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A Conversation with Berna

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Atop a desk sits a fax machine, a technology that you haven't used in years or, perhaps, your only memory of it is from having seen it in old TV shows. Curious, you approach the object. As you walk closer, the phone rings, as if anticipating you. You grab the phone and hear a matter-of-fact voice introducing itself as Berna, inviting you to press one to begin.

A Conversation with Berna (Vallverdu, 2024) is an interactive piece that speaks to the banality of the present from the banality of the past, using obsolete technology to reflect on our current digital landscape. It reminds us that familiar technology can vanish rapidly, and that data, often perceived as intangible, has a physical footprint (Mageswari, Manoharan and Poomalai, 2022).

The piece emphasizes a phenomenological approach, urging the audience to physically experience data. While VR has been used to explore concepts like big data (Raghunathan, 2015), Berna provides a sensory experience where data is rendered in touchable paper form, engaging our sense of smell, weight, and tactility. In an era dominated by AI, Berna poses a question: should creative technology focus solely on advanced AI and VR, or should it address practical, everyday issues?

The Conversation

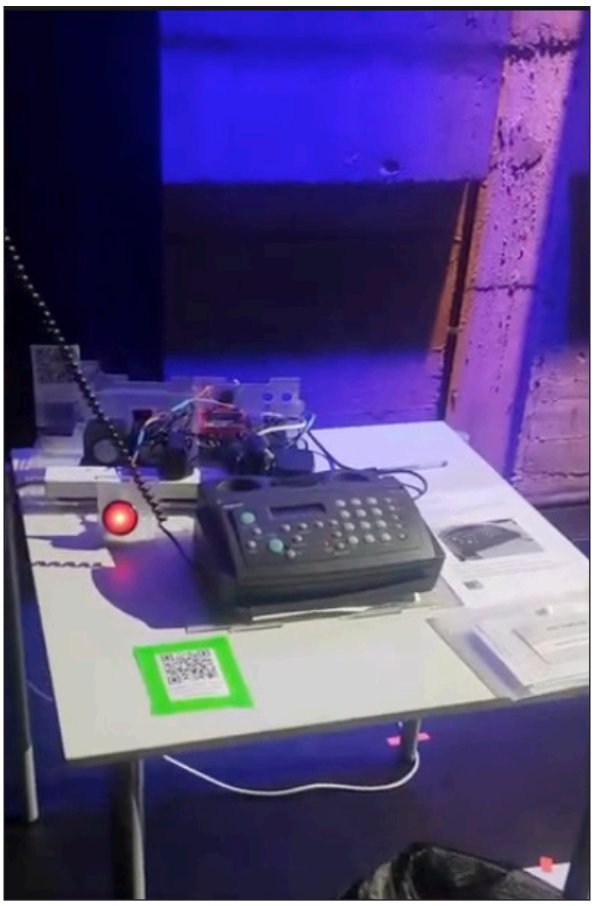

Figure 1: *A Conversation with Berna* at DRHA Munich, Diana Vallverdu, 2024.

Link to performance video (Screenshot in **Figure 1**)

In *A Conversation with Berna,* Berna, using a variety of AI-generated voices from ElevenLabs (ElevenLabs, 2024), is trying to sell itself to the audience as the solution to all their problems. The piece takes the form of telemarketing, attempting to evoke a 1980's nostalgia in audiences. After assessing the users' needs, Berna gives the solution to all their problems as the Conscious Social Media, a social media that prints posts through the fax machine and allows users to post, like and comment by sending faxes and making landline phone calls. The Conscious Social Media is presented as the perfect solution to slow down, relearn to pay attention, and meditate while waiting for posts to be printed. At the end of the conversation, the machine seems to break down, to soon after state that the product has been discontinued due to a lack of sales.

As part of the initial assessment, Berna asks the audience what they think is the weight of a message. Berna gives different options that the audience can choose but doesn't produce an answer until the end by printing it as part of the credits. This bit of information, which they can take home with them, allows the audience to not only experience the data, but also think about the physical counterpart of data beyond the conversation itself.

More generally, the piece momentarily generates an alternate reality where one must wait for social media posts to be printed. The experience of the wait allows audiences to have a snippet of what life may be had technology followed a different path, had the internet never been invented. Positioning the audience in this scenario is not intended to advocate a return to fax machines, but to highlight the absurdity of contemporary life and the artificiality of accessing information just by tapping and moving our fingers along a screen.

