# **Supplementary Material**

# 1 UTOPIAN AND DYSTOPIAN SCENARIOS

In this section, we first include a table showing the relation between researchers, their background and their utopias and dystopias, as well as providing relevant background information (when relevant) that might help contextualize where the utopias and dystopias came from. Second, we include a longer explanation of each utopia and dystopia, as well as the images of (and/or links to) the created artefacts that we built to illustrate them.

ID	Background	Utopia	Dystopia	Relevant Information
R1	Electronic Eng.	MindHarmony	MindHarmony	
R2	Telecom. Eng., HCI, Neuroscience	SoundBody	SoundBody	Both: Extensive prior work on movement sonification, neuroscience of sensory perception applied to HCI
R3	Interaction Design, HCI, Multimedia Technologies	ConnectingBodies	Transform.Me	Utopia: Research interest on social interaction and body communication
R4	Artificial Intelligence, Unconventional Computing	EpiSense	EpiSense	Both: Prior work on unconventional biocomputing elements such as fungi.
R5	Interactive Telecom. Engineering, Creative Coding	Symbiosis	Focus	Dystopia: prior experience on creative coding and industries.

## 1.1 Utopias

1.1.1 MindHarmony. Academic research on wireless brain implants enabled movement prediction based on neural activity. Breakthroughs in 2008 and 2017 demonstrated successful control of robotic arms and typing through mental control. In 2019, somatosensory data was extracted from a pig, setting the stage for MindHarmony. Introduced in 2045, this brain device connects to our nervous system and provides sensory inputs when programmed. It enhances reality through sensations, sounds, and smells. The device is always connected to our brains but can be turned on/off and customized via a smartphone. By influencing sensorimotor perception, it alters body perception and emotions. For example, it can positively impact perceived shape, fluidity of movements, and generate a sense of freedom. With widespread applications in various contexts, such as work, leisure, and art, it enhances everyday activities, promoting efficiency and happiness. A video illustrating MindHarmony's utopia can be found in this link. Video created with stock material from Pexels and FreeSound.

*1.1.2 SoundBody.* The SoundBody app is a transformative technology that uses sound and haptic feedback to improve body perceptions and well-being. The accessible SoundBody app utilizes smartphone sensors to create a real-time blueprint of the user's body image, capturing data on motion, heart rate, and breathing. Through personalized sound feedback, the app modifies body perceptions by hacking sensorimotor loops. Users experience positive emotions, confidence, and can redefine their identity by embracing their desired body. The technology also impacts posture,

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movements, and physical abilities. In this utopian future, various entities design variations of the technology, making principles for changing body perceptions accessible to all. This encourages experimentation and reporting of novel experiences across multiple domains., such as sports, health and well-being, and even arts.



Fig. 1. Fanzine illustrating a scenario for SoundBody's utopia. Photograph collected from printed magazines.

**Example scenario:** An example scenario (see Fig. 1) is the case of Miss X, who is insecure about her appearance, believing her body looks abnormally big and deformed, although she is only slightly overweight. She avoids social activities due to shame and has missed school because of how she perceives her body. Miss X searches for ways to change her appearance online but is too embarrassed to discuss her concerns with others. She discovers the SoundBody app, which alters her body perception. The app invited her to take a walk while wearing her phone and headphones. She decided to try it and took a long walk because she was feeling well, her body didn't seem as heavy as usual, making her feel lighter and more elegant. Using SoundBody boosts her confidence, and she plans to use it at a party with friends, so that she can use SoundBody for a few minutes if needed.

1.1.3 *EpiSense.* **Context.** This utopia envisions a world where biomaterial innovations and smart wearables have become integral. The EpiSense artificial second skin 2) is a revolutionary biomaterial that integrates with intelligent biosensors, providing personalized insights and recommendations for optimizing health and decision-making. It functions as an interface for augmented skin, offering real-time feedback on bodily functions, emotions, and thoughts. It enhances personal understanding, for example, helping lift to consciousness unconscious thoughts or perceptions. It also improves communication among individuals beyond verbal cues, as it can enrich a person's discourse with Manuscript submitted to ACM



Fig. 2. Illustrative images of EpiSense second skins. All images created with Bing Image Creator, Microsoft, June 2023, https://www.bing.com/create

non-verbal visual cues, e.g. helping a doctor and a patient make sense of each other. Also in medical and healthcare settings, it enables continuous health monitoring and aids in disease management, e.g. it can detect signs of heightened stress levels, anxiety, or depression by monitoring heart rate variability, skin conductivity, and other physiological markers. This information can be relayed to individuals in real time, allowing them to be more aware of their mental state and take appropriate actions to manage their well-being. It can also exert control over the person wearing it, as it can take over health decisions if the individual is deemed to engage in risky behaviour for too long, for example making the person cut down on smoking. EpiSense also enhances productivity in work environments, by aiding with cognitive focus, and it revolutionises physical movements and capabilities, enabling individuals to transcend their natural limits, as its advanced algorithms and sensory feedback empower users to optimise their movements.

