Rundown: Designing Game Strategies for Raising Awareness and Action on Environmental Impact of AI

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Increasing use of Generative AI (GenAI) in work and increasingly team-based applications have led to increasing demands on data centers, energy and water demands, and social and societal costs in embedded communities. Raising awareness about unsustainable and environmentally damaging practices are often difficult, because the consequences of the these practices are not immediately visible and require envisioning into the future. Public proclamations of these dangers often fall on deaf ears because people are often not receptive to issues they are not personally in touch with, and may form reactance towards public imperatives. To make the intangible future harms of unsustainable GenAI use more grounded in everyday experience, we propose game strategies that use indirect methods of raising awareness. By using a simulation game to represent the labor, resources, and demands required to maintain a data center, this game hopes to enrich public understanding of the environmental impact of AI use in the long run, and increase awareness and alignment with sustainable practices in utilizing GenAI in future practice. This work hopes to contribute a general design strategy for applying play to illuminate sustainability aims in HCI.

CCS Concepts: • **Human-centered computing** → **Interactive systems and tools**; **Interaction paradigms**.

Additional Key Words and Phrases: Sustainability, Environmental Impact, Generative AI, Games for Change

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1 Environmental Impact of AI

The increasing use of GenAI has impact in both the hardware level and in the social impact level. Estimates have shown that cooling data centers in use of GenAI in US alone may rise to 8 percent of total electricity use, and up to 5 percent in Europe by 2030 [2]. Components of CPUs and GPUs add on to increased costs in energy and water use. Social impacts include air quality and water use impacts on the surrounding communities, as well as reliance on mining to raise particular minerals and materials that affect community demographics [6]. More critically, however, is the lack of transparency regarding the exact cost of using GenAI in areas concerned with HCI research, which was not well quantified until recently [7]. This lack of transparency can lead to lack of awareness about actual costs involved and environmental impacts, further distancing people from impacts that may have longer term effects rather than address peoples' immediate concerns. How shall we raise awareness for a phenomenon that appears not to affect us today, but rather have long term effects potentially beyond our own lifetimes?

When given either proclamations or demands, people often react by purposely going against given beliefs, even when they do not actually believe the contrary [10]. When faced with attempts to raise awareness, especially about issues

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beyond immediate concern, people naturally react against this form of persuasion regardless of their true beliefs due to the need for freedom of thinking. Reactance thus makes it very difficult to tackle issues like sustainability awareness and climate change, critical issues where awareness is warranted [1]. Similarly, environmental impact of AI use is relatively neglected because people are using GenAI without seeing its consequences, and reactance may form when attempts are made to convince them of the long term consequences.

2 Games as Agent for Awareness and Change

Previous work in games for awareness and social good applications suggest that playful strategies may help to overcome reactance formation and promote open-mindedness in confronting issues that may be contrary to personal opinions [3, 4]. One recent game attempted to persuade users to act with sustainable intention in the future by showing players how unsustainable practices in the present will translate into in future terms [12]. This work showed that even though players' attitudes and personality persisted after game play, nevertheless, their in-game sustainable-aligned actions and intention for future sustainable behaviors were increased after game play (Figure 1). This suggests that even if are unlikely to be affected long term in terms of their underlying beliefs, their day to day decisions may be affected by playful interactions that does not attempt to argue or convince the player, but rather use the game as a "magical world" environment with which to narratively promote change. This type of strategy is well aligned with previous work where media like participatory narrative design and manga comics were applied to tackle difficult to change opinions like vaccine use and public health [8, 9].