Link to full script

Research Context

High tech universities that offer creative computational courses insist on acquiring the latest tech; from next-generation VR to high level AI-integrated robots (Coffey, 2024). This tendency fails to realise that the same technology they are investing on is far from trickling down into day-to-day life. In VR, this issue is present in sectors such as tourism (Yung & Khoo-Lattimore, 2017), where one may expect the broader public to be ready to test more advanced technology, and even those in favour of VR accept that this is far from an established day to day technology (Hamad & Jia, 2022). Robotics, on the other hand, seems to have been relegated to the industrial – robot arms, transportation etc. – and service – lawn mowing, vacuum cleaning etc. – sectors (Torresen, 2017).

A Conversation with Berna critiques this institutional trend by examining the promises of new technology through the lens of an older, accessible device. Berna, lying between machine and robot, reacts to its environment with pre-programmed responses and challenges assumptions about social robots by forgoing a humanoid appearance.

Furthermore, the work challenges the push for human-like robots, as seen in efforts to increase social robot acceptance (Tong, Liu, and Zhang, 2024; Wang, et al., 2024). Studies that suggest humanoid robots are liked by humans (Chikaraishi, et al., 2017; Becker-Asano, et al., 2010) fail to acknowledge experiments are made in constrained environments – such as theatre shows or electronics festivals. In the work of Becker-Asano, et al., the visitors' feedback to the installation of Geminoid HI-1 at Ars Electronica was analysed, collecting quantitative data of visitors' interaction. Forty

positive comments, as opposed to thirty negative comments, were collected. Nine of the positive reactions where conversational-related. In that experiment, someone on the other end was listening and responding on behalf of the robot, making those nine responses seem less relevant than the others and thus bringing the balance to an almost 50/50, within an environment where participants were potentially inclined to have a favorable view of robots.

A Conversation with Berna was created in response to the broader field, and in particular to Becker-Asano et al.'s paper, featuring an intentionally non-humanoid robot that interacts with people. This project aims to challenge the assumption that VR and social humanoid robots are the inevitable future of daily life.

Tech

Berna, the fax machine, was created by ANTS Theatre, an interactive theatre company, for their performance *We Still Fax* (Barnes, et al., 2020). Most tech has been brought onto the machine used for *A Conversation with Berna*, but some modifications have been done to better suit the needs of the piece. The machine uses the following technology, which can be seen in **Figure 2**.

1. A raspberry pi which connects and controls the rest of the elements.
2. A fax machine.
3. External speakers, independent from the fax machine.
4. A sensor movement used to start up the conversation when someone walks by.
5. A Big Red Button attached to the machine that the audience can press.

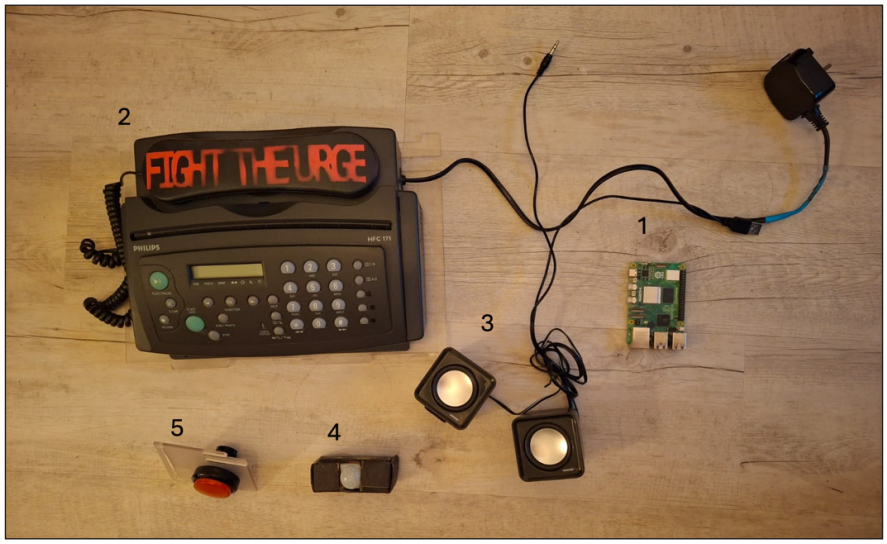

Figure 2: The technological components of Berna, Diana Vallverdu, 2024.

Both the original code, developed by Zhou and Vallverdu of ANTS Theatre, and the most updated code, developed by the Author, are openly published in GitHub. Here follows the explanation of the current code in the machine, which was developed on top of the original version of the code.

