

# SOCIAL ROBOTS, MORAL EMOTIONS

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**Abstract:** The affective revolution in Psychology has produced enough knowledge to implement abilities of emotional recognition and expression in robots. However, the emotional prototypes are still very basic, almost caricaturized ones. If the goal is constructing robots that respond flexibly, in order to fulfill market demands from different countries while respecting the moral values implicit in the social behavior of their inhabitants, then these robots will have to be programmed attending to detailed descriptions of the emotional experiences that are considered relevant in the interaction context in which the robot is going to be put to work (e.g., assisting people with cognitive or motor disabilities). The advantages of this approach are illustrated with an empirical study on contempt, the seventh basic emotion in Ekman's theory, and one of the "rediscovered" moral emotions in Haidt's New Synthesis. A phenomenological analysis of the experience of contempt in 48 Spanish subjects shows the structure and some variations –prejudiced, self-serving, and altruistic– of this emotion. Quantitative information was later obtained with the help of blind coders. Some spontaneous facial expressions that sometimes accompany self-reports are also shown. Finally, some future directions in the Robotics-Psychology intersection are presented (e.g., gender differences in social behavior).

## 1 INTRODUCTION

"Our most ardent emotions are evoked not by landscapes, spiders, roaches, or dessert, but by other people." (Pinker, 1997; p. 396)

Humanoid robots are being constructed with various uses in mind. Evolutionary inspired psychological research, which reverse-engineer emotions, can be very useful to decide what emotions must be programmed in order to reach the relevant goals in different situations. If social robots are to be created, then moral emotions should be simulated, given that each one of these emotions seems to be, among other things, the solution to a social exchange problem from our evolutionary past (Cosmides & Tooby, 2005).

My first proposal is that current psychological theories on morality can help engineers to decide the "proper" emotions for different human-robot interaction situations by taking into account both the evolutionary roots of each emotion and the functionality of that emotion in the current interaction context.

Impressive as they are, abilities of emotional recognition and expression in robots are still very

basic ones. My second proposal is methodological: in order to know the structure of emotional experiences, descriptive phenomenology (also known as heterophenomenology) can be of great help. We can agree in that animation design and robots that are to be marketed in a specific culture or in a particular population stratum must take into account people's particularities. Thus, after deciding what emotions need to be programmed, a detailed description of the experiences and facial expressions of people from the target culture or population stratum in everyday life should be obtained for the selected emotions. This is exactly what descriptive phenomenology is useful for.

## 2 SOCIAL ROBOTS

Social robots are being constructed so that their dispositions or behaviours take the interests, predicted intentions or needs of human beings into account.

According to Salichs et al. (2006), the long-term goal of the most part of research in Robotics is to develop a social robot that can interact with humans

and participate in human society. This type of robot must have effective and natural interfaces with a high level of robot autonomy. There are various robotic platforms that have been built to study human-robot social interaction. Kismet is probably the most popular one (Breazal & Brooks, 2005). Other social robots are RUBI (Fortenberry, Chenu & Movellan, 2004), Felix (Cañamero & Fredslund, 2001), and Maggie (Salichs et al., 2006), to cite just a few.

It is important to note again that social behavior and moral emotions are intrinsically related. Known to the researcher or not, moral values are implicit in many social customs. Obviously, it is not easy for us to perceive how it works in our own culture, given that we are part of it, and so the implementation of capabilities of expression and recognition of the so-called moral emotions in robotic platforms could also help to make explicit some values that are implicit in the social interaction but sometimes remain unseen even for the trained eye.

## 2.1 Human-Robot Interaction

Evolutionary inspired research shows that the human selective sensitivity to features in the human face that convey information on sex, age, emotions, and intentions is applied not only to other human beings or animals, but also to artificial structures, such as cars. (Yes, others do it too!) When people are asked to report the characteristics, emotions, personality traits, and attitudes they attribute to car fronts, automotive features and proportions are found to covary with trait perception in a manner similar to that found with human faces (Windhager et al., 2008). There is a consistent association between certain emotion expressions and the inference of some personality traits that designers had implicitly known and used –e.g., from the expression of contempt, together with some postural gestures, people make the inference of shyness (Arya, Jefferies, Enns & DiPaola, 2006). In animation design and Robotics, this information is useful to create affective production systems.

Cañamero (2005) has reviewed the reasons why it would be convenient to have robots with affective capabilities. A common (and reasonable) assumption in the field is that displaying emotions and recognizing and responding appropriately to the emotional states of humans will make users more prone to accept robots and engage in interactions with them. In fact, expressive facial animation synthesis of human-like characters is already being approached with good results (see, e.g., García-

Rojas et al., 2006).

