

IN/ACTive:

in-location digital performance

Proposed by :

RAY LC, with Zijing Song

IN/ACTive 未/啟動

INTRODUCTION

In the age of increased virtualization due to public health measures and safety concerns, there's a need for transformation of the public space into a new type of interaction "at a distance." These distanced performances have included motion capture for showing at exhibition venues [8], augmented projection spaces [2], shadow play for joining multiple artists at different locations, and telepresence robotics for expressive movements [3]. These technologies not only allow functional capture of networked performances, but also probe the fundamental connection between humans that lie at the heart of the current wave of digital performance.

While lacking the context, social cues, and nonverbal communication of traditional classic stage performances , the digital performance does have the advantage of embedding artists in the context of their performance locations, for example home studios and in-location situations. For example, dancers of a local ethnic dance can perform in the village live to be streamed to the exhibition venue, and an artist practicing at home can show her craft live to digital audiences. This type of in-location performance strategy can augment the experience of stage performance using in-location livestream that coordinates with the expressive intent of the artist, and can potentially involve multiple separate parties performing together in the same physical venue. However, the affordances and excitement of seeing performances live cannot be taken over by digital at-a-distance strategies.

To support remote performance, recent technology has utilized telepresence robotics to allow both rehearsal and performance to occur remotely [4], however they have yet to fully incorporate this technology into the human performance process. Much of the devices and robotics are mechanical, rigid, and subservient instruments[1], failing to reflect the way technology collaborates with art. In our view, art and technology are natural extensions of each other, as humans and machines collaborate and create with the help of each other in a new context of co-performance in physical and digital. In particular, previous work from our studio invoke the idea that robots have their own point of view and their own language of gestures [7], for example, a lamp that follows the human from far away by tracking its face, but turns away when the human is near,

showing an anthropomorphized and emotional expression of curiosity and shyness [5,6]. We use these emotional expressions of machines in recent work with an industrial robotic arm as well, showing that audiences can change their intended strategy in a game based on how the arm is expressing itself through nonverbal communication during chess game play in an interactive installation (in review, https://raylc.org/chairbots/PowerChess_ARTECH2021_10_New.pdf). In this work we utilized these tried and tested methods for machine interaction to allow co-performance of human and machine in physical and digital space, creating an exhibition-performance beyond the classic stage.

To support a new age of performance that supports both in-person and virtual interactions, we create a new exhibition using previously investigated technologies to bridge the gap between digital space and embodied physical interactions. The human dancer will perform on schedule at her home studio to lighting conditions and music volume that are determined by the exhibit visitor, and her movements are translated to physical presence at the exhibition by an industrial robotic arm that communicates her body movements using its own language of gestures (see figures). The nonverbal interactions absent from current “at a distance” performances are captured by a bidirectional interaction of audiences controlling the instruments of the performer’s home studio, as well as the performer controlling the physical manifestation of her dance at the exhibit via the human-machine interaction in co-creative performance.

Our method of presentation also uses both an exhibit format that encourages interaction and another venue more directly relatable to the watching experience in traditional theatre. As such it addresses digital performance from methodological, sociological, and technological perspectives.

Theme and Focus:

In-location digital performance

Target Audiences:

- a. Those interested in dance performance and its expanded forms
- b. Programmers who have an interest in robotics
- c. Students in media art/ technology / performance
- d. Scholars and students in media archeology, critical theory of society and the digital humanities
- e. Any everyday person who cares about the live performance

Key Personnel:

Project Supervisor, Projector Director and Artist: RAY LC

Dancer and Performer: Koala YIP, Mizuho Kappa

Curator: Zijing SONG

Programmer and Software technologist: Kasin FONG

Implementation:

At the exhibition venue, a Ufactory (Shenzhen) XArm 6 will be installed on top of a plinth. The arm has previously been used for a collaborative project involving robot game play, and will be programmed by our experienced python programming staff. To the right of the robot is a projected digital window previously used at exhibitions at Floating Projects and Osage. The lighting at the exhibition is kept low to allow the 1500 lumen projection to be seen. The digital window shows a view of the performer's home-dance studio, including her instruments, practice schedules, photos, etc, everything that provides a context to the performance. Next to the digital window is a speaker that plays the sound live from the video feed of the dancer-artist, as well as a switch and dial much as you find in your home. The switch turns the light of the performer's studio on and off, while the dial changes the volume of a constantly looping music that plays at the performer's location. The distanced control strategies are used by the HCIX Performance Tech program, a making-centered research and prototyping initiative led by the artist. In short, it uses a browser-IOT control application called RemoteMe coupled to an Arduino controller at the home of the dancer. The lights are then activated via a light dimmer module that converts the voltages. Audiences can turn on and off the lights and music interactively in the dancer's home studio.