Link to published code of the machine

Asterisk, an open-source framework for building communications applications (Spencer, 1999), is used to control the fax machine, in combination with a Python script that manages the conversation stage. The conversation is structured as a series of steps defined in a json file. Each step can have a combination of the properties displayed in **Table 1**.

Property	Possible values	Machine's Behaviour
incoming_call	true/false	The machine waits for a specific number to be called on the number pad. Once a number is called, relevant sound for said file is triggered by Asterisk.
outgoing_call	path to file	The machine triggers the Asterisk call. Relevant sound is played on the phone by Asterisk.
incoming_fax	true/false	The machine waits for a specific number to be faxed on the number pad. Once number is called, the fax is saved in a temporary file.
outgoing_fax	path to file	The machine triggers an Asterisk call of type fax.
diegetic_sound	path to file	The machine plays the necessary sound on the external speakers and halts any other process (except for background sounds) before it is fully played.
background_sound	path to file	The machine plays the sound on the external speakers, in parallel of any call and/or diegetic sound.

Table 1: List of step properties the machine understands.

Before each interaction begins, a motion sensor halts the program from executing until movement is detected by the movement sensor, which points towards the space in front of the machine. A while loop is used to advance in the conversation with each step corresponding to one iteration of the loop. A step stage integer variable is stored in a database that both Python and Asterisk can access; Python uses it to both check the step and advance in the conversation, while Asterisk uses it to manage the call reaction.

Asterisk and Python continually communicate to prevent a step from advancing to the next one when a call has not been answered.

Once all steps of the interaction have been executed, the Python side restarts the steps stated in the database and jumps back to the beginning of the execution. Once again, it will wait until movement is detected to start the interaction.

Artistic Inspiration

In the piece *We Still Fax* (Barnes et al., 2020), the character Berna acts as a bridge between our world and a fictional universe where the internet was never created. During the production of *We Still* Fax, Berna became more than just a machine for audiences; users personified it, viewing it as a character rather than just a tool. This quality suggests that the choice of using Berna artistically to explore the necessity of humanoid form for social robots is ideally suited.

The work also explores the theme of data and data transmission. With Big Data now a significant part of everyday life, fax machines are revisited as early transmitters of 2D data, a capability that surpassed that of telephones or letters in their time. This history adds a layer to the exploration of how data influences society and technology today.

Development of the Piece

The piece was devised by the Author, in collaboration with fellow lecturers at Norwich University of the Arts through a series of workshops. Once a theme and means were decided, two devising workshops were held to create the rest of the performance.

The first workshop, titled *Exploration of Berna*, was held on 3 July 2024. The workshop was dedicated to devising ideas and creating a persona for the fax machine. The *Dungeons & Dragons* character sheet in **Figure 3** was used to develop a personality for Berna. The created characters all displayed quirky personalities of the 1980's, such as being a fan of Dolly Parton, having a 'serious personality with a dry sense of humour that nobody else understands', and life goals of 'destroying all boy bands except the Back Street Boys' and 're-establishing Block Busters', as can be seen in **Figure 4**. However, the word that stood out the most from the workshop was **telemarketing**. After the workshop, it was decided that the conversation would be a telemarketing conversation, in which Berna is trying to sell a product, while displaying an underlying 1980's nostalgic personality.

Having chosen the format of the conversation, the Author, in collaboration with Thom Haley, who acted as a writing consultant, wrote the final script from the workshop's observations. The voice of Berna is a variety of AI generated voices from ElevenLabs (ElevenLabs, 2024). This choice was made to prevent assumptions of

