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Giving Voice to Nature: Digitally Enabled Human-Nature Interaction to Support Restoration Practices in the Shannon River

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Abstract. This project seeks to enable interaction, communication and understandability between humans and the natural environment by means of digital technologies, for collaboration with nature focusing on the aquatic ecosystem, with case study on the Shannon River of Ireland. While water, fishes and plants don't talk and we can't easily get their feedback on our sustainability efforts, there are indicators in nature that show how healthy or unhealthy these entities are. But those indicators are mostly available to, or detectable by, scientists who interpret and communicate them only scientifically, making them largely inaccessible to the ordinary citizens. Using the new More-than-Human and Research through Design approaches, this project seeks to make those indicators more accessible to the layperson and to, in the long run, bring about large-scale, citizen-driven, technology-mediated but nature-led actions towards environmental sustainability.

Introduction

This project aims to help bring nature in as a crucial stakeholder and collaborator in our sustainability efforts through new and emerging interactive technologies. Specifically, it seeks to develop a case study on the Shannon River of Ireland, enabling more responsible and respectful interaction between human actors such as fishermen, farmers and students, and nonhuman actants such as water, fishes and plants, towards better restorative practices. It seeks to achieve this by translating nature's signals in the form of visual and sensor-detectable indicators into human-understandable and actionable digital interfaces that are fun and accessible to ordinary citizens, not just scientists. The project is multidisciplinary, combining aspects of computer science with the natural sciences.

Background

CSCW research on environmental sustainability is limited, though there are recent workshops and discussions on computing and environmental justice (Liu et al. 2022; Doggett et al. 2023; Light et al. 2023). Historically, CSCW has focused on human interaction in social and organizational settings (Grudin 1988, 1994), human participation in design (Bannon and Ehn 2012), and knowledge sharing (Ackerman 2000), using computing. However, it overlooks other species affected by computing.

Environmental harms can cause irreversible sociocultural damages (Tschakert et al. 2019), even to workers in heavily computer-supported collaborative environments like Silicon Valley (Lécuyer 2017). Post-COVID-19, collaborative technologies like video conferencing and cloud computing have brought CSCW practice under the spotlight (Simon 2021). Energy-intensive and water-demanding data centres are now as ecocidal as oil/gas, coal, etc. (Ensmenger, 2018), with computing responsible for 1.8% to 3.9% of global greenhouse gas emissions, compared to aviation's 2.5% (Freitag et al. 2021; Knowles 2021). The electricity footprint of ICT is over 2000 TWh, projected to reach 8,265 TWh by 2030 (Andrae 2020).

Consequently, researchers urge moderation in computing to prevent catastrophic environmental damage (Knowles 2021; Widdicks et al. 2022). A significant contribution by a CSCW scholar does exist which emphasizes scaling up environmental responsibility from individual persuasion to collective actions (Dourish 2010). To Dourish, nature is no more an enemy to dread, conquer and exploit, but a “social fact” and a true home to be desired for rejuvenation and interaction with (ibid.). Accordingly, this project advocates for eco-technical practices in addition to the prevalent socio-technical relations promoted by CSCW, recognizing our interdependence with other species for sustainable

futures (Light et al. 2023). Focusing on the Shannon River, it addresses the UNSDG Goal 14 (Life Under Water), an identified research gap in CSCW and HCI (Hansson et al. 2021; Perovich et al. 2023).

Main Research Question

How do we bring in natural entities into everyday interactions as collaborators to increase stakeholders' involvement for more scaled and impactful efforts at environmental sustainability?

Theoretical Framework

The project uses the More-than-Human Design (MtHD) framework (Bastian et al. 2017; Giaccardi and Redström 2020; Coskun et al. 2022) because of MtHD's innovative approach and its focus on decentring humans in collaborative systems design, promoting equitable multispecies co-existence and interaction instead (Giaccardi et al. 2024; Nicenboim et al. 2025). It acknowledges our dependency on other species and our shared existential crisis (Light et al. 2017; Liu et al. 2018). Its approaches are also multidisciplinary.

Understandably, Bremer et al. caution against seeking expertise in too many disciplines, suggesting the use of HCI's traditional skillset to aid policymaking (Bremer et al. 2022). However, the latest wave of HCI, which emphasizes MtHD, extends the multidisciplinary requirement further. Its posthumanist orientation involves philosophical discourses like Object-Oriented Ontology and designing for a pluriversal world (Forlano 2017; Escobar 2018; Clarke et al. 2019; Akama et al. 2020; Wakkary 2021). It supports other disciplines in stressing our interconnectedness with the earth and the agency of objects to overcome human exceptionalism (Latour 2007; Abram 2010; Haraway 2016; Tschakert 2022). Addressing environmental challenges requires combining sciences with art and design (Latour and Weibel 2020).

Methodology

Because of its multidisciplinary nature, this project uses the methods of qualitative data collection, specifically interviews, field observations and basic lab studies. It also utilizes the Research through Design (RtD) approach, with the non-linear design thinking method of Empathy, Ideation, Iterative Prototyping and Testing, but with co-design workshops involving the Shannon's stakeholders. The qualitative rather than quantitative approach was chosen because of the need for deeper insights into the behaviours, needs and relationships (with nature),

rather than just raw numerical data, to inform the design at this stage. It is expected that the resulting prototype would be autonomously generating numerical sensor data when up and running.