In the Artificial Intelligence field, researchers have devoted much effort to solving the problem of emotion recognition and expression; psychological and even neuropsychological theories of most of the basic emotions –fear, sadness, surprise, happiness, anger, and disgust– are well known by many, and so I will not insist on them. I would just like to point out that the communicative function of emotions (Darwin, 1872), has been highlighted by Adolphs (2006) as one of the two future trends in the scientific study of emotion. (The other direction has to do with the use of neural and psychophysiological measures.)

Even though the instruments derived from Paul Ekman's theory –such as the JACFEE test (Matsumoto & Ekman, 2004)– have been decisive in the scientific advances in the study of emotional expressions, a methodological change leading to more naturalistic, less caricaturized stimuli, is now required. According to Adolphs (2006), context effects and individual differences will have to be taken into account in future research projects in the Neurosciences, whose current procedures are focused on very simple prototypes. Adolphs's suggestion could be applied to Robotics word for word.

## 2.2 Moral Emotions

“People are selfish, yet morally motivated. Morality is universal, yet culturally variable. Such apparent contradictions are dissolving [...]” (Haidt, 2007; p. 998)

Evolutionary theories inquiring into the origins of morality have focused on the study of reciprocal altruism (Cosmides & Tooby, 2005; Haidt, 2003; Trivers, 1971), a strategy that can be biologically successful only when participants have both the motivation to cooperate and the motivation to avoid or punish cheaters (Trivers, 1971).

Knowledge of the latest theories on the so-called moral emotions is not common among AI researchers. Actually, neither is it among psychologists, given its novelty. Psychological research on morality had traditionally focused on the study of moral reasoning and on two of the moral emotions: guilt and empathy. A simulation of empathy seems to have been the dominant strategy in social robotics. However, in the last few years, increasing attention has been paid to other emotions such as contempt, although the interest in anger and disgust has somewhat obscured the role of contempt. The CAD (Contempt, Anger, Disgust)

hypothesis of Rozin, Lowery, Imada and Haidt (1999), associates an emotion to each one of the violations of community morality. Contempt is the emotional response to the violations of duties associated with some social hierarchy, while anger and disgust are linked to violations of autonomy and purity, respectively.

Actually, in Haidt's New Synthesis, the building blocks of human morality are the emotions, and moral intuition is considered as previous to moral reasoning. Various psychological foundations, each with a separate evolutionary origin, seem to support moral communities constructed by human cultures. Moral reasoning can override moral intuition, but it is usually performed with social goals in mind, i.e., to avoid being the target of gossip.

The study of the moral role of emotions such as contempt, anger and disgust, typically considered as negative, is one of the most novel and promising fields in Psychology (Haidt, 2007).

### 3 ON CONTEMPT CONSIDERED AS ONE OF THE MORAL EMOTIONS

The expression of contempt, characteristically asymmetrical, is the least studied of the basic emotions in Ekman's theory and the most variable one with respect to cultural context (Elfenbein & Ambady, 2002).

Miller (1997) has described the subtle ways in which contempt serves in signalling and maintaining distinctions of rank, which is consistent with the CAD hypothesis. In hierarchical societies, contempt is shown as an assertion of the lack of importance of the other, who would not even deserve a strong feeling such as anger. In more egalitarian societies, however, contempt is felt for those who do not measure up either to social position, or to the self-claimed level of prestige. According to Miller (1997), a common phenomenon in democratic societies is "upward contempt", such as the contempt of students for teachers or daughters for mothers.

From the scientific –not literary, philosophical or legal – point of view, contempt has hardly been investigated. In the context of emotion theories, some authors had considered contempt to be a variant of disgust (Ekman & Friesen, 1975), anger (Lazarus, 1991), or a mixture of these emotions (Plutchik, 1980). Ekman and Friesen (1986)

included contempt in their list of basic emotions, and recent cross-cultural studies indicate that, when a matching procedure is used, contempt is recognized nearly as well as the remaining basic emotions (Rozin, Lowery, Imada, & Haidt, 1999). Thus, it seems that methodological factors were in part responsible for the confusion between disgust and contempt in previous studies.

More corroborating evidence can be found in a recent neuropsychological experiment: disgusted faces elicited greater activation than contemptuous faces in the insula and contemptuous faces elicited greater activation than disgusted faces in the amygdala (Sambataro et al., 2006); the amygdala seems to be especially involved in processing face cues that are socially relevant.

