. Our model for moods is based on the ALMA model [7].

Attitudes of the recruiter will be determined by its actual moods and personality and will be initialised by its personality. Table 2 summarize relevant emotions, moods and attitudes for the virtual recruiter.

5 Dynamics of the affective core

Our dynamics follow this principle : we compute emotions by comparing youngster detected affects and youngster expected affects. Then, we compute moods on the base of computed virtual recruiter emotions. Finally, considering agent's personality and actual moods, we compute the social attitudes of the virtual recruiter.

5.1 Dynamics of virtual recruiter's emotions

Computation of emotions is based on OCC [17]. In OCC, events of the simulation allow the computation of emotions. Events are perceptions from the virtual agent. In our simulation these events are related to affective expressions of the youngster detected by the virtual recruiter : $E_d(emotion)$, $A_d(attitude)$ and $M_d(mood)$. The perception of events lasts during the full time of the youngster's answer. Lets detail the different computations.

Joy and distress. Following OCC [17], joy is the occurrence of a desirable event. In the current version of our model, we do not consider the semantic context of the interaction in the job interview. For this reason, we simply assumed that youngster's detected positive affects (Ev^+) increase the joy of the recruiter whereas detected negative affects (Ev^-) decrease it.

In order to balance between short-time emotions and mid-term moods, we compare all affects to decide the overall expression of the youngster. Let us denote Δ_d the difference between positive detected affects and negative ones.

$$\Delta_d = \sum_{a \in Ev^+} E_d(a) - \sum_{a \in Ev^-} E_d(a)$$

and let us define $norm$ the normalization function between 0 and 1 :

$$norm(x) = \begin{cases} 1 & \text{if } x > 1 \\ 0 & \text{if } x < 0 \\ x & \text{otherwise} \end{cases}$$

The intensity of joy felt by the recruiter is then defined by :

$$E_f(joy) = norm(\Delta_d)$$

Similarly, the $distress$ is the occurrence of an undesirable event, *i.e.* negative expressed affects by the youngster :

$$E_f(distress) = norm(-\Delta_d)$$

Hope and fear. Following OCC [17], $hope$ is the expectation of a desirable event, and $fear$ corresponds to undesirable events. Similarly to joy and distress, we define Δ_e the difference

between positive expected affects and negative ones :

$$\Delta_e = \sum_{a \in Ev^+} E_e(a) - \sum_{a \in Ev^-} E_e(a)$$

The intensity of $hope$ and $fear$ is then defined by :

$$E_f(hope) = norm(\Delta_e)$$

$$E_f(fear) = norm(-\Delta_e)$$

Disappointment, admiration, relief and anger. $Disappointment$ happens if a desirable event does not occur, *i.e.* when the agent is in a state such that $E_f(hope) > 0$ and the desirable events (detection of positive emotions) do not occur with an intensity as high as expected. Concretely, if $E_f(hope) > 0$:

$$E_f(disap.) = norm(max_{a \in Ev^+}(E_e(a) - E_d(a)))$$

Note that $E_f(disap.) = 0$ when $E_f(hope) = 0$.

Reciprocally, admiration occurs when the detected positive emotions are bigger than expected. Concretely, when $E_f(hope) > 0$:

$$E_f(admir.) = norm(max_{a \in Ev^+}(E_d(a) - E_e(a)))$$

Similarly, relief occurs when undesirable events do not occur with the expected intensity : when $E_f(fear) > 0$,

$$E_f(relief) = norm(max_{a \in Ev^-}(E_e(a) - E_d(a)))$$

Finally, anger is triggered by higly detected undesirable events. However, we also use the current agressivity of the recruiter to increase the intensity of the felt anger (the more the recruiter is agressive, the more it wil get angry). Concretely, when $E_f(fear) > 0$,

$$E_f(anger) = norm\Big((1 + A_f(agress.)) \times$$

$$max_{a \in Ev^-}(E_e(a) - E_d(a))\Big)$$

Based on this emotions (computed through expectations and perceptions of the youngster), the next section presents how we compute the mood of the recruiter.

5.2 Virtual recruiter moods

The computation of moods is based on emotions following the ALMA [7] : the mood is a point in the PAD (Pleasure, Arousal, Dominance) space proposed by Mehrabian [12]. Based on these models, we propose a mapping of OCC emotions into PAD space that will be used to compute virtual recruiter moods.

In the context of a job interview, the recruiter is always in a dominant position considering its status. As a consequence, the D parameter of the PAD space is never negative changing the mapping of emotions and mood as shown in table 3. According to the intensity of the emotion, the arousal can be positive or negative for some emotions and it will trigger different moods. For example, if a joy is intensive (positive arousal), it will lead to an exuberant mood. But, if the joy intensity is weak, the agent will just become relaxed. However, some emotions have always big intensity : anger will always have a positive arousal. In the same way, a disappointment can imply disdainful attitude if the dominance is important and bored attitude for a low dominance.