At the performer's studio (Koala Yip, Mizuho Kappa), a webcam is installed in front of the performance area to stream the feed live to the exhibition. A kinect camera is also mounted to capture the movement of the dancer. As used previously in the robotic

arm study, the code uses the dancer's digital skeleton captured via computer vision to direct the robotic arm directly via its IP address. In short, the captured head movements of the dancer are translated to hand movements of the robot in space, while the body movements (knee, hip, and torso joints) are translated to the successive joints of the robot arm. Hand movements of the human dictates that amount of top-to-bottom variance in the breathing gesture of the arm, as detailed in the Artech paper. This gives the arm a sense of presence as a real participant in the performance creation process. The arduino controller and light dimmer module also sits in the home studio as responsive to the IOT control by the audience visiting the exhibit. The technical setup in terms of home IOT control is a more succinct version of the work shown by Lauren McCarthy [9]. The dancer's studio is decorated to feel like a home, with natural lighting and props that give personality to the space via environmental storytelling. These instruments include photos of the dancer's life and previous activities, machines and technologies used on a daily basis, musical choices in the playlist looped on the speaker, agenda items on a checklist, arrangement of furniture, etc. The audience should be made to feel at home in a visit to the artist's open studio, where she demonstrates her craft of movement using human-machine collaboration.

At the viewing venue (can also be online), a large screen is setup in an event setting broadcasting the live feed of the interaction at the exhibit. However, instead of showing only the robot and audience interactions, the viewing venue also shows a direct feed from the performer's home, in essence showing both the way the performance is made at the studio in location (screen on the right), and the way human-machine telepresence enables this performance digitally at the exhibit (screen on the left). The viewing venue also serves a traditional venue, much as in stage performances, to allow audiences to grasp the entire interaction at a glance. Technology involves broadcasting the same livestream previously used from both locations. Sitting is arranged in rows around the 20 meters squared area but allowed to be modified informally.

Background:

How long shall we be separated? How else might we break through? IN/ACTive explores the relationship between audiences and performers from distance, exploring how the classical venues for dialog between a seated audience and a staged performer can be transfigured into a physically embodied expression across a digital divide.

The bridge between digital and physical is the form of a life-sized industrial robotic arm, which transmits the dancer's movements in its own language of machine gestures, converting human head movements to robotic hand gestures, and human body to robot arm movements. Note that robotic gestures are designed to have natural human-like smooth expressions using inverse kinematics and neuroscience-inspired motion design, as detailed in a previous collaborative project. The robot arm sits next to a digital window in the form of a projection onto a physical window frame that looks out into the home of the dancer. The dancer is isolated at home during the exhibition performance period, and her lights and speakers at home can be controlled by the audience via a panel that looks like a light switch and dial usually found when entering a home. This panel is placed next to the digital window, serving as an interface to bridge the physical distance between audience and performer. Turning on the light remotely alerts the dancer-artist, who is on standby during the exhibition performance period. She will then perform to the music currently looping if the volume dial on the panel is turned up. Otherwise she'll practice her routine individually. In both cases, the robotic arm uses computer vision in the camera in the dancer-artist's home to capture human movements and translate them to machine movements in the exhibition space, giving audiences a sense of presence in the performance taking place.

The isolated dancer is available during specific times in the exhibition-performance, but otherwise, her daily movements are also translated by the robot into movements whenever she's seen in the room, providing a physical presence to the gallery as the day progresses. The home of the artist-dancer provides clues about her work, her preferences, her habits, and her friendships in the form of photographs, devices, to-do lists, etc, giving the audience a glimpse into not only her dancing, but her goals, desires, and dreams. The space in which the artist-dancer performs is a home studio with a computer, refrigerator, poster, open space flooring, and various papers, photos, and props related to the dancer's practice, providing an environment-based narrative that tells us more about the dancer's life than the classical stage.

IN/ACTive is an exploration of the way technology can bring presence to distanced expressive communication, transforming the classical staged performance with the help of robotics and camera technology to a nuanced, environment-centered narrative and physical expression behind the scenes in an artist's studio.

