International Journal Of Engineering Research & Management Technology

ISSN: 2348-4039

Email: editor@ijermt.org March 2014 Volume 1, Issue 2 Website: ijermt.org

Robot With Facial Expressions

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Abstract—
This paper explores the process of self learning of facial expression. We discuss how our low cost humanoid design may help to illuminate the computational study of infants to make facial expressions by the use of human-like face of the robot. Today, there has been increasing need for robots to behave more human like and display different emotions and expressions. There have been robots in existence from quite a period of time but there has been dearth in the factor of ease associated with them. It is because till now no such robot has been constructed so that it has human-like face and reproduces human expressions. Yes, so far robots have only been to obey orders mechanically and make things simpler for human being. But, this robot on which the paper focuses on is going to uphold all the advantages so far associated with non human-like robots but in addition to that make a revolution in technology era as well as be a pioneer and frontrunner in all associated robot activities.

I. INTRODUCTION

Today, there has been increasing need for robots to behave more human like and display different emotions and expressions. Will people find a machine with a human appearance or thatinteracts in a human-like manner engaging or frightening? If a face is humanoid, whatlevel of realism is optimal? Different studies have independently shown the impact ofrobot appearance on people's behaviour towards, expectation of, and opinion of robots [1]. Lessons learntfrom the literature indicate that a humanoid appearance can support enjoyable andsuccessful human-robot interaction, however, the degree of human-likeness required for acertain task/context etc. remains unclear.In contrast to various approaches trying to build robots as visual copies of humans, so-called 'android' research[2], or research into designingversatile high-tech humanoid robots with dozens of degrees of freedom in movement andexpression[3], the approach we adopted isthat of a humanoid, but minimally expressive, robot called KASPAR2 [4] that was built in2005[5] and have modified and upgraded since then.Our key aim was to build a robot that is suitable for different human-robot interaction studies and realistic enough to pass for a human, but robot enough to freak us out.

II. ROBOT DESIGN FOR INTERACTION

This section reflects in more detail on issues regarding the appearance of a robot in thecontext of human-robot interaction and how people perceive faces (robotic or human).
Related work on designing socially interactive research platforms will be discussed.
We do not discuss in detail the design of commercially available robots sinceusually little or nothing is made public about the details or rationale of the design. Anexample ofsuch robots is the Wakamaru (Mitsubishi Heavy Industries)
which has been designed to "live with humans"

Figure1. The minimally expressive humanoid robot KASPAR designed for social interactions

The robot's face needs several degrees of freedom to have a variety of differentexpressions, which must be understood by most people. Its sensing modalities shouldallow a person to interact with it using natural communication channels.

III. PERCEPTIONS OF FACE

In this section we discuss some important issues to how people perceive human or robot faces.

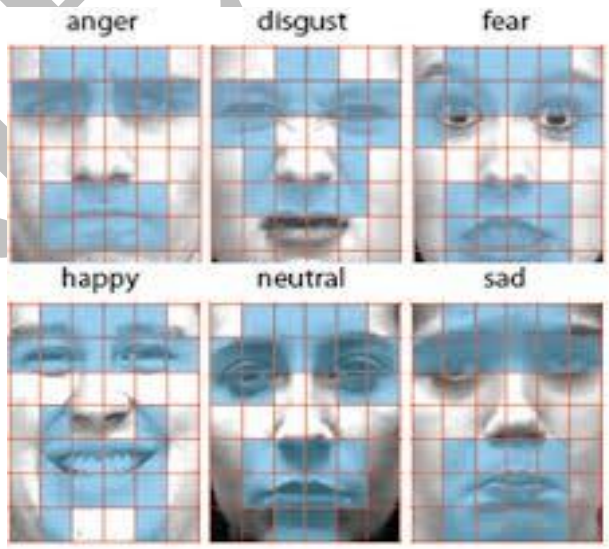

Figure2. The face expressions of human for social interactions

A. Managing Perceptions

DiSalvo (2002) performed a study into how facial features and dimensions affectthe perception of robot heads as human-like [6]. Factors that increased the perceivedhumanness of a robot head were a 'portrait' aspect ratio, the presence of multiple facial features and specifically the presence of nose, mouth and eyelids. Heads with a 'landscape' aspect ratio and minimal features were seenas robotic.