Emotion	P	A	D	Mood
Joy	+	+/-	+	Exuberant, Relaxed
Distress	-	+/-	0/+	Hostile, Disdainful, Bored
Hope	+	+/-	0	Exuberant, Relaxed
Fear	-	+	0	Hostile
Relief	+	-	+	Relaxed
Disappointment	-	+/-	0/+	Hostile, Disdainful, Bored
Admiration	+	+	0	Exuberant
Anger	-	+	+	Hostile

TABLE 3 – Mapping of emotions into PAD space and corresponding moods

We can notice that, usually, emotions $Admiration$, $Disappointment$, $Distress$, $Fear$ and $Hope$ are associated to a negative dominance. However, as we discussed above, the context of a job interview confers the virtual recruiter a dominant status and we consider that these emotions will tend to a low dominance which is still positive.

As proposed by [7], mood is initialised with the personality of the virtual recruiter. The personality is defined using the OCEAN model and we transform this into affective values and then into a point in the PAD space following the proposition of [16]. Then, all along the simulation, felt

emotions modify the initial agent's mood by attracting the 3D PAD point to the new PAD center of the future mood. The new PAD center is computed according to emotions felt during a certain period thanks to the PAD mapping given in table 3.

In the context of our job interview simulation, the period is determined by the number of cycle question/answer. Each answer slightly influences recruiter's mood. The base for calibration is the following, after 5 cycles of a specific emotion (anger for example), the virtual recruiter will be in the corresponding mood (hostile).

5.3 Virtual recruiter attitudes

[24] has shown relation between attitudes and personality and [26] exhibits some relations between moods and attitudes. Based on that, our computation of attitudes is based on two main parameters : the actual mood of the virtual recruiter (which evolves during the simulation according to new emotions) and the initial personality of the virtual recruiter (which will remain in the same state during the simulation). In order to analyse the mood and personality, we compare them to a threshold θ, which was set to 0.5 in our experiments in the next section.

The intensity of $friendly$ attitude ($A_f(friendly)$) is defined in our model as the combination of the personality trait $agreableness$ (A) and the degree of mood $exuberant$:

If $(P_f(A) > \theta) \vee (M_f(exub.) > \theta)$, then :

$$A_f(friendly) = max(M_f(exub.), P_f(A))$$

The intensity $A_f(aggressive)$ depends on $agreeableness$, $neuroticism$ (N) and the $hostile$ mood :

If $\Big((P_f(A) < \theta) \wedge P_f(N) > \theta\Big) \vee (M_f(hostile) > \theta)$, then :

$$A_f(aggr.) = max(M_f(hostile), P_f(N), 1 - P_f(A))$$

The intensity $A_f(dominant)$ is based on $extraversion$ (E), $neuroticism$ and the $hostile$ mood :

If $\Big((P_f(E) > \theta) \wedge P_f(N) > \theta\Big) \vee (M_f(hostile) > \theta)$, then :

$$A_f(dominant) = max(M_f(hostile), P_f(N), P_f(E))$$

The intensity $A_f(supportive)$ is based on $agreeableness$, $extraversion$ and the $relaxed$ mood of the agent :

If $\Big((P_f(E) > \theta) \wedge P_f(A) > \theta\Big) \vee (M_f(relax) > \theta)$, then :

$$A_f(compr.) = max(M_f(relax), P_f(A), P_f(E))$$

The intensity $A_f(inattentive)$ is based on $conscientiousness$ and the $disdainful$ mood :

If $(P_f(C) < \theta) \vee (M_f(disd.) > \theta)$, then :

$$A_f(inatt.) = max(M_f(disd.), 1 - P_f(C))$$

Similarly, the intensity $A_f(attentive)$ depends on $conscientiousness$ and $relaxed$:

If $(P_f(C) > \theta) \vee (M_f(relax) > \theta)$, then :

$$A_f(att.) = max(M_f(relax), P_f(C))$$

Last, $A_f(gossip)$ is based on $extraversion$ and the $exuberant$ attitude :

If $(P_f(E) > \theta) \vee (M_f(exub.) > \theta)$, then :

$$A_f(gossip) = max(M_f(exub.), P_f(E))$$

The way we compute attitudes follow this principle : an agent can adopt an attitude according to its personality or according to its actual mood. For example, someone who is not aggressive due to his personality can become aggressive if its mood is very hostile. The mood compensate the personality and vice versa.