Studio [<https://recfro.github.io/>] [<https://www.instagram.com/studiofornarrativespaces/>]

Artists [<https://raylc.org/>] [<https://www.scm.cityu.edu.hk/people/yip-choi-fung-koala>]

Figure:

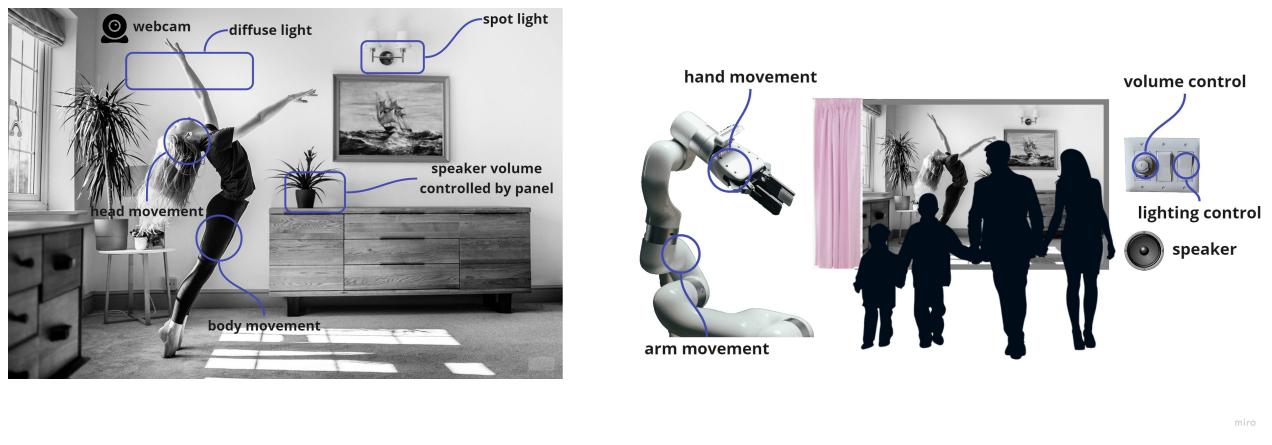


Figure 1. (Left) exhibition-performance space. (Right) home studio of dancer-artist.

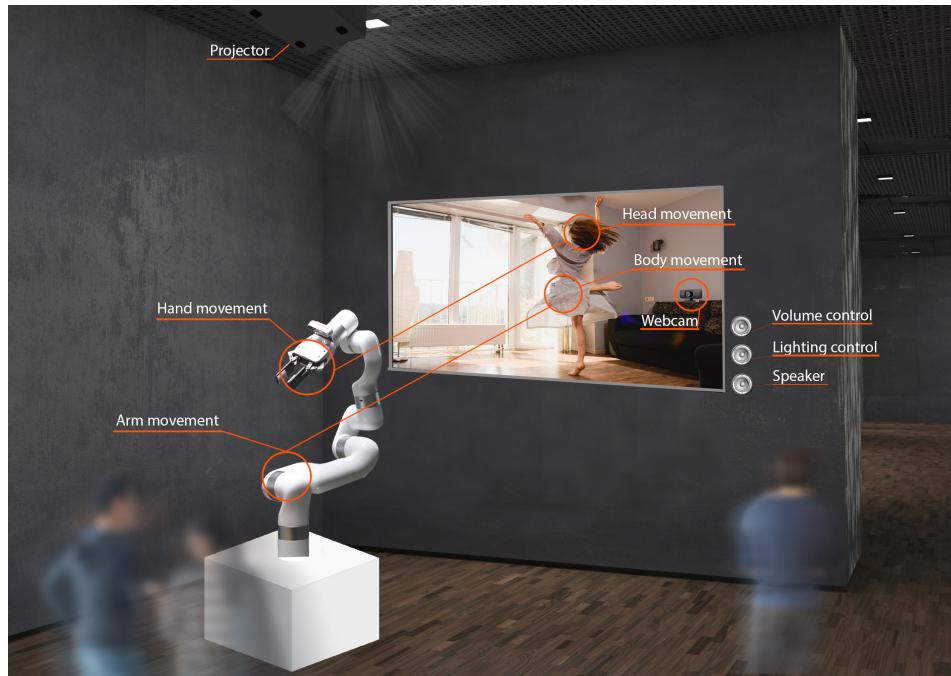


Figure 2 Exhibition-performance space.



Figure 3. Home studio of dancer-artist.