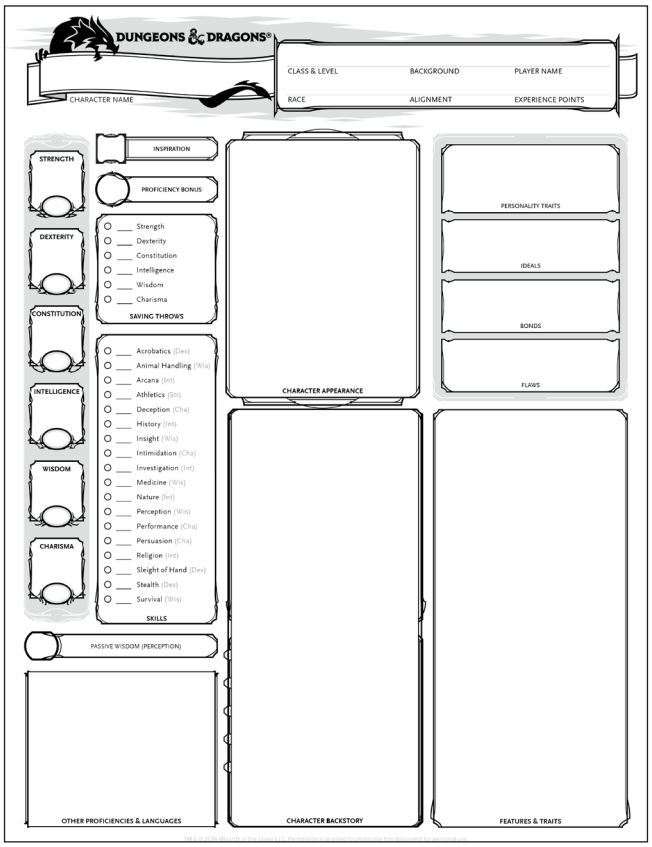

Figure 3: Dungeons & Dragons Modified Character Sheet, Wizards of the Coast, 2024.

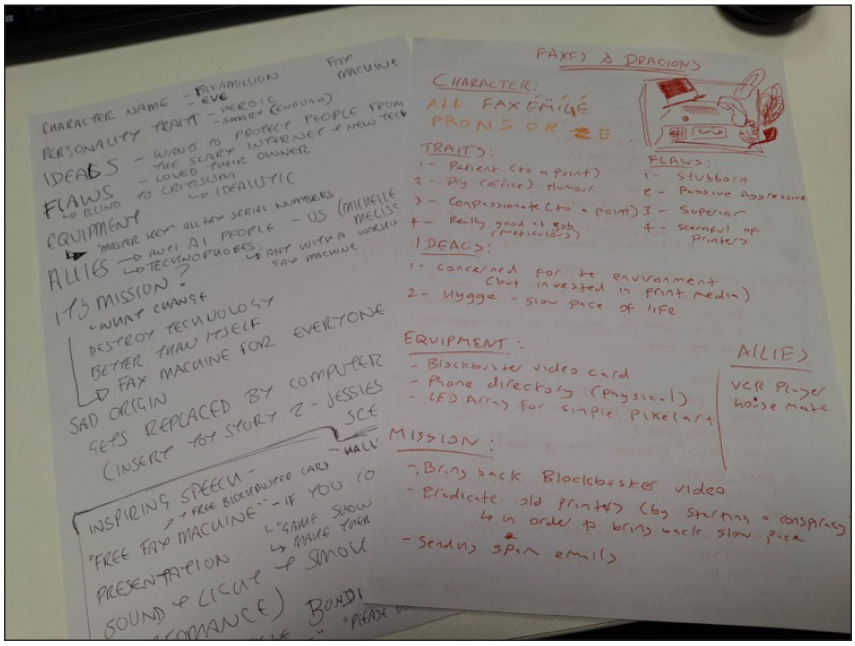

Figure 4: Notes from *Exploration of Berna* workshop, Diana Vallverdu, 2024.

who Berna 'is' based on the perceived gender/age/accent and other properties of the voice. Some of the voices chosen where purposefully robotic sounding – such as OmniBot's and Mary's – to prevent the audience from assuming Berna is too human. A full list of all voices used, and their corresponding ElevenLabs IDs can be seen in **Table 2**.

Voice Name	ElevenLabs ID
Bill	pqHfZKP75CvOlQylNhV4
Lilly	pFZP5 JQG7iQjIQuC4Bku
Alice	Xb7hH8MSUJpSbSDYk0k2
OmniBot – cyborg	WVUxqVRHCgitR5hkftOk
May	iHRZLgHEgk4 NeRlNa0PE
Charlie	IKne3 meq5aSn9XLyUdCD
Matilda	XrExE9yKIg1 WjnnlVkGX

Table 2: List of Voices and Eleven Labs IDs used in *A Conversation with Berna*.

The second workshop, held on 28 August 2024, was used to user test the piece ahead of its first official presentation at the Digital Research in Humanities & Arts (DRHA) 2024 conference. This workshop served to finesse the interaction and collect preliminary feedback. No new material was created after the workshop, other than incorporating clarification points for the audience and fixing some technical issues.