6 Simulation

This section details a concrete scenario inspired by video of job interview taken with the Tardis users. The scenario is a succession of 6

questions/answers during the job interview for a bus driver position. At the beginning of the interview, the recruiter asks the youngster to talk about himself and his professional career. The youngster has no experience in this domain. Quickly, he seems to be stressed and does not find relevant arguments. The succession of questions/answers is the following :

Q1 - Recruiter : What is the customer looking for when he takes the bus ?
A1 - Youngster : Uncomfortable, doesn't find many relevant arguments.
Q2 - Recruiter : What about the journey ? Could it be long ?
A2 - Youngster : Comfortable, he is flexible about commuting and work hours.
Q3 - Recruiter : How do you see your career in 10 years ?
A3 - Youngster : Little bit more at ease, he expects an evolution in the company but remains vague. He doesn't know enough about career advancement.
Q4 - Recruiter : Do you have plans to evolve in this activity ?
A4 - Youngster : As she ignores the professional perspectives, she simply answers : "Being responsible".
Q5 - Recruiter : Let's consider a practical case, how do you manage a complicated situation ? Find one and explain me your solution.
A5 - Youngster : Has trouble to find relevant arguments. Many hesitations.
Q6 - Recruiter : Can you list your main qualities and drawbacks ?
A6 - Youngster : She whispers, not convincing and uncomfortable.

In this scenario, the youngster is often in difficulty during the interview. He expresses many hesitations and negative affects that we annotate with socio-cognitive specialists. With these data, we want to see if our model can answer in a realistic way to youngster reactions. At the beginning of the simulation, the recruiter is relaxed. Our first simulation consider the youngster affective reactions.

First let's analyse some affective answer of the virtual recruiter : Expected affective answer for question 3 is $[Joy = 0.5, Anxious = 0.8, Agitated = 0.7, Focus = 1]$. Affective answer to question 3 is quite positive : $[Anxious = 0.6, Agitated = 0, Focus = 1, Calm = 0.7]$. The recruiter was expected negative affect (agitated), for this reason, he was feeling fear. Since its fear is not confirmed, he is relieved $[Relief = 0.7]$ but a bit disappointed $[Disappointment = 0.5]$ because he was expecting joy. The emotional answer of the recruiter is coherent with the video expectations.

At each question, every emotion will give new influence to the PAD center according to emotions triggered influencing the recruiter's mood. Figure 2 shows this evolution. In this figure the mood of the recruiter moves between slightly relaxed to slightly exuberant but its level of pleasure depends of the applicant answers. We can see the correlation between good answers and pleasure increase and bad answers and pleasure decrease. Its main attitude during all the interview is attentive.

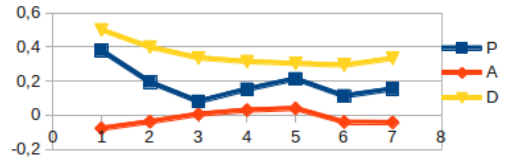

FIGURE 2 – PAD evolution for a relaxed youngster

In order to see another reaction of our virtual recruiter, let's consider the same scenario with an aggressive youngster. Reaction will be different for the recruiter and will lead to the PAD evolution exposed in figure 3. Because of the aggressivity of the youngster, the pleasure decrease more and the intensity of emotions is more important (in particular because of anger emotion). Recruiter's mood will tend to be hostile and as a consequence, its attitude will then become aggressive.

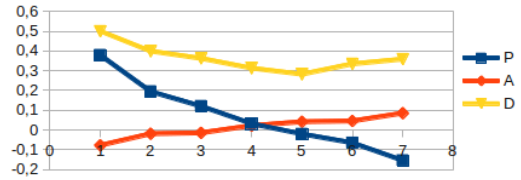

FIGURE 3 – PAD evolution for an aggressive youngster

This example shows that our agent is able to interact in a realistic emotional way in a job interview situation because emotions, moods and attitudes triggered are coherent with socio-cognitive specialists annotations. Next step will be to test this evolution based on Social Signal Interpretation in real time and to follow by evaluation.

7 Conclusion

In this paper, we have presented an affective model for a virtual recruiter in job interview simulations. This model is based on emotions, moods and attitudes in both inputs (recognized affects) and outputs (expressed affects). We illustrated on a scripted example scenario the results of our model and we showed that we could achieve variability in the agent's attitude.

However, our work is still in a preliminary stage. Our first goal is to include this model in the TARDIS platform and to validate it through user experimentations (winter 2013). One core issue that has to be dealt with is the imprecisions and errors in the social signal interpretation. We are currently considering how our model can be extended to consider probabilistic or fuzzy theories.

The next step in our research is to build an affective representation of the interaction from the recruiter's point of view, so that action selection based on virtual recruiter internal affective states and the scenario considers also the strategic intentions and the goals of the virtual recruiter in the decision process. Furthermore, the recruiter shall adapt its vocabulary and its level of politeness according to its social attitudes towards the youngster. Previous work [4] has proven that the language level could be adapted using a simple affective model.