Equipment:

Item	Qty
Projector	1
Web-camera	1
Robot arm	1
Speaker	1
Spot light	1
Podium	1
Curtain	1
Window frame	1

Partnerships:

This work will be exhibited at the innovative and supportive Osage Gallery in Kwun Tong, which provides a space large enough for organic audience interactions. Osage has been in support of our previous robotic arm project and a frequent communicator in regards to different technical aspects of the project, and has also collaborated to show our work this year in regards to machine learning-based art. This exhibit, "I'm Always There," includes three works from the Studio for Narrative Spaces, which is continuing the exploration set

forth in these previous examples in the current project. Given its familiarity with our approach and the spatial capacity to organize our work, Osage forms a perfect partner for further innovative work.

This work will also be viewed at Floating Projects at JCCAC, which will stream the event at Osage and at Koala's home studio in tandem. Floating Project forms a more local experience for those who are observing the event as opposed to interacting with the exhibit and fits in well in the JCCAC milieu. The two different ways of participating in the event allows audiences to participate in the digital performance interaction or to view the performance as a guest, providing both exhibition and more traditional viewing platforms. Floating Project provides an intimate space for such viewings. Its frequent events and collection of youthful and enthusiastic audiences provides a great base for further discussion, as we will have after the discussions. Moreover, Floating Project has been a frequent partner in workshops and exploratory exhibits that are perfect for this form of collaborative viewing experience. It is also more likely to attract general audiences visiting JCCAC, forming a diverse base for public engagement.

Our team is an interdisciplinary collective consisting of dancers (Koala Yip, Mizuho Kappa), curator (Zijing Song), programmer (Kasin Fong), and artist (RAY LC). Together we work to complement each other's skill sets and make the requirements of this exhibit-performance possible. Our experience (see CVs) are both experience based, including numerous international and Hong Kong performances and exhibitions, as well as academically oriented, producing numerous scholarly work in the area of design and interaction. It is hope that we produce a paper from the outcome of this project as well.

Implementation Details:

- The robotic arm technology is detailed at <https://recfro.github.io/power-chess/>, and presented in a technical paper to ACM conference on Artech as a previous collaboration with artist Maurice Benayoun.
- The projection strategy is adapted from work at New York Hall of Science as part of the residency there working with robotics and performance education: <https://raylc.org/machinegaze/>
- The remote control strategy is implemented as part of the HCIX program for digital performance, with details to be published in academic journal in the coming months: <https://mp.weixin.qq.com/s/MjWOB1ToWbqo-zJYhJqS3g>
- The performance collaborations bridging digital and physical have been explored previously at New Museum in New York City: <https://recfreq.wordpress.com/portfolio/the-skin-of-our-sheath/>

Promotion Plans:

Media coverages

In order to engage more audiences, press invitation and release will be distributed to the possible local or oversea press in advance. This project will also seek media partners for free listings, coverage and advertising.

Social media promotion

Artist's on-going research and work-in-progress will be regularly published in STUDIO FOR NARRATIVE SPACES 's IG account as well as official website. Media editor will assist artists on preparing the materials, such as demonstration video, photos, technical drawings and texts.

Publications

Exhibition posters, catalogs and booklets will be distributed in artistic, cultural and educational venues and our cooperative institutions.

Contingency Plans:

- Should internet connections be a temporary issue, we can play the robotic movement animations based on previously programmed dance movements mirrored from working with the dancer. The window will then be shown as the corresponding captured video of the movements in rehearsal along with the robot.
- Should availability become a problem, performance can be timed for 11am and 3pm each day only.
- Should there be electrical failures, LED lighting and portable speakers can be powered by portable battery bank for electrical control from a laptop connected to an Arduino system.
- If there are unforeseen noises in the home studio, we can programmatically lower the exhibit volume.
- For more information, contact Zijing Lillian Song [lilliasong1997@gmail.com] and RAY [LC@raylc.org]

REFERENCES:

