Figure Infinity: Human-Assisted AI Performance
Louis McHugh, Jung In Jung, Deniz Johns

Figure Infinity is a performance piece that connects a human per- former in a self-reflexive network of control and communication with artificial intelligence. The Computer Vision and Large Language Model AI agents collaborate to direct a human performer by generating performance direction in sequence. Human participants play the part of creative, yet invisible labour workers to refine the system. Instead of disguising the human factor at the centre of AI systems, we foreground it, and use it as experimental, aleatoric seeds in the performance. We use feedback between human performers and AI Agents, but making it less an active creative participation by the per-former and instead a system of control. The work focuses on themes of accelerated platformisation of labour, algorithmic management and artificial intelligence failure.

Keywords: AI Performance, Feedback Loop, Human-Assisted AI, Failure, Dataworkers, Invisibilised Labour, Platformisation, Algorithmic Management.

Introduction

Figure Infinity is a performance piece that connects a human per- former in a self-reflexive network of control and communication with artificial intelligence. Throughout, Computer Vision[1] and Large Language Model (LLM)[2] AI agents collaborate to direct the "human- in-the-loop"[3] to execute tasks determined to be the next step in the performance sequence. The discontinuity between the discrete nodes of this cybernetic feedback system (Galloway 2021), formed by the human and non-human agents, creates space for playful miscommunication and dynamic absurdity. The work was originally conceived as a response to FestForward magazine[4] developing the themes of accelerated platformisation of labour, algorithmic management and artificial intelligence failure.

Human Labour

Despite the recent furore over AI tools like chatGPT (BBC 2023, Steer 2023) their ability to function is underpinned by "precaritised 'ghost work' to maintain plausibility" (McQuillan 2023). The illusion of a perfectly intelligent automaton is prevalent as it can be seen from the name of Amazon's micropayment-based crowdsourcing platform Amazon Mechanical Turk (mTurk). It was named after the lifelike chess player machine created in the 18th century commissioned by Austrian Empress Maria Theresa (Pew Research Center 2016). The machine was dressed in Turkish costumes and had a human chess player hiding inside (Crawford 2021). Similarly, real workers on mTurk remain invisible, to anonymously serve the idea of magically intelligent AI (Gahntz 2018). mTurk is one example in a trend in out- sourced content tagging where workers

[1] https://ultralytics.com/yolov5
[2] https://ultralytics.com/yolov5
[3] https://humansintheloop.org/what-is-a-human-in-the-loop/
[4] https://www.festforward.org/

are not only invisibilised, but undervalued and whose conditions are under scrutiny (Reese 2016, Perrigo 2023). Even with the marginalisation of the human work- force, human-assisted data labelling remains to be the most efficient way to train AI (Bridle 2018, 160) as can also be seen in the case of Google's use of CAPTCHA to feed its image recognition algorithms (Bloomberg 2020).

In Figure Infinity, the performer plays the part of the precarious "immaterial labour worker" (Terranova 2004, 92), subjected to the algo-managed conditions of the gig economy, invisibilised to all but the system that is controlling them. Further, it is a participatory piece, as we micro-task the audience to tag the actions on stage using their phones. Instead of disguising the human factor at the centre of AI systems, we foreground it, and use it as experimental, aleatoric seeds in the performance.

AI Performance & Feedback

For dance projects like AI_am[5] by Valencia James the AI avatar was used to create improvisation between human dancers and AI. Similarly, in Rhizomatiks Research's Discrete Figures[6] AI dancers are collaborators for the human dancers. Ideally those AIs are there to inspire human dancers to create something new. As Peltarion's project shows in the AI training process for choreography, AI is learning human dance movements and reproducing those movements. Eventually, what makes those results so interesting are the human dancers who intelligently interpreted the movements generated by AI and performed. Perhaps the result is a fulfilling myth; AI-powered human body movement.

In this tradition of cybernetic performance artists, we use feedback between human performers and AI Agents, but making it less an active creative participation by the performer and instead a system of control (Dixon 2007, 146). The body affects a cybernetic feedback loop, with layers of interpretation at each juncture between (human) body agent, vision agent and language agent. Further, we highlight feedback as an "aesthetic of failure" (Cascone 2000), with audio and video feedback used as noise to confuse the AI agents, as well to illustrate the circularity of the cybernetic system to the audience.

Experimentation

The piece is currently a work-in-progress. So far, we have experimented with feeding various resources to the AI agents such as endlessly mirrored live camera feed, keywords generated from the Computer Vision AI, and some texts from Samuel Beckett's novel. The work will be developed further to achieve fine-tuned performance directions that will be more applicable to the human performer and a dramaturgical arc. Our existing implementation of this project uses Ultralytics' yoloV5[7] model[8] for Computer Vision and OpenAI's text-davinci-003[9] as LLM. A camera pointing at the stage

[5] https://valenciajames.com/projects/ai_am/
[6] https://research.rhizomatiks.com/s/works/discrete_figures/en/
[7] https://peltarion.com/use-cases/teaching-ai-to-dance
[8] https://ultralytics.com/yolov5
[9] https://platform.openai.com/docs/models

is fed to the yoloV5 object detection algorithm, which creates a list of objects in the shot. This object list is then used as a seed to prompt our LLM, with prompts fed periodically to create the next step in the performance. Each step is then fed to the performer on stage via a thermal printer (Fig. 1).