1.1.4 Symbiosis. **Context.** In Madrid, Spain, the extreme heat and drought have turned the country into a desert, leading people to live isolated in bunkers with controlled energy supply. Despite the challenging conditions, the entertainment industry thrives. Symbiosis Fest 2053 (see Figure 3) stands as an alternative festival where individuals gather to challenge social hierarchies and the unequal distribution of energy. Through activities like dancing, music, games, meditation, and community workshops, participants break free from their routines and connect with each other. One notable workshop focuses on building Symbiosis Vests, customized multisensory vests made from salvaged and analog technologies. These vests allow wearers to experience sensory inputs from various elements and scales: Manuscript submitted to ACM



Fig. 3. Visual

inner workings, bacterial and fungal activity, other people, water levels, tides, electromagnetic spectrum, moon cycles, planetary motion, etc. The vests generate stimuli like vibrations and mild electric shocks for the wearer to perceive. People find solace in the vests, using them during festivals, parties, and rituals during Symbiosis Fest 2053, seeking to reconnect with themselves, the living world, and their communities, in search of a renewed sense of purpose and regain reasons of why life is worth living.

1.1.5 ConnectingBodies. Context.In the near future, technological advancements have transformed work environments, leading to increased ubiquity. This primarily applies to urban and suburban areas in a Western European country. Cities have expanded, forming interconnected metropolises. However, this future is marked by extreme neoliberal values, commodifying bodies and experiences according to unattainable influencer and brand standards. Despite this, there are also spaces of creativity, activism, and joy in the body. These spaces exist in makerspaces, community-led programs, and artistic scenarios.

In this context, the designed artefact in Figure 4 illustrates the imagined ConnectingBodies artefacts and two scenarios in which it would be used.

### ConnectingBodies

nectingBodies is an open-source electronic otyping platform that empowers people mbed computational power into everyday

esigners, and devel as a hub of collective d programming code, all freely ually expanded upon. Whether y expanded upon. Wh engineer or a begi cs, ConnectingBodie ronment that prom and playful experimer

and her friends are curr g apart due to work. each other tremende They usly.



Fig. 4. Description of ConnectingBodies toolkit and four short scenarios. Base photographies taken from PixaBay.

## 1.2 Dystopias

1.2.1 MindHarmony. Similar to MindHarmony's utopia, between 2030 and 2050, MindHarmony's neural implant is deployed to help individuals with depression, paralysis, and body concerns, providing them with a constant state of happiness. Initially successful, eventually the technology eventually falls into the "wrong hands". Implanted devices in Manuscript submitted to ACM

people's skulls rewrite people's thoughts, emotions, and sensations. Creativity and self-identity become nonexistent, and the device cannot be turned off. Particular sensorimotor transformations are priviledged by the device, limiting differences among the people in terms of what body experiences they experience. The device "anesthetizes" people, leading to a state where they do not feel compelled to rebel and instead feel compelled to conform to societal expectations. For example, it affects the perception of time, leading workers to work longer hours without being cognitively aware of it, towards increasing their productivity. A video illustrating this dystopia can be found in this link. Video created with stock material from Pexels and FreeSound.

*1.2.2 SoundBody.* In a dystopian future, the SoundBody technology will be programmed to impose specific types of body experiences deemed "desired" by an external organization (see Fig. 5). Users are forced to conform to these standards, and any deviation from the desired body experiences results in persecution and punishment. The control of body perceptions affects motor behavior, self-perception, identity, emotions, and social interactions. Everyone is forced to use the technology in various contexts, eroding individuality and controlling body perceptions as a way to control behaviors and emotions, as a way to "perform" better (i.e. work more efficiently, exercise more, socialize more). As a result, the technology impacts work efficiency, leisure activities, and the relationship between the body and the environment. The technology restricts feedback to only produce desired body experiences, limiting personalization.

Data on user usage is stored on a server accessible to the external organization. Companies producing the technology, along with governmental and moralistic entities, wield power over individuals' perceptions, emotions, and behaviors. People may willingly adopt this technology to fit societal body ideals, becoming dependent on it as their real bodies



#### Fig. 5. Visual

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generate negative experiences. Body-self relations and interpersonal relationships become flat and superficial, and artistic expressions based on body movements may be banned.

