The Partial Poker-Face

When Affective Characters Try to Hide Their True Emotions

Christopher Ritter[✉] and Ruth Aylett

Heriot-Watt University, MACS, Edinburgh, Scotland, UK
{cmr4,r.s.aylett}@hw.ac.uk

Abstract. Research on emotional expressive embodiments for simulated affective behavior resulted in impressive systems allowing for characters being perceived as more natural. In consequence we want to explore what happens if these characters gain the human ability to hide their true emotions. More particular we are looking for the change in emotional engagement and the change in perceived naturalism. The Partial Poker-Face will allow virtual characters to recognize and control their own emotional expressive behaviour in order to influence the perception of self by others. While our research assumes applications in virtual storytelling, we are confident that it will be also of value for other areas, like human robot interaction.

1 Introduction

Research on virtual or robotic characters simulating emotions has shown that affective characters are not only more accessible to human inter-actors [1], but also seem to be more appropriate tools [2] for certain learning applications.

At the same time there has been vast research for architectures capable of communicating emotions to human interaction partners. Published work ranges from realistic expressions of basic emotions [3], down to selective gazing behavior [4] and other detailed micro expressions. Goal is to express simulated emotions as naturalistic as possible.

Less attention was paid to the idea that human beings do not always want to express all their emotions. This can be related to cultural influence [8] or due to exceptional situational context. Some examples of such work can be found in [5–7].

We also try hiding our emotions when deceiving others. An example for such a situation is a poker game. The so called Poker-Face is essential for not giving away important information to other players. The opponent might use leaking emotions to reason about the true value of Ones hand by updating his Theory of Mind (ToM) about Ones intentions. In consequence a player also has to learn how to use their own facial expressions in order to manipulate the perception of self by others.

Similarly active deception can happen, when one tries to maintain social harmony or to prevent social conflict from escalating by using Emotional Intelligence [9, 10].

2   The Partial Poker-Face

As indicated in Table 1 the Partial Poker-Face is looking for a gradual blend between the two extremes of a child's face (most current architectures) and the perfect poker-face. The "blending weight" can be imagined as a variable based on a character's Emotional Intelligence (EI) and conscientiousness [11]. A value of 0 prevents the character from ever hiding its emotions implying it has no control about its expressive behaviour. A value of 1 on the other hand would prevent any unconscious leaking of emotions. In between the true emotional expression would always start showing up until the character triggers an expression to replace it. The closer the value is to 1 the less time the true emotional expression would be visible to others.

Table 1. Defining the partial poker-face

Child's face	Partial Poker-Face	Poker-Face
• purely affective emotional expressive behaviour	• Conscious deceiving of emotions possible • Can be noticed through "leaking" emotions!	• True emotions never shown subconsciously! • Can only be revealed by deep reasoning!
What we have!	What we want!	Considered unrealistic!

We defined two scenarios for evaluation. The first scenario features a woman encountering a slightly aggressive man. The man asks for change claiming that he has lost his wallet. This scenario will show if spectators can spot suppressed emotional expressions without prior anticipation and how much leakage is necessary for this to happen. The second scenario shows a graffiti-sprayer nearly getting caught in action. The culprit has good reason to hide his guilt resulting in an obvious case of deception. As a consequence spectators will have clearer anticipations about the characters future behavior. Evaluation is looking for the spectator's emotional engagement, compared to using a "child's face"-approach. We also will evaluate the change in perceived naturalism of the displayed behaviour asking spectators to reason about the expressive behaviour displayed by the character.

3   Proposed Model

The basis of the Partial Poker-Face is the concept of a closed body-mind loop similar to [12] (see also Fig. 1). Being able to reason about own affective expressions allows characters to react to their own subconscious emotions. Further intrinsic events (Fig. 1) allows for perceiving upcoming affective expressions much earlier.

We will adapt simulation based ToM as defined in [13] for our model. Meaningful decision to hide emotions requires the character to have expectations about how the hidden emotion would affect perception of self. Also the character should be able to reason about the possible effect the desired expression will have.

The model further generates a dynamic interplay between affective and cognitive computing. Quick and slow thinking, as defined by Kahneman [14], is expected to
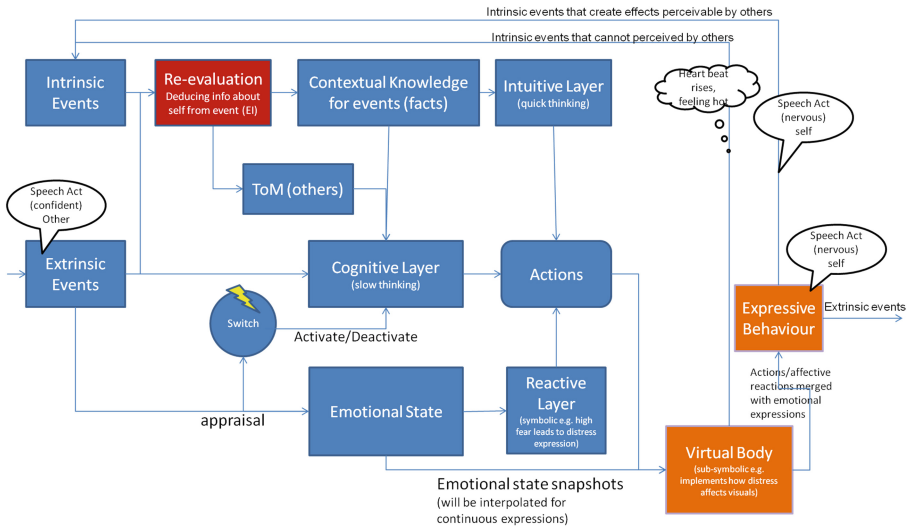
Fig. 1. Proposed model overview

