Title: Choreographic and Somatic Practices Toward the Development of Expressive Robotic Systems (or in the Robotics, Automation, and Dance Lab)

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Abstract: As robotic systems move out of factory work cells into human-facing environments questions of choreography become central to their design, placement, and application. With a human viewer or counterpart present, a system will automatically, necessarily be interpreted within context, style of movement, and form factor by a human being as an animate element of their environment. The interpretation by this human counterpart is critical to the success of the system's integration: ``knobs'' on the system need to make sense to a human counterpart; an artificial agent should have a way of notifying a human counterpart of a change in system state, possibly through motion profiles; and the motion of a human counterpart may have important contextual clues for task completion. Thus, professional choreographers, dance practitioners, and movement analysts are critical to research in robotics. They have design methods for movement that align with human audience perception; they can help identify simplified features of movement that will effectively accomplish human-robot interaction goals; and they have detailed knowledge of the capacity of human movement. This article details practices employed by one research lab and specific impacts on technical and artistic projects within.

Themes we could cover:

- Activities employed in the lab
    - Writing hour
        - Movement observation and description
        - Practice with qualitative tools
    - Movement hour and summer workshops
        - LBMS as a taxonomy for observation, generation, modulation
        - Techniques in choreography for movement design
        - Developing (and interpreting) meaning from movement
            - Defining context and intention
    - Interdisciplinary course development (for both teachers and students)
        - Challenges and benefits
        - Key takeaways and exciting outputs
- Importance of creating a safe space; both sides will be worried about looking dumb
    - Respect for values
        - Respect for qualitative (nontechnical does not make for easy or simple)
        - Respect for quantitative (simplification does not make for linear thinking)
        - Top-down versus bottom-up thinking
    - Respect for boundaries of experience
        - Touching, jumping, vocalizing
        - Algorithm "sees" "decides" or foot "tendus" – must explicate terminology
        - Boundaries created by technical tools (CAD, LaTeX, scapula movement)
    - Respect for time

        - Authorship
        - Compensation
        - Time to interact with and understand the building blocks of tech available
        - Citation of performances, classes, informal practices as output
- The complexity of human movement
    - On dance side, this means being forgiving of oversimplifications that need to happen to extract quantitative models for tech interaction
    - On engineering side, this means being able to listen to how important things we aren't often able to model, like breath, are
- Need for interdisciplinary approach to help design tech that moves (robotics)
    - Accessibility in design process
    - Context, meaning, narrative, arrangement
    - Alignment between human experience of movement and the movement of artificial machines, which may inhabit personal spaces
    - Balancing tradeoffs with respect to fundamental compile times / design loops
        - On engineering side, it may take hours just to complete one design loop
        - On dance side, it may take minutes to throw out a sequence after weeks of working with it
- Design of user studies
    - Expert evaluation of movement (as an academic output that should be recognized with co-authorship)
    - Formulation of context
    - Taxonomy for description (as more powerful than "happy", "sad", etc)
    - Artistic generation of stimuli
    - Priming