#### 3.1 Meaning and Use

There is no controversy concerning the meaning of the term "contempt" (the Spanish "desprecio", the French "mèpris", or the Italian "disprezzo"). It implies a feeling of superiority over someone who is negatively considered (Izard, 1977; Darwin, 1872, Ekman & Friesen, 1986). For instance, the meaning of the Spanish term has not changed for centuries, as registered in the successive dictionaries of the Spanish Royal Academy.

By using frequency as an indirect indicator of the use of the term "desprecio", it has been found that contempt is an especially salient emotion in Spain, in contrast with other Spanish-speaking countries. In a study carried out on a representative corpus composed of 103,184 basic emotion terms with the objective of deciding the verbal labels for the seven basic emotions in Spanish, a consistently ordered sequence was discovered –fear, sadness, surprise, happiness, anger, contempt and disgust–, both diachronically and synchronically (in Colombia, Cuba, Chile, Mexico, Nicaragua, Peru, Puerto Rico, Spain, USA and Venezuela). Even though consistency was nearly perfect, there was an anomaly: in Spain, the Spanish term for contempt is more frequent than the Spanish term for anger, that is to say, contempt was the fifth and not the sixth term of the ordered sequence, contrary to the rest of the Spanish-speaking countries (Delgado, 2007).

Concerning action tendencies, contempt is a cold emotion (Darwin, 1872; Izard, 1977), which makes it easier for a robot to express it. Contempt does not motivate fight or flight, but promotes cognitive changes so that its object is treated in a less considerate way in future interactions (Oatley & Johnson-Laird, 1996). This is probably why

contempt is usually evaluated as a negative emotion. However, there might well be situations in which people intuitively feel contempt for someone and consider it the morally appropriate answer to a social behavior (or lack of it).

### 3.2 The Experience of Contempt

“It seems to me that this is why, although statistical methods were highly productive in early experiments on animals, they rarely led to good, new ideas about the levels at which only people can think. This is why I want to emphasize the importance of trying to classify the Types of Problems that people recognize [...]” (Minsky, 2006; p. 252)

Descriptive phenomenology is one of the expanding methodological perspectives in Psychology (Giorgi & Giorgi, 2003). The procedure begins with a description of an experience to be understood psychologically which is usually obtained by means of an interview and becomes the raw data of the research. Meaning units are first established and later transformed into psychologically sensitive expressions. Finally, the structure is determined.

Lacking an external and objective measure of emotional experience, the analysis of the patterns of what people say about their feelings and mental representations seems to be the best point of departure. It is well known that self-reports do not reveal causal information, but they are essential for revealing the ontological structure of consciousness (Barrett, Mesquita, Ochsner & Gross, 2007). Even though “qualia” are not themselves causal, they are informative indicators of causal core states; in fact, conscious states are the only indicators we have of any overall core state (Edelman, 2006).

#### 3.2.1 Objective

The objective of this empirical research was to describe the structure and some variations of the experience of contempt by analyzing a corpus of interviews, as well as showing spontaneous facial expressions that sometimes accompany self-reports.

#### 3.2.2 Methodology

Some forty-eight University students in their early twenties volunteered as participants.

Data were saved on a MacBook by means of an iSight webcam oriented to the participant (see in Figure 1 how the screen is oriented to the

interviewer so that she can control the image). To store, edit and analyze the videotaped interviews, Quicktime and iMovie were used.

As to the procedure, participants were interviewed about (a) their general idea of contempt, (b) a typical contempt episode, and (c) a personal episode. Later on, they fulfilled tasks of emotional perception and production whose results are reported elsewhere.

A descriptive phenomenological analysis was then carried out in order to learn the structure of the experience and categorize the answers following a bottom-up, inductive approach. The general idea of contempt was found to be composed of some qualitative elements that could be coded as present or absent and then added up to make a *contempt definition score*.



Figure 1: A simple data-collection instrument.

Both the prototypical and personal episodes were categorized by means of two concurrent category systems each, describing the *objects* and *reasons* of contempt. In order to avoid expectancy bias, results were quantified with the help of two “blind” coders.

#### 3.2.3 Qualitative Results

Contempt was associated to (a) an *avoiding* attitude, (b) a *negative* experience, and (c) a feeling of *superiority*, which is consistent with the psychological literature on the topic, although the avoiding attitude was mentioned more often than expected for a “cold” emotion. In fact, rejection (or some sort of avoiding) was the most mentioned element, followed by the negativity of the experience.

