

The Motor Theory – Nathan Gray

Project Outline

CTM Radio Lab 2020

Commission Proposal



Imitation of mouth gestures in new borns.

“...a vocabulary of motor acts, in which the words are represented by populations of neurons.”

– *Mirrors in the Brain-How Our Minds Share Actions and Emotions*, Giacomo Rizzolatti & Corrado Sinigaglia, Oxford University Press, 2006

The Motor Theory

Recent advances in machine and A.I. speech recognition technologies use vastly different strategies to humans in understanding the spoken word. In fact how human understand speech is still largely a mystery.

The Motor Theory is a lecture performance in which a series of simple observations, experiments and hypotheses carefully build to a strange and unexpected conclusion. It expands on the “motor theory of speech recognition” which proposes that humans understand speech not as sounds but as vocal tract gestures. The surprising result of this theory is: that speech recognition is done by the mouth, lips, tongue and throat of the listener in sympathetic resonance with the mouth, lips, tongue and throat of the speaker.

Using research done on mirror neurons in macaques, the findings of 18th Century anatomists Pierre Paul Broca and Carl Wernicke and Aristophanes’ assertion in Plato’s symposia; that every contemporary human is half of an ancient whole the work uses simple audio experiments and demonstrations to illustrate each step in its logic. These experiments include:

- Creating the sensation of being on stage / in the room with me using a styrofoam head and binaural microphones

- Reversing this effect using binaural headphones that record my voice as I hear it, to give the impression that the listener is speaking when I am speaking.
- Using a stethoscope microphone to record the sound of my skull as I speak. Bone induction is the missing ingredient when one hears one's own voice. This is why recordings of one's voice sound different or alien.
- Reconstructing the voice from recordings that consist only of individual sounds (or phonemes) to demonstrate the fallibility of sound as a carrier of spoken meaning
- Playing several recordings of voices at once to demonstrate strong selective attention that makes humans only able to understand one voice at a time. This shows that sound is sorted pre-consciously and directed to a system, specifically for understanding speech, that is capable of only processing one signal at a time.

The work's conclusion blurs the boundaries between listener and speaker characterising speech recognition as a sort of empathic response that creates an inter-subjectivity where control of the voice becomes a shared activity. It proposes conversation as a liminal space where the voice, often associated with identity, becomes a communal organ with which we understand one another.

Radio, Live Performance and Program Themes

The Motor Theory has been researched and developed especially as a live radio work, it uses different microphone and mixing techniques to explore the work's content and make audible ideas around speech recognition in humans. The explanation of its means of production is part of its method and it proceeds as a series of experimental interactions with the listener.

The work is intended for audiences with headphones. Headphones increase the effectiveness of the work's recording techniques. The test recordings were made using simple often home-made recording devices in the artist's studio including a stethoscope microphone and styrofoam binaural dummy head. The budget will be spent in part in consulting an audio engineer and refining recording techniques with professional equipment.

The Motor Theory proposes that speaking and understanding speech are intrinsically connected and the line between speaker and listener are blurred when in conversation. This proposal renegotiates traditional notions of identity and establishes a liminal grey zone around ownership of the voice and the organs of its production.

It uses Aristophanes Speech from Plato's Symposium as an example text, for audio demonstrations but also as a metaphor for humans as composite beings whose bodies are literally joined together.

"...each person's shape was complete: they were round, with their backs and sides forming a circle. They had four hands and the same number of legs, and two absolutely identical faces on a cylindrical neck. They had a single head for their two faces (which were on opposite sides), four ears, two sets of genitals, and every other part of their bodies was how you'd imagine it on the basis of what I've said."

- Aristophanes Speech, *The Symposium*, Plato, Penguin Classics, 2003

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