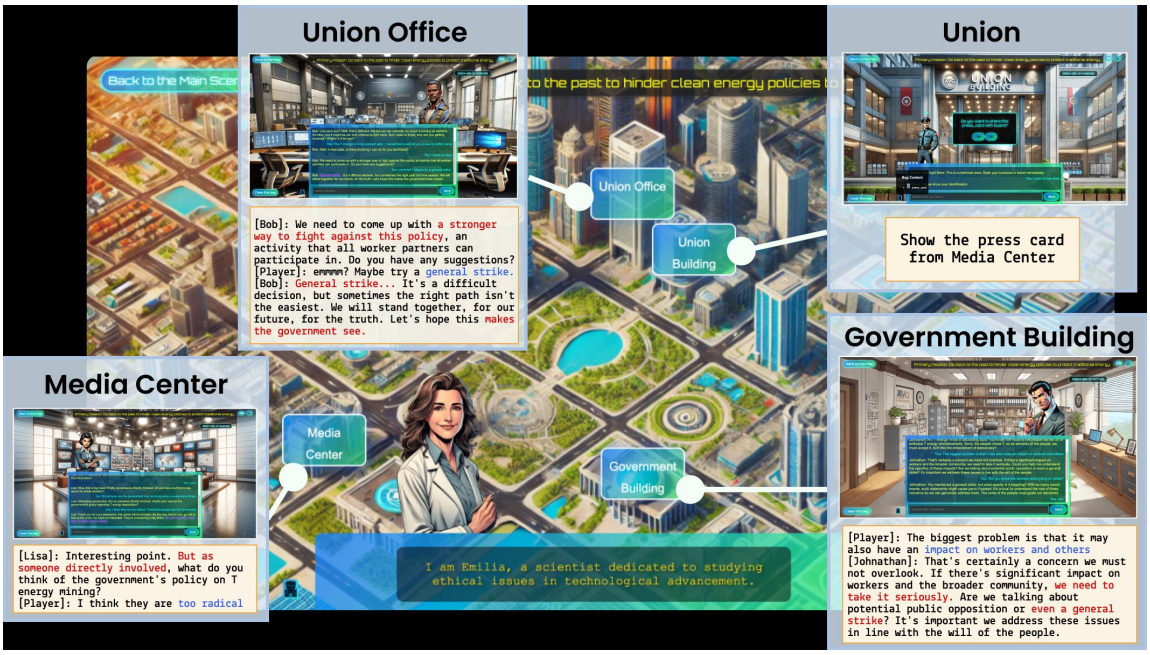

Fig. 1. In Eco Echo, players are shown the consequences of changing society to take unsustainable actions, and narratively seeing its effect on the future world. The future consequences then promotes awareness of players for the issues through implicit mechanisms enacted through the fictional world.

Another type of games that promote awareness is through free-form exploration such as embedded in free-form dialogue in the form of conversations with chatbots. These free form structures enable embedding of the game narrative and purpose in the form of implicit messages that are part of the game nonplayable characters (NPCs) characteristics. One example of such gamefied interactions is Eternagram, which uses dialogue with an alien character to show players what earth's future would be like if it maintained an unsustainable path [14, 15]. The game starts with the player encountering a mysterious character on social media, and begins understanding this NPC through dialogue (Figure 2). We learn that the character is an alien from another planet where resource constraints in its ancient history have led to changes in the planet's terrain. Through game unlocking dialogue and mechanisms of discovery and visualization, the game slowly reveals that the alien planet of concern is actually the future earth. The speculative story of the game reduces reactance formation because its playful nature demands exploration and curiosity. Instead, players are led to discover the consequences of unsustainable practices through narrative reveals. Similar strategies have been adapted to enable exploration of past cultural heritage in gamefied forms [5, 13] and learning about the effects of misinformation on public opinion [11]. We propose that game strategies for illuminating lack of transparency through speculative design and narrative influence would make impacts on the way people perceive the environmental impacts of AI use.