Contrary to descriptions of contempt as an emotion that serves mainly in signalling and maintaining distinctions of rank, superiority was the

least mentioned element.

As to the prototypical episode, subjects often described situations in which a person feels contempt for another who has done something wrong to a third party, i.e., altruistic contempt, although contempt as prejudice was modal. Only three participants told a story in which the motive for contempt is self-serving (e.g., person A feels contempt for person B who has done something wrong to A).

*Exemplar 1: feeling contempt for someone who has bothered the subject.*

*Exemplar 2: feeling contempt for someone who has committed a terrorist act.*

*Exemplar 3: feeling contempt for people of a different race.*

More variability was found for the personal episode. Unexpectedly, many participants began telling a story in which they were the “receiver” of contempt (a fact that could be of clinical significance). This is not semantically wrong, but it is not what was wanted, and thus they were asked to report an experience in which they were the “sender” of contempt.

The phenomenological analysis shows that the structure of the personal contempt experience is mostly associated with situations in which someone has done something wrong to the participant, although situations in which contempt is felt for a person who had done something wrong to a third party or whose characteristics are disliked were also described.

*Exemplar 1: feeling contempt for a friend who has despised me.*

*Exemplar 2: feeling contempt for a person who has done something unfair to a third party.*

*Exemplar 3: feeling contempt for a person because I dislike her clothing style.*

Both the prototypical and personal episodes were categorized by means of two concurrent systems each, describing the *objects* and *reasons* of contempt.

Concerning the object of contempt, the category system divides the domain into three: *intimate, social and abstract*.

As to the reasons for contempt, they are also classified in threes: something that the object *has done to the subject* of contempt, something that the object *has done to a third party*, and something that *the object of contempt is* (race, social role, personal characteristics...). These reasons have been labeled as self-serving, altruistic, and prejudiced,

respectively.

### 3.2.4 Quantitative Results

Two trained observers, blind to the objectives of the study, used the previous systems to code the transcriptions and get frequency data. Inter-observer agreement was 97%.

When asked for their general idea of contempt, participants responded with at least one term related to a negative experience, an avoiding attitude or a feeling of superiority. These elements were coded as present or absent and then added up to make a *contempt definition* score. Table 1 shows the distribution of answers with one, two or three coded elements, as well as the frequency distribution of scores.

It can be seen that rejection or some kind of avoiding attitude was the most mentioned element, doubling in frequency the superiority aspect.

Table 1: Contempt Definition Elements and Score.

Avoiding	Negativity	Superiority	Score	Frequency
1	0	0	1	13
0	1	0	1	8
0	0	1	1	6
1	1	0	2	12
1	0	1	2	5
0	1	1	2	2
1	1	1	3	2

When describing a typical contempt episode, 65% of the subjects narrated events that can be thought of as *prejudiced*, implying the feeling of contempt for something that the other *is* (race, social role, personal characteristics...).

Some 29% told episodes in which a person felt contempt for another who had done something wrong to a third, i.e., *altruistic* contempt. Notice that the 95% confidence interval for this proportion goes from .16 to .42, not including zero.

Table 2 shows that only three participants attributed direct *self-serving* motivations to the subject of contempt.

Abstract referents (a person, someone...) were described by 85% of the sample, and only seven subjects mentioned a contempt object with which the subject had a social (but not intimate) relationship.

Table 2: Typical Contempt Episode: Reason by Object.

	Intimate	Social	Abstract	Total
Self-serving	0	0	3	3
Altruistic	0	0	14	14
Prejudiced	0	7	24	31
Total	0	7	41	48

When describing a personal episode, there was more variability in the narrated events (see Table 3). Two subjects insisted that they had never felt contempt for anyone. Of the remaining forty-six, half described *self-serving* situations in which the objects of contempt were diverse (close friends and loved ones were mentioned five times in this kind of episode).

Table 3: Personal Contempt Episode: Reason by Object.

	Intimate	Social	Abstract	Total
Self-serving	5	8	10	23
Altruistic	1	3	7	11
Prejudiced	0	3	9	12
Total	6	14	26	46

Some twelve subjects (26% of the sample) described episodes that can be coded as *prejudiced*, and eleven, or 24% of the sample, described *altruistic* episodes (the 95% confidence interval for this proportion goes from .12 to .36, not including 0). The object of contempt was abstract in 57% of the episodes, social in 30%, and intimate in 13% of them.

### 3.2.5 Spontaneous Facial Expressions

Some participants showed clear expressions of contempt while narrating their experiences. These expressions are more ecologically valid than the usual, posed ones.

