Magician Robot Interaction
Can a magician and a robot collaborate on stage to create a believable, evocative performance?

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• What is the affect space for a human-magician performance?
• Can we improve on current robot animation techniques by including computational choreography and aesthetics-influenced motion planning in ways that lead to desired emotional reactions in observed human-robot collaboration?
• What are challenges and opportunities when designing human-robot performances? Can we generate a new class of tools and approaches that facilitate artistic and functional robot programming by non-experts?

We are studying how the quality of robot movement, perceived robot agency, and blended static/dynamic interactivity between a robot and human performer might influence an audience’s emotional state and belief in the validity of a robot character during a performance.

Agency and Believability
Robotic animation techniques for live performance typically rely on backstage human puppeteering or playback of pre-rendered animation sequences. However, these methods are insufficient for high-speed, close human-robot proximity and coordination, especially when the human performer’s position and timing are unpredictable (e.g., rapid passing of objects between human hands and robot grippers). Furthermore, simple playback of animation can detract from the believability of the performance if an audience is not convinced that the robot has agency (i.e., its ability to act on its own).

Static / Dynamic Interaction
We are developing tools that allow us to compose a human-robot performance that blends pre-rendered choreography with key moments of dynamic interactivity to enhance the realism of the character. If the performance successfully mediates the degree to which the robot responds to the human in a pre-defined manner versus behavior that is completely reactive to the dynamic performer, then the audience might still perceive the robot as having complete agency. For example, as the robot is playing back a choreographed series of poses, it might also track the face of the performer to maintain eye contact. By blurring lines in this interaction, the audience might be more willing to believe the robot is animate.

Implementation
For this project, we have built trajectory timeline composition software, a static/dynamic behavior system, a face animation library and pose tree system to transition between expressions, a sympathetic interface to an industrial robot, and custom hardware to achieve magic effects to be used in a live magi-robot performance.