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Project Proposal: Emotional Referencing for the Robot Leonardo -

I believe that one of the keys for designing systems that are deeply engaging for humans is to create systems that are themselves deeply engaged with humans. Many current robots and other interactive systems fail to be interesting because it's obvious that we don't matter to them - they see us as just another source of input instead of as thinking, acting, social partners. We can make robots more engaging by making humans important to them and to their understanding of the world. An important first step in this process is to design robots that attend to us and learn from us in some of the same ways that we attend to and learn from each other.

To this end, I propose to build support for emotional referencing into Leonardo, our interactive robot. Emotional referencing is the process by which humans, especially infants, learn an affective response to a novel object or situation by essentially borrowing the affective response of another person. Babies, for example, often learn how to react emotionally to a new object by looking at how their caregiver reacts to that object. Giving Leonardo this ability will create an important channel for emotional communication between the human and the robot. This project fits into a larger, ongoing effort to increase Leonardo's social understanding of objects: where people think they are, what people think they're useful for, how people feel about them, etc.

Adding emotional referencing to Leonardo will require the creation and integration of a number of new technologies that will be incorporated into the robot's existing behavior and motor control system. First, Leonardo will need to be able to perceive which object in the scene the person is attending to. Second, Leonardo will need to be able to measure the person's emotional reaction to the object - for this project, by recognizing their facial expression as one of a small set of emotional poses. Third, Leonardo will need to be able to attach this emotional information to his long-term, persistent model of the object. Finally, Leonardo will need to be able to use this emotional information to bias his interactions with the object. To be truly engaging, the emotional referencing must affect Leonardo's behavior in an important, easily readable way.

These new abilities will build on a large body of existing research by the Robotic Life group, especially research into new vision algorithms for the robot. My efforts for this project will revolve around refining and integrating existing work to build support for emotional referencing, and creating a compelling interaction with the robot involving emotional referencing.