1.2.3 *EpiSense.* The ubiquitous use of EpiSense (Fig. 2) has led to unintended negative consequences and ethical dilemmas, impacting both end-users and biomaterials. EpiSense's all-encompassing nature captures and processes vast amounts of data, resulting in the misuse of personal information and privacy breaches. Technology skews the relationship between individuals and their bodies, diminishing personal autonomy and enabling manipulation. It has created a surveillance society where the boundaries between public and private blur. Marginalised groups face discrimination and exclusion due to unequal access and utilisation. Additionally, the communication capabilities of biomaterials raise concerns about the ethical treatment of these sentient species. This dystopian reality raises questions about data access, purpose, and impact on end-users. Lack of transparency, power imbalances, and unethical practices prevail, undermining EpiSense potential benefits.

1.2.4 Focus. In the context of Madrid, where people live isolated in bunkers because Spain is now a desert after extereme heat and drought, the entertainment industry is very prominent as they create high-tech virtual experiences for a few people. Cognitive workers in this industry tend to be young, creative and idealistic people, that have to work very intensely in order to survive but that are also very motivated to eventually rise to the top of the trade. Targeting this group, Focus (see Figure 6) was developed. Focus is a neuroscience-backed and subscription-based solution to the problem of tiredness, in the form of a neuroimplant that inhibits the perception of fatigue and stimulates individualism. People use it during work, all the time, during large stretches of time, because with it they are able to keep working regardless of inhumane conditions. People forget their sense of embodiment, self and self-care, and they lose the need



Fig. 6. Poster illustrating a call for FOCUS

for community. Focus is marketed positively as a way to develop one's creativity and avoid distraction, becoming the best version that one can be.

*1.2.5 Transform.Me.* In a similar context to its utopic counterpart ConnectingBodies, the designed artefact in (Figure 7, next page) illustrates the imagined Transform.Me artefacts and two scenarios in which it would be used.

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Transform. Me is a collection of designer accessories (jewels, belts, wearables and stickables) that transform your body perception instantly. Based on decades of neuroscience evidence, it employs powerful biodata processing algorithms and intricate multimodal reedback to quickly and effectively change the negative attitudes, endeption of the state of the state of the changing how how every to your body appearance, capabilities and worth.

With an easy-to-use app, you can let Transform. Me to automatically sense and transform how you are feeling, or you can set pre-defined transformations that you can trigger at any point you want trigger at any point you wou to choose and customize what sensing and actuating accessories you want to wear.

Transform.Me empowers users to deal with stressful and negative situations on their own - improving the lives of thousands of people.

Fortunately, Lexi does not leave her house without her ransformMe accessories. Her accessories are able to quickly register the slight increase in heart rate and perspiration of her skin, the slightly faster breathing, the clenching of her jaws. Transform.Me has been understaming Lexi for a long time, and it well knows what Lexi is experiencing. It can ense Lexi is feeling upset and anxious about her body.

Lexi's Transform.Me also knows very well how to improve Lexi's mood. Through an array of haptic sensations, temperature changes and sounds particularly tailored to Lexi's preferences and needs, it reshapes Lexi's perception of her own body.





She starts feeling low-key sad, She does not have such a desirable body, such natural attraction, such a fantatic life, rowch interesting friends either. She knows her body too be too big, too new and atte the wrong places. She feels a well-known knot start forming in her stomach. She cannot take her eyes away from the screen and unconaciously wishing for such a life. 11

As Lexi is experiencing such feedback, she feels better. She can feel her body being relaxed, and suddenly she does not feel as heavy, as weak, as thin, as inadequate in her own skin. She has learned to rely on

She has learned to rely on Transform.Me for an easy and quick improvement of her mood. She knows that she can transform her body perception, and although the transformation does not always last long, it allows her to enjoy her life more fully.

Now, although she is still checking her social networks, the content she is consuming does not disturb her own self-perception so much, and soon is able to go back to enjoy the coffee with her friends.





Mark is nervous. He is facing his first physical meeting at his new job. He has worked there for several months, but as the work is almost fully remote, he has never met his colleagues face to face.

Tace to face. Mark is the youngest and most junior member of his team. He is also the only black person in the team, something which some of his teammates are only finding about today. He knows some people might judge his opinions and abilities based on racial biases, and he is torn between warning to expose, address and call out racist stereotypes he knows he will face, and wanting to blend in and be accepted by his white peers without conflict.

Anticipating such frictional experience, he has decided to wear his Transform.Me accessories at work today.



Short before the meeting, he activates his Transform.Me into Confidence and Agreeability mode. He has long worked out what combination of sensations Transform.Me can provide him that will both boost his own selfhappy and joyful, and hence make him be more agreeable.

As soon as he enters the meeting and introduces himself, he can be can be apprived glances from his peers. But he can also sense a warmth around his chest, which instantly calms his nerves and makes him happy. Through his earings, he hears himself speaking in a powerful, low-tone voice, which makes him feel confident, hardly perpendible sculp massage, which gives him a pleasant semation.

Once again, thanks to Transform. Me, he has been able to navigate a potentially tense situation without uppseting or being upset at his peers!