Chapter 8

PLAYING THE EMOTION GAME WITH FEELIX

What Can a LEGO Robot Tell Us about Emotion?

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Abstract This chapter reports the motivations and choices underlying the design of Feelix, a simple humanoid LEGO robot that displays different emotions through facial expression in response to physical contact. It concludes by discussing what this simple technology can tell us about emotional expression and interaction.

1. Introduction

It is increasingly acknowledged that social robots and other artifacts interacting with humans must incorporate some capabilities to express and elicit emotions in order to achieve interactions that are natural and believable to the human side of the loop. The complexity with which these emotional capabilities are modeled varies in different projects, depending on the intended purpose and richness of the interactions. Simple models have for example been integrated in affective educational toys for small children [7], or in robots performing a particular task in very specific contexts [11]. Sophisticated robots designed to entertain socially rich relationships with humans [1] incorporate more complex and expressive models. Finally, other projects such as [10] have focused on the study of emotional expression for the sole purpose of social interaction; this was also our purpose in building Feelix1. We approached this issue from a “minimalist” perspective, using a small set of features that would make emotional expression and interaction believable and at the same time easily analyzable, and that would allow us to assess to what extent we could rely on the tendency humans have to anthropomorphize in their interactions with objects presenting human-like features [8].

Previous work by Jakob Fredslund on Elektra2, the predecessor of Feelix, showed that: (a) although people found it very natural to interpret the happy and sad expressions of Elektra’s smiley-like face, more expressions were needed
to engage them in more interesting and long-lasting interactions; and (b) a clear causal pattern for emotion elicitation was necessary for people to attribute intentionality to the robot and to “understand” its displays. We turned to psychology as a source of inspiration for more principled models of emotion to design Feelix. However, we limited our model in two important ways. First, expression (and its recognition) was restricted to the face, excluding other elements that convey important emotion-related information such as speech or body posture. Since we wanted Feelix’s emotions to be clearly recognizable, we opted for a category approach rather than for a componential (dimensional) one, as one of the main criteria used to define emotions as basic is their having distinctive prototypical facial expressions. Second, exploiting the potential that robots offer for physical manipulation—a very primary and natural form of interaction—we restricted interaction with Feelix to tactile stimulation, rather than to other sensory modalities that do not involve physical contact.

What could a very simple robot embodying these ideas tell us about emotional expression and interaction? To answer this question, we performed emotion recognition tests and observed people spontaneously playing with Feelix.

2. Feelix

Due to space limitations, we give below a very general description of the robot and its emotion model, and refer the reader to [3] for technical details.

2.1 The Robot

Feelix is a 70cm-tall “humanoid” robot (Figure 8.1) built from commercial LEGO Mindstorms™ robotic construction kits. Feelix expresses emotions by means of its face. To interact with the robot, people sit or stand in front of it. Since we wanted the interaction to be as natural as possible, the feet seemed the best location for tactile stimulation, as they are protruding and easy to touch; we thus attached a binary touch sensor underneath each foot.

Feelix’s face has four degrees of freedom (DoF) controlled by five motors, and makes different emotional expressions by means of two eyebrows (1 DoF) and two lips (3 DoF). The robot is controlled on-board by two LEGO Mindstorms RCX™ computers3, which communicate via infrared messages.

2.2 Emotion Model

Feelix can display the subset of basic expressions proposed by Ekman in [4], with the exception of disgust—i.e. anger, fear, happiness, sadness, and surprise, plus a neutral face4. Although it is possible to combine two expressions in Feelix’s face, the robot has only been tested using a winner-take-all