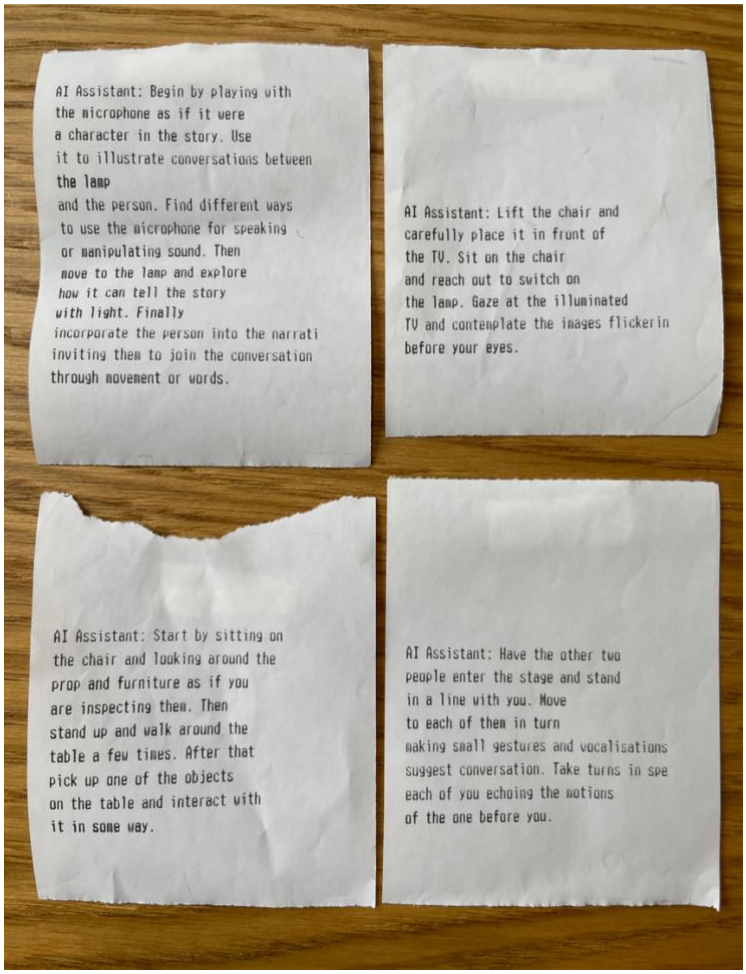

Figure 1: Printed performance instruction generated by Large Language Model.

Here is an example of an initial prompt we used:
The following is a conversation with an AI assistant. The assistant will act as a director, giving performance directions to a sole performer on stage during a performance.
Each Direction must follow logically from the last.
No Direction can repeat itself.
At each prompt the AI assistant will be given a list of objects on stage with the performer that the performer can interact with and must respond with performance directions.
Here is the first prompt:
Prompt: screen, chair, cables.
Here is an example of the type of instruction it produces:
AI Assistant: Begin by walking slowly to the chair and sit down. Reach out with your left hand for the cables connected to it and investigate the connection. Inspect each cable, noticing details about its length, colours, or any other unique feature. Move on to examine closely the screen near you. Take a few moments to consider its purpose in the performance space before beginning to interact with it.

For the experimentation two hacked Gametrak controllers were attached to the wall where the video was projected. The tethered controllers were attached to the performer's wrists to use them as a metaphor to visualise entangled loops between the performer and the visual set fed by the AI tool. And the length and direction of the tethered controllers affect sound depending on how the performer is moving on the stage. Therefore, the directions given to the per- former affected the human sonic environment, unbeknownst to the AI agents in the loop.

Further Development

We have several ways in which we plan to develop the project be- yond our initial experiments. The first is fine tuning our yolov5 object detection model to allow it to take more risks and force it to always provide a result. After this, we wish to further distort the visual feed (beyond the feedback projection) by using objects on stage such as mirrors, as well as pixelating and blurring the input and using a panel to project another image onto the surface. We hope this will generate more obscure keywords to feed our LLM.
Additionally, we wish to make the performance participatory by asking the audience members to comment on what is happening during the performance. This will further seed the LLM with details and be used to generate a text review of the performance at the end of the work, with audience members unwittingly providing the key micro-labour for its production.