The characteristic asymmetry of contempt, described by Darwin as “a slight uncovering of the canine tooth on one side of the face” (Darwin, 1872; p. 255), and considered by Ekman and Friesen (1986) as a pan-cultural expression of emotion, can be seen in Figure 2.

According to Darwin (1872), another common method of expressing contempt is by slightly turning up the nose, which apparently follows from the turning up of the upper lip. This is the expression showed by the participant in Figure 3.

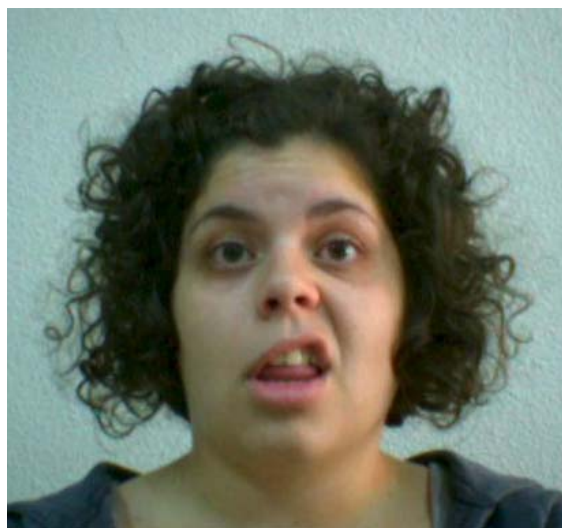


Figure 2: A spontaneous contempt expression.



Figure 3: A spontaneous disgust-as-contempt expression.

Darwing himself indicated that mouth and nose movements such as those in Figure 3, *when strongly pronounced*, express disgust. Current emotion classifications, not taking into account either the intensity or the context of the expression, would label Figure 3 as a disgust expression.

## 4 CONCLUSIONS

The structure of the contempt experience was extracted from the analyses of answers to three open questions. First, when asked for a definition of contempt, participants responded with at least one term related to a negative experience, an avoiding attitude or a feeling of superiority. Rejection or

some kind of avoiding attitude was the most mentioned element, more than expected for a “cold” emotion.

When describing a typical episode, subjects seldom mentioned episodes related to reciprocal altruism. More often, they narrated episodes in which a person felt contempt for another who had done something wrong to a third party, i.e., not a self-serving situation, but an altruistic one. However, experiences reflecting prejudice –feeling contempt for something that the other is– were modal.

Finally, when describing a personal situation, there were mainly *self-serving* episodes that can be related to reciprocal altruism, although both prejudiced and altruistic contempt appeared in similar proportions. It must be noticed that whether the moral role of contempt is salient in subjects’ self-reports (and not only in the theorist’s mind) is an empirical question for which this study has found a positive answer.

These results are in concordance with Haidt’s New Synthesis, in which contempt is the emotional response to the violation of some social duties. According to Haidt (2007) the moral domain of educated Westerners is more focused on principles of no-harm and fairness than it is in the rest of the world. However there are still other psychological foundations of morality; one of them, having to do with intuitions of ingroup-outgroup dynamics and the importance of loyalty, is clearly behind many of the situations that have been described by participants in this study. Moll, de Oliveira-Souza and Zahn (2008) have proposed that truly moral choices lie in doing something “right” (including punishment or avoiding of norm violators) when more immediate selfish motives would tell the agent to do otherwise. There is usually no direct benefit in despising terrorists or feeling contempt for people who mistreat other people, and thus the conception of altruistic contempt seems to be supported by our data.

## 5 FUTURE DIRECTIONS

The next step is to begin new rounds of interviews with other population strata, such as old people. Following the trends in qualitative sampling, using an extreme comparison group would help to falsify (or else corroborate) conclusions on the structure of the experience of contempt.

Pursuing the study of sex-related differences in contempt is another unquestionable fruitful

direction, because morality theorists as well as psychologists have found some such differences in both morality and social communication (e.g., Hall, 2006; Jaffee & Hyde, 2000). Given our evolutionary past, sex-related differences in social cognition have also been predicted (Kimura, 1999; Geary, 2006). Thus, the lack of differences in current studies could be attributed to procedures not taking into account contextual factors (Fischer & Roseman, 2007).

Other variables such as personality type could also be taken into account in future studies. In any case, it has been shown that it is possible to investigate the moral concepts and expressions that characterize a target group by means of a very friendly procedure. This information should be of use to those who wish to market more versatile social robots while respecting the moral values implicit in the customs of the target population.

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