Figure3.Einstein Robot showing disgust,surprise,anger

They suggest that robot head design should balance three considerations:
'human-ness' (for intuitive social interaction), 'robot-ness' (to manage expectations ofthe robot's cognitive abilities) and 'product-ness' (so the human sees the robot as an appliance) as an example of Einstein robot in figure 3 .
To fulfill their design criteria they present sixsuggestions: a robot should have a wide head, features that dominate the face, detailedeyes, four or more features, skin or some kind of covering and an organic, curved form.

B.The Design Space of Faces

Faces help humans to communicate, regulate interaction, display (or betray) ouremotions, elicit protective instincts, attract others and give clues about our health or age.Several studies have been carried out into the attractiveness of human faces, suggestingthat symmetry, youthfulness and skin condition (Jones et al. 2004) are all factors [7].
Human infants seem to have a preference for faces, and it appears that even newborns have a knack for it.
Situated over a horizontal line which is characteristic of two eyes located above a mouthpossess an 'innate' ability to spot basic facial features, such as a pair of round blobs.
It has been debated whether this is due to special face recognition capability or due to sensory-based preferences for general perceptual features such as broad visual cues andproperties of Figures such as symmetry, rounded contours etc. which then, in turn, formthe basis for learning to recognize faces (Johnson & Morton 1991)[8].

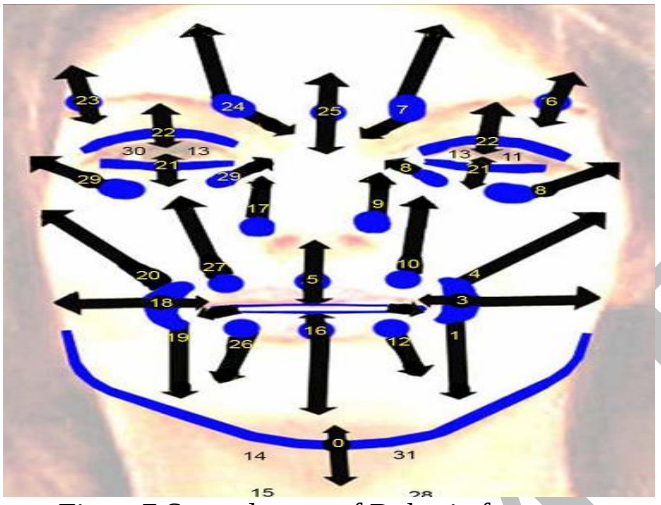

Figure7.Servo layout of Robotic face

IV. Proposed work

Three Layered Structure in figure 5.

1. THE SOLID BASE:

The base of the facial structure is a firm solid material made of fibre or hard plastic. In our case, we are using a dummy face which has been already collected. The lower jaw of the dummy will be cut off to allow place for mounting of motors which will be fitted at the back and room for expressions.

2. THE ELASTIC COVERING OF THE BASE:

Upon the hard base, there will be an elastic covering, which will stretch and give rise to expressions. The servo motors [9] which will be fitted at the back would be connected to this elastic covering with the help of strings and screws. As the servo motors will rotate, depending upon the speed and rotation orientation the elastic will be stretched to produce expressions. Frubber, rubber materials or elastic locally available can be used.

Figure 5.Three layered structure of face

Servo Motors**:**

We will require 10-12 servo motors fitted at the back of the basefor eyes motion in figure 6,7. These motors will be connected to the elastic layer with the help of strings and screws. As the motor rotates it will stretch or relax the elastic giving rise to expressions.

3. SILICA GEL LAYER:

Upon the elastic layer, there will be an enveloping of silica gel to give the ultimate face and to look very appealing.

V. APPLICATIONS/FUTURE SCOPE

We will use our Robot to have the following aspects to be used as in

- For the source of entertainment in malls and public places.
- Helping special students to learn emotions in an interactive way.
- Robot assistive learning in which necessary feedback is given by the robot through emotions and Expressions.
- Making robots human-like and apting human emotions.

Figure. Movement for effective face expressions

VI. CONCLUSIONS

In view of above, it is evident that this facial expression robot is sure to bring a revolution in the robotics arena. The advanced and more sophisticated human-robot interaction in due course will help humans relate with robots to the grassroot. The numerous benefits that will emerge will help the economy and society plunge into an unimaginable level of advancement. From source of entertainment to children, patients to benefiting the business corporates, robotics will emerge as the strongest resource for variety and versatility. The shackles of inconvenience associated with conventional robots will be broken with the emerging of facial expression robot. Yes, however there should be no compromise with the advantages and benefits provided by robots so far but these will be coupled with facial expression to make them highly appealing aesthetically and much more interactable.

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