produce more naturalistic behaviour in extreme situations. This introduces two systems of cognitive processes working at different speed and competence. Upon recognising their most intense emotions the characters will thus either use quick thinking (Intuitive Layer in Fig. 1) or slow thinking (Cognitive Layer in Fig. 1), when revealing their true emotions is not an option.

Quick thinking will be modelled as a rule based approach using contextual facts (variables) and common sense (semantic rules). *Quick thinking* only triggers a priori defined intuitive reactions encouraged by certain situations. The rules are created by generalisation and might lead to incomplete conclusions. Applicable situations are

- High cognitive pressure situations (time)
- High emotional arousal situation
- Unclear situation (confusion)

In a less demanding situation the character can try to switch to *slow thinking*. In this mode the character can use their full Cognitive Layer to seek for more appropriate reactions. ToM allows predicting how the altered perception of self changes the emotions of others - assuming everyone will appraise the selected expression the same way as oneself. In EI this skill is called "regulating emotions of others" [10].

Whether the character can utilize only quick thinking or also slow thinking is determined by a switch (Fig. 1). If the character's most intense emotions exceed a threshold, set by its level of emotional awareness, the Cognitive Layer (see Fig. 1) will be deactivated till the emotional arousal has again decayed below the threshold.

To visualize: In the moment our Sprayer is caught he feels both intense surprise and fear. Both emotions will foster quick thinking with their intensity crossing the threshold. Fear makes him show signs of nervousness (both intrinsic and extrinsic events). Intuitively he tries to mitigate the situation by hiding his fear (e.g. look

friendly) waiting for the emotional arousal going back below the threshold. Only then he finally can use ToM in order to figure a smooth way out of the situation.

References

1. Breazeal, C.: Emotion and sociable humanoid robots. Int. J. Hum. Comput. Stud. **59**, 119–155 (2003)
2. Paiva, A., et al.: Learning by feeling: evoking empathy with synthetic characters. Appl. Artif. Intell. **19**(3), 235–266 (2005)
3. de Melo, C.M., Gratch, J.: Expression of emotions using wrinkles, blushing, sweating and tears. In: Ruttkay, Z., Kipp, M., Nijholt, A., Vilhjálmsson, H.H. (eds.) IVA 2009. LNCS, vol. 5773, pp. 188–200. Springer, Heidelberg (2009)
4. Lance, B., Marsella, S.: Glances, glares, and glowering: how should a virtual human express emotion through gaze? Auton. Agent. Multi-Agent Syst. **20**(1), 50–69 (2010)
5. Becker-Asano, C., Wachsmuth, I.: Affective computing with primary and secondary emotions in a virtual human. Auton. Agent. Multi-Agent Syst. **20**(1), 32–49 (2010)
6. Poggi, I., Niewiadomski, R., Pelachaud, C.: Facial deception in humans and ecas. In: Wachsmuth, I., Knoblich, G. (eds.) ZiF Research Group International Workshop. LNCS (LNAI), vol. 4930, pp. 198–221. Springer, Heidelberg (2008)
7. Rehm, M., André, E.: Catch me if you can: exploring lying agents in social settings. In: Proceedings of the Fourth International Joint Conference on Autonomous Agents and Multiagent Systems, pp. 937–944. ACM (2005)
8. Hasada, R.: Some aspects of Japanese cultural ethos embedded in nonverbal communicative behaviour. In: Poyatos, F. (ed.) New Perspectives And Challenges In Literature, Interpretation And The Media, vol. 17, p. 83. John Benjamins, Amsterdam (1997)
9. Van Kleef, G.A.: Emotion in conflict and negotiation: introducing the emotions as social information (EASI) model. In: IACM 2007 Meetings Paper (2007)
10. Salovey, P., Mayer, J.D.: Emotional intelligence. Imagin. Cognit. Pers. **9**(3), 185–211 (1989)
11. Goldberg, L.R.: an alternative description of personality: the big-five factor structure. J. Pers. Soc. Psychol. **59**(6), 1216 (1990)
12. Ribeiro, T., Vala, M., Paiva, A.: Thalamus: closing the mind-body loop in interactive embodied characters. In: Nakano, Y., Neff, M., Paiva, A., Walker, M. (eds.) IVA 2012. LNCS, vol. 7502, pp. 189–195. Springer, Heidelberg (2012)
13. Dias, J., Aylett, R., Paiva, A., Reis, H.: The great deceivers: virtual agents and believable lies. In: Proceedings of CogSci2013, pp. 2189–2194 (2013)
14. Shleifer, A.: Psychologists at the gate: a review of daniel kahneman's thinking, fast and slow. J. Econ. Lit. **50**(4), 1–12 (2012)