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Références

[1] R A Baron. Interviewer's Moods and Reactions to Job Applicants : The Influence of Affective States on Applied Social Judgments. *Journal of Applied Social Psychology*, 17(10) :911–926, 1987.

[2] M.R. Barrick and M.K. Mount. The big five personality dimensions and job performance : A MetaAnalysis. *Personnel psychology*, 44(1) :1–26, 1991.

[3] John Bynner and Samantha Parsons. Social Exclusion and the Transition from School to Work : The Case of Young People Not in Education, Employment, or Training (NEET). *Journal of Vocational Behavior*, 60(2) :289–309, April 2002.

[4] Sabrina Campano and Nicolas Sabouret. A socio-emotional model of impoliteness for Non-Player Characters. *Affective Computing and Intelligent*, pages 1123–1124, 2009.

[5] Timothy DeGroot and Stephan J Motowidlo. Why visual and vocal interview cues can affect interviewers' judgments and predict job performance. *Journal of Applied Psychology*, 84(6) :986–993, 1999.

[6] P Ekman and W V Friesen. *Unmasking the face : A guide to recognizing emotions from facial clues*. Number 1968. Prentice Hall, 1975.

[7] Patrick Gebhard. ALMA - A Layered Model of Affect. *Artificial Intelligence*, pages 0–7, 2005.

[8] Shlomo Hareli and Ursula Hess. What emotional reactions can tell us about the nature of others : An appraisal perspective on person perception. *Cognition & Emotion*, 24(1) :128–140, 2010.

[9] Stacy Marsella, Jonathan Gratch, and J Rickel. Expressive behaviors for virtual worlds. *Lifelike Characters Tools Affective Functions and Applications*, pages 317–360, 2003.

[10] R. R McCrae and O. P John. An introduction to the five-factor model and its applications. *Journal of Personality*, 60 :175–215, 1992.

[11] Albert Mehrabian. Analysis of the big-five personality factors in terms of the pad temperament model. *Australian Journal of Psychology*, 48(2) :86–92, 1996.

[12] Albert Mehrabian. Pleasure-arousal-dominance : A general framework for describing and measuring individual.. *Current Psychology*, 14(4) :261, 1996.

[13] A N Meltzoff. Understanding the Intentions of Others : Re-Enactment of Intended Acts by 18-Month-Old Children. *Developmental Psychology*, 31(5) :838–850, 1995.

[14] Alice Mitchell and Carol Savill-Smith. The use of computer and video games for learning : A review of the literature, 2004.

[15] Paula P. Morris, William N. ; Schnurr. *Mood : The frame of mind*. New York, NY, USA, springer-v edition, 1989.

[16] Magalie Ochs, Nicolas Sabouret, and Vincent Corruble. Simulation of the Dynamics of Non-Player Characters' Emotions and Social Relations in Games. *IEEE Transactions on Computational Intelligence and AI in Games*, 1 :4 :281–297, 2010.

[17] Andrew Ortony, Gerald L Clore, and Allan Collins. *The Cognitive Structure of Emotions*. Cambridge University Press, July 1988.

[18] A. Paiva, J. Dias, D. Sobral, R. Aylett, P. Sobreperez, S. Woods, C. Zoll, and L. Hall. Caring for agents and agents that care : Building empathic relations with synthetic agents. In *Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems-Volume 1*, pages 194–201, Washington, DC, USA, 2004. IEEE Computer Society.

[19] L Pareto, DL Schwartz, and Lars Svensson. Learning by guiding a teachable agent to play an educational game. *in Education Building Learning*, pages 1–3, 2009.

[20] Lynellen D S Perry. Emotionware. *Crossroads*, 3(1) :5–6, September 1996.

[21] R W Picard. Affective Computing. *Emotion*, TR 221(321) :97–97, 1995.

[22] Helmut Prendinger and Mitsuru Ishizuka. Social role awareness in animated agents. *Proceedings of the fifth international conference on Autonomous agents AGENTS 01*, pages 270–277, 2001.

[23] Monika Sieverding. 'Be Cool !' : Emotional costs of hiding feelings in a job interview. *International Journal of Selection and Assessment*, 17(4), 2009.

[24] Mark Snyder. The influence of individuals on situations : Implications for understanding the links between personality and social behavior. *Journal of Personality*, 51(3) :497–516, 1983.

[25] L Z Tiedens. Anger and advancement versus sadness and subjugation : The effect of negative emotion expressions on social status conferral. *Journal of personality and social psychology*, 80(1) :86—-94, 2001.

[26] Duane T Wegener, Richard E Petty, and David J Klein. Effects of mood on high elaboration attitude change : The mediating role of likelihood judgments. *European Journal of Social Psychology*, 24(1) :25–43, 1994.