

Biomedical Engineering Seminar II:
Applications in Psycho-physiology
Suchismita Datta

Psycho-physiology is the branch of physiology dealing with the relationship between physiological processes and thoughts, emotions, and behavior.

Artificial Life: Recent Study was done by Parisi & Schlesinger on Artificial Life. Piaget's Cognitive Theory is a theory used to study patterns of intellectual development in humans. Assumptions taken from this theory:

- To understand phenomena, we must understand their origins
- Intelligent behavior is rooted in biological adaptation
- Intelligence emerges from action and not language

ALNNs (Artificial Life Neural Networks), were developed to simulate living phenomena in a computer. They interact with external environment through their "physical body" (just as humans do). Ideally, they have a circular relationship with the environment; output can modify environment and hence modify subsequent input. Fewer innate fixations in human fetus allows it to be born less mature and hence provides the unparalleled flexibility; human development is profoundly influenced by social interaction and culture. Aiming at similar developmental factors for ALNNs; therefore a similar type of innateness

Humanoid Robots: Traditionally, autonomous robots are used in environments that are inaccessible by humans, thereby requiring minimum contact with them. However, the new range of application domains, like the health field, demand robots interact and co-operate with humans

Humanoid robots are best suited to provide this "sociable interface"

Communication takes place in the form of facial expression, body postures, gestures, gaze direction, and voice

Embodied Conversation Agents combine natural language with an embodied avatar. They Focus on natural, conversational discourse accompanied by gesture, facial expression, etc

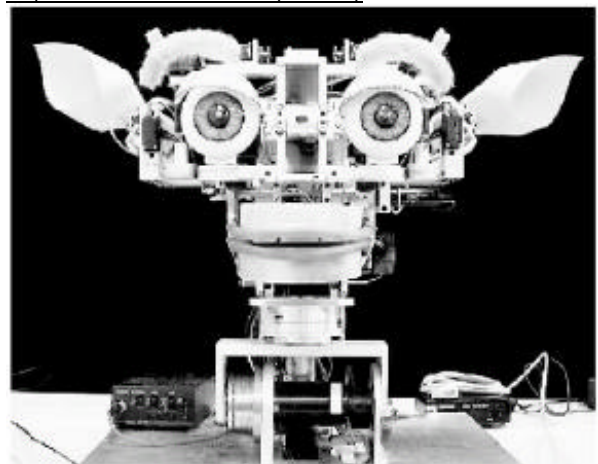
For example, the Rea located at the Media Lab, MIT. It is a Synthetic Real Estate Agent, situated in a virtual world, people can query about buying property, it communicates through speech, intonation, gaze direction, gesture, and facial expression, senses location of people in room, recognizes a few simple gestures

Human Friendly Robots possess ability to safely, space efficiently and easily communicate with humans. Some examples include the MOVAID system, which provides assistance to elderly & disabled, the Sage, a museum tour guide, Aibo a synthetic pet, Sony's robot dog. There are several projects focusing on expressive face robots

Science University of Tokyo has developed most human like face, which represents that of a Japanese woman. It incorporates hair, teeth, silicone skin, and a large number of control points that map the *facial action units* of the human face. Using camera mounted in left eye ball, the robot can recognize and produce a predefined set of emotive facial expressions

Humanoid Robots

Expressive Face Robots (Kismet)



Kismet is inspired by infant social development, psychology, ethology, and evolution; it integrates theories and concepts from these diverse viewpoints

From the robot's perspective, the real world is complex, unpredictable, partially knowable and continually changing. For "them", social and emotive qualities not only provide a feasible interface with humans, but also play a pragmatic role in promoting survival, self maintenance, learning, decision-making, etc. Hence, while designing robots the issue is determining *what kind* of emotions the robots should have.

References:

International Journal of Human- Computer Studies
Journal of Intelligent and Robotic Systems
Trends in Cognitive Sciences