- [1] Donna Davis and Shelby Shelby. 2021. The Machine as an Extension of the Body: When Identity, Immersion and Interactive Design Serve as Both Resource and Limitation for the Disabled. *Hum.-Mach. Commun.* 2, (January 2021), 121–135. DOI:<https://doi.org/10.30658/hmc.2.6>
- [2] Hannah J. Ellis. 2021. Intersection Between Digital and Dance: The Digital Environment's Impact on the Arts. Thesis. University of Wyoming. Libraries. Retrieved June 23, 2021 from <https://mountainscholar.org/handle/20.500.11919/7184>
- [3] Oliver Gingrich, Alain Renaud, and Eugenia Emets. 2013. KIMA: a holographic telepresence environment based on cymatic principles. In *ACM SIGGRAPH 2013 Art Gallery* (SIGGRAPH '13), Association for Computing Machinery, New York, NY, USA, 332–343. DOI:<https://doi.org/10.1145/2503649.2503652>
- [4] Tom Gorman, Tiina Syrjä, and Mikko Kanninen. 2019. There is a world elsewhere: rehearsing and training through immersive telepresence. *Theatre Dance Perform. Train.* 10, 2 (May 2019), 208–226. DOI:<https://doi.org/10.1080/19443927.2019.1610491>
- [5] RAY LC. 2019. Secret Lives of Machines. *Proc. IEEE ICRA-X Robot. Art Program* 1 (2019), 23–25.
- [6] RAY LC. 2021. NOW YOU SEE ME, NOW YOU DON'T: revealing personality and narratives from playful interactions with machines being watched. In *Proceedings of the Fifteenth International Conference on Tangible, Embedded, and Embodied Interaction* (TEI '21), Association for Computing Machinery, New York, NY, USA, 1–7. DOI:<https://doi.org/10.1145/3430524.3442448>
- [7] RAY LC, Aaliyah Alcibar, Alejandro Baez, and Stefanie Torossian. 2020. Machine Gaze: Self-Identification Through Play With a computer Vision-Based Projection and Robotics System. *Front. Robot. AI* 7, (2020). DOI:<https://doi.org/10.3389/frobt.2020.580835>
- [8] Wu Zhen and Lian Luan. 2021. Physical World to Virtual Reality – Motion Capture Technology in Dance Creation. *J. Phys. Conf. Ser.* 1828, 1 (February 2021), 012097. DOI:<https://doi.org/10.1088/1742-6596/1828/1/012097>
- [9] SOMEONE — Lauren Lee McCarthy. Retrieved June 30, 2021 from <https://lauren-mccarthy.com/SOMEONE>

Artists and designers want to see beyond the surface, to envision the future that we cannot comprehend from the technologies we do not yet have. To truly look into places that harbor the unknown, the futures that we cannot predict, we have to look inside ourselves, to know what we desire and fear. We have to know ourselves.



Hong Kong-based artist RAY LC's practice creates interactions and environments for building bonds between human beings and between humans and machines, by utilizing the nonverbal communication media of movements, sounds, and cinematic storytelling. He studied computer vision at Cal Berkeley and neuroscience at UCLA, applying these technologies to performance, media art, and fashion at Tokyo, Japan. He holds a PHD from UCLA and an MFA from Parsons School of Design and with an artistic practice based in Hong Kong, serving as Assistant Professor of Creative Media at City University of Hong Kong.

RAY's exhibitions include BankArt, Process Space LMCC, New York Hall of Science, Saari Residence, Elektra Montreal, ArtLab Lahore, Ars Electronica Linz, NeON Digital Arts Festival, New Museum performances, Elektron Tallinn, Floating Projects Hong Kong, JCCAC, Osage Gallery (in 2021). Funding awards include National Science Foundation, Japan Society for the Promotion of Science, Adobe Design Award, Microsoft Imagine Cup, Davis Peace Foundation, CityU SIRG and Teaching Development Grants.

Artist: [<http://raylc.org/>] CityU Studio: [<https://recfro.github.io/>]

羅銳致力於在社區和機器之間建立聯繫，他的實踐從人機互動、新媒體和合作敘事等角度創造互動和環境。他於加利福尼亞大學洛杉磯分校取得神經科學哲學博士以及於帕森設計學院取得設計與科技藝術創作碩士。他目前專注透過以藝術的介入展現空間設計對我們的感知和行為的隱性影響。

重點駐場項目：BankArt (東京), New York Hall of Science (紐約科學館), Saari Residence (薩利進駐), Elektron (塔林)

重點展覽：Elektra (蒙特利爾) , ArtLab (拉合爾), Ars Electronica (林茨) , NeON Digital Arts Festival (霓虹燈數字藝術節), New Museum (新當代藝術博物館), NY Short Documentary Film Festival (紐約短紀錄片電影節), NeurIPS (溫哥華).

Website網頁: <http://raylc.org/> Studio工作室: <https://recfro.github.io/>