Production

This piece was first displayed in September 2024, at the 2024 DRHA conference (DRHA, 2024). The conference opened the possibility to present research by exhibition in parallel to traditional paper presentations, allowing for research like the one conducted with Berna to attend the conference. As shown in **Figure 5**, the display setup allowed audiences to interact with Berna in a structured setting. The piece was exhibited for three days. Due to the size of the conference, only a handful of audiences could converse with Berna – a total number of seven individuals/groups. This means that no conclusions on ongoing themes of the research have yet been obtained, but informal conversations with audiences seem to indicate the research appears to progress towards its desired goals.

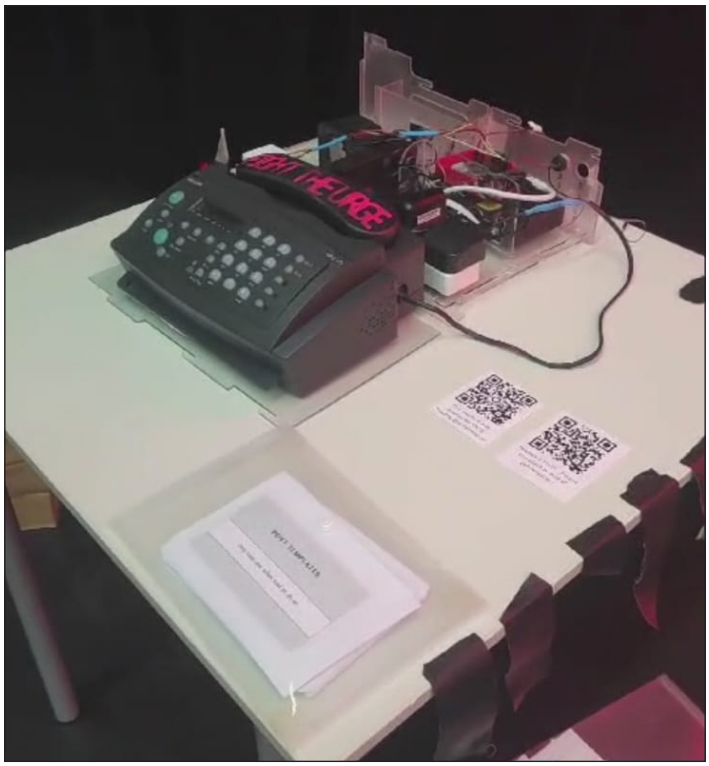

Figure 5: Berna at the DRHA Conference 2024, Diana Vallverdu, 2024.

Next Steps – Comparing Berna to Geminoid HI-1

Having undertaken a proof of concept with Berna, the next step for this piece is to focus on obtaining comparable results with those of Becker-Asano, et al (2010). A feedback form, akin to the one presented by Becker-Asano, et al. is currently in development.

In Becker-Asano, et al.'s research, answers were qualified per topic according to whether they were positive or negative. Some of the topics covered where how **interesting** the conversation was, the **emotional reaction** of visitors and their **reasons for approaching** the robot. The goal of this research is for Berna to score consistently higher compared to Geminoid HI-1 in most categories, except for the conversational aspects, as there was a human driving the conversation behind the scenes in Geminoid HI-1's experiment.

Feedback will be collected by asking questions in person and recording answers, just like Becker-Asano et al. previously did, with the necessary ethical processes put in place, and classified using the same demographic indicators. Potential exhibition spaces are currently being collected, to be contacted to run this experiment in the Summer of 2025.

Conclusion

Creating art with fax machines generates a myriad of research avenues, including data physicalization, reflections on contemporary technology alongside 1980s nostalgia, and explorations in social robotics. While current research with Berna focuses primarily on the theme of social robotics, future studies will delve into additional directions, such as phenomenological analyses of data interaction across various media and collaborative artistic endeavors. Through these efforts, we aim for Berna to become a central figure in a broader range of academic discussions and publications.

Competing Interests

Diana Vallverdu was a member of ANTS Theatre when Berna was created. This research is undertaken independently from ANTS Theatre, but they have lent the machine. Berna is not currently being used in any ANTS Theatre show. No more competing interests needed to be declared.

Biography

Diana has a mathematical and theatrical background, which she is currently applying at Norwich University of the Arts as a dedicated member of the Creative Arts & Technology department. She has experience of freelancing in the theatre industry, having devised mathematically inspired theatre, as well as developing software for immersive performances. She is currently researching Human Robot Interaction in the performing arts, specifically using Berna, the fax machine robot. In her research she explores questions such as what makes us empathize with a robot in a performance and whether humans trust humanoid and/or non-humanoid robots.

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