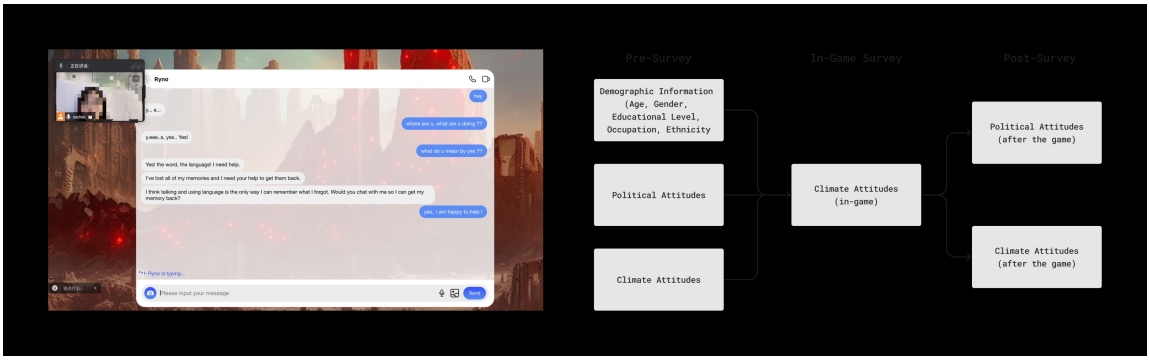

Fig. 2. In Eternagram, player encounters a character who is from another world. Through free-form explanation, the player finds out that the devasted world that the alien is from got there due to reliance on unsustainable practices. That planet is actually Earth.

3 Designing Playful Strategies for Understanding and Reflection

Our design for the game preliminarily titled *Rundown* is about a metahporical data center based on detailed research, where many different actions are required to maintain its operation. The game does not start nor even title itself after environmental effects of AI, because we want players to first be enveloped in a playful world before reactance can form (Figure 3). The narrative revolves around an operator in the data center who must negotiate the daily challenges of running the data center. The player must make sure the GPU and CPU temperatures are low, while reducing a quota of electricity and water usage. Meanwhile, the task remains difficult because it is increasingly hard to keep up with demands. Over every successive day of operation of the data center, the electricity consumption limits are even more strict, and water use increased even more. Meanwhile, social costs on morale of its workers and surrounding protests lead to further reduction in the satisfaction point rating in the game. The player is confronted with the impossible task of maintaining the data center on a daily basis. When the operation fails in the final day possible, the game ends. The game always ends in failure.

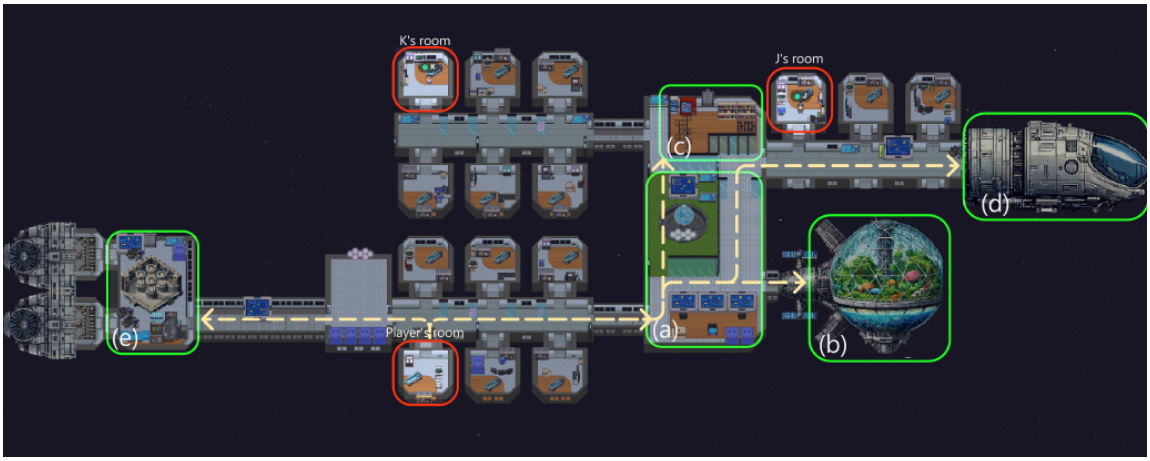

Fig. 3. Proposed 2D game map for interactions for a game about the day-to-day running of a data center. The player must talk to each stakeholder to maintain low temperature, guarantee electricity load, reduce ineffectual use, while maintaining operation. Nevertheless the game always results in failure because the data center cannot catch up with demands on its finite capabilities.

In summary, we propose to counter reactance formed against persuasion in regard to environmental impacts of AI use by using a playful strategy to enact narrative forms of transparency, showing the processes of data center maintenance and the deleterious effect on the environment. This general principle of playful interaction design promotes a type of awareness and reflection in players that enable them to think beyond themselves and into thinking about future consequences of AI use.

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