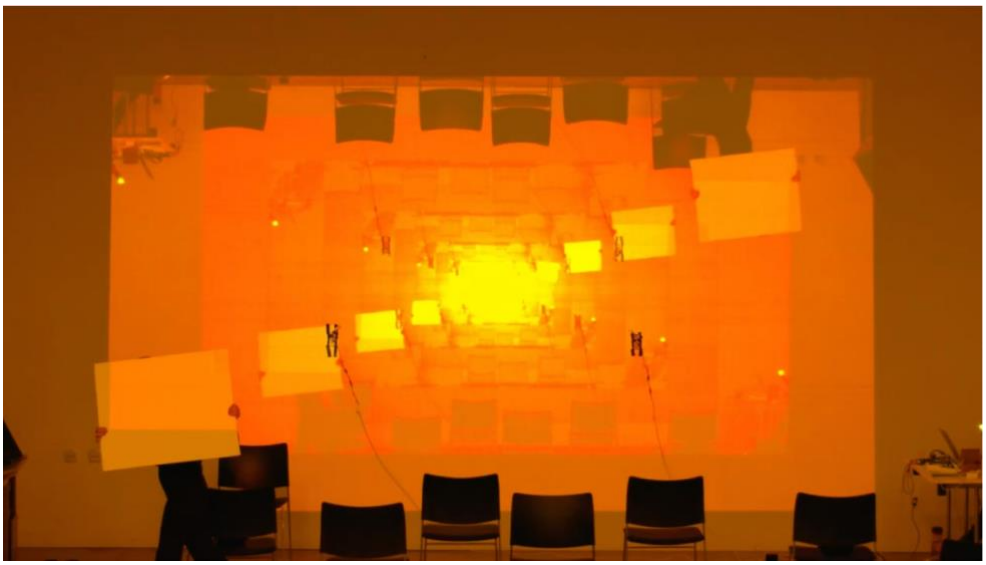

Figure 2: Experimentation with projected images, objects and movement with Computer Vision.

Furthermore, the prompts used to create the performance direction needs to be further crafted to make the results easier to interpret for the performer and more movement rather than story-based. Varying the prompts can give vastly different results, with "Prompt Engineering" being seen as a creative skill in its own right (Millière 2022).
Finally, we are looking into ways to integrate sound more holistically into our cybernetic AI feedback system. One method could be to ask audience members to rate the performance at each step of the performative sequence, with the score data used to responsively manipulate the sound. Another could be to play with controlled audio

feed- back on stage with the AI agents inadvertently directing the mic'd performer towards a speaker resulting in rising sinusoidal noise.

Acknowledgements. The project was supported by Creative Informatics and the University of Edinburgh.

References:

BBC. 2023. "Will ChatGPT lead to mass unemployment." BBC One Question Time. Accessed Feb 14, 2023. https://www.bbc.co.uk/ programmes/m001j0c3.
Bloomberg. 2020. "By Typing Captcha, you are Actually Helping AI's Training." Accessed Feb 14, 2023. https://www.bloomberg.com/press- releases/2020-11-27/by-typing-captcha-you- are-actually-helping-ai-s-training.
Bridle, James. 2018. New Dark Age: Technology and the End of the Future. Verso Books.
Cascone, Kim. 2000. "The Aesthetics of Failure: Post-Digital Tendencies in Contemporary Computer Music." Computer Music Journal 24(4):12-18. DOI:10.1162/014892600559489
Crawford, Kate. 2021. The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. Yale University Press.
Dixon, Steve. 2007. Digital Performance. The MIT Press.
Gahntz, Maximilian. 2018. "The invisible workers of the AI era." Accessed Feb 14, 2023. https://towardsdatascience.com/the-invisible- workers-of-the-ai-era-c83735481ba.
Galloway, Alexander R. 2021. Uncomputable: Play and Politics in the Long Digital Age. Verso Books.
McQuillan, Dan. 2023. "We come to bury ChatGPT, not to praise it." Accessed Feb 14, 2023. https://www.danmcquillan.org/chatgpt.html.
Millière, Raphaël. 2022. "AI art is challenging the boundaries of curation." Ars Technica. Accessed Feb 14, 2023. https://arstechnica. com/gaming/2022/07/ai-art-is-challenging-the-boundaries-of-curation/2/.
Perrigo, Billy. 2023. "Exclusive: OpenAI Used Kenyan Workers on Less Than $2 Per Hour to Make ChatGPT Less Toxic." Time. Accessed Feb 14, 2023. https://time.com/6247678/openai- chatgpt-kenya-workers/.
Pew Research Center. 2016. "Research in the Crowdsourcing Age." Accessed Feb 14, 2023. https://www.pewresearch.org/ internet/2016/07/11/what-is-mechanical-turk/.
Reese, Hope. 2016. "Inside Amazon's clickworker platform: How half a million people are being paid pennies to train AI." Tech Republic. Accessed Feb 14, 2023. https://www. techrepublic.com/article/inside-amazons- clickworker-platform-how-half-a-million- people-are-training-ai-for-pennies-per-task/. Steer, George. 2023. "Artificial intelligence stocks soar on ChatGPT hype." Financial
Times. Accessed Feb 14, 2023. https://www. ft.com/content/e341458e-ec12-43bb-835c-26392678ded0.
Terranova, Tiziana. 2004. Network Culture. Pluto Press.