Work Done So Far

Using the above methodology, the researcher has carried out the first and second phases of the project, including data gathering, to understand the main issues around the Shannon.

Interviews

A total of 22 key human stakeholders of the Shannon have been interviewed: 1 sustainability student, 3 lecturers involved in sustainability, 1 professor of ecology, 3 fishermen/anglers, 3 kayakers, 2 rowers, 1 Shannon-based boat operator/transporter, 3 government officials responsible for biodiversity, 1 PhD researcher and head of an environmental group, 1 zoologist and riparian conservationist, lecturer and kayaker, and 3 officials of Ireland's Electricity Supply Board (ESB) who operate the Ardnacrusha and Parteen hydroelectric dams located across the Shannon.

Field Tours and Observation

12 solo attunement (Akama 2014; Hey 2021; Milstein et al. 2024) tours and 5 guided ethnographic tours of the Shannon have been undertaken on different days, to observe and understand the nonhuman entities in/around the Shannon and how they could cooperate with humans. The researcher was led on the guided tours by boat operators, rowers and kayakers, to different sections of the river from the Shannon Estuary in Limerick City up to the Ardnacrusha power plant and the Parteen Weir, and to different sections within the power plant by ESB officials.

Lab Studies

Finally, guided by a professor of ecology in the Biological Sciences department, the researcher worked with some ecology students on laboratory exercises of identification, observation and taxonomy of some common freshwater plant species to understand their adaptation characteristics and behaviours in different habitat conditions.

Data Analysis

Clark and Browne's Thematic Analysis method was chosen for data analysis because of its reflexivity and flexibility which is more suitable for multidisciplinary research, because it is inductive and because it is a "staple of qualitative HCI research" (Brulé 2020).

Product Design

The third phase of this project involves the production of a digital or physical artefact using the Research through Design (RtD) method (Findeli 2001). This method involves using novel design artifacts to generate new knowledge in order to improve the future (Zimmerman et al. 2007). Over time, the resulting prototype from this project would mediate human-nature interaction towards mass climate literacy for more sustainable futures. It could be a sensor, VR/AR, AI or web technology enabling nonhuman entities within the Shannon's ecosystem as active research participants in ongoing realtime data gathering even years after this project, rather than merely representing them in 'pseudo-participation' (Bastian et al. 2017). 'Pseudo-participation' can sometimes be "abused giving them the false impression that they have a say in the research process" (Bergold and Thomas 2012). Thus, the project will enable nature's direct contribution to the human restorative efforts; a CSCW with nature for sustainability.

For want of another expression, this approach could be called "Thing Science" as a more-than-human tweak to citizen science which is largely human-led and already commonplace in Ireland (Roche et al. 2021; CIEEM Ireland 2022). Dourish (2010) advocates for working with nature at societal and policy levels, instead of citizen science or individual voluntarism. Indeed, this is one of the reasons the researcher advanced to MtHD from the originally intended City Common's framework (Balestrini et al. 2017) which uses citizen science and serves human purposes. "Thing Science" is nature-led.

Early Findings

The result of the data analysis reveals 9 major issues and needs impeding sustainable interaction with the Shannon:

- Water Level Management/Diversion: 400 cumecs diverted to power Ardnacrusha hydroelectric scheme. The management causes flooding of homes in Winter and weak flows in Summer making it difficult for salmon to survive;

- Pollution and Water Quality: Diffused pollution mostly from agricultural runoffs due to excessive EU Nitrogen derogation, and consequent excessive plant growths on the river suffocating aquatic animals; sewerage from homes and water treatment plants, and people dumping refuse into the river;
- Water Abstraction Plan to Dublin: Anxiety among stakeholders who fear that there is no hope in sight for restoration when more harm is being planned;
- Significant Decline in Wildlife Population: Ardnacrusha's hydroelectric turbines mincing salmon in their numbers. Other wildlife, e.g., Otters, lamprey, going extinct, etc.;
- Invasive Species a Menace: Giant hogweed, knotweed, Himalayan balsam, minks;
- Public authorities more interested in development and economic growth against nature;
- Lack of Public Awareness: Tonnes of data already available through citizen science but inaccessible to the layperson; Public apathy;
- Artforms Needed to Elicit Public Interest and Awareness: Connect to heritage, mythology and history – Storytelling and gamification;
- Recreation and nature-based tourism facilities needed.

Next Steps

- Though the researcher is currently doing data analysis, data gathering is not done yet as some guided field tours are scheduled for the coming Summer. One is an overflight tour of the Shannon on a light aircraft. Another is more field ethnography with ecologists to study invertebrates and aquatic plants;
- Another Co-Design workshop planned with local stakeholders;
- Experiments with various sensor, web and VR/AR technologies;
- Development and testing of a prototype/proof of concept;
- Completion and revisions of thesis;
- Viva.

Contributions and Conclusion

In this paper, an ongoing research and design project has been presented which seeks to enable collaboration between ordinary stakeholders and the natural environment using new and emerging technologies. The project seeks to bring scientific data to laypersons in ways that are artful, fun and accessible, and potentially empower them to respond in more respectful and sustainable ways. The project contributes principally to the general body of knowledge by addressing the UNSDG Goal 14 (Life Below Water) for which HCI is said to

have no tools or methods yet (Hansson et al. 2021). It also contributes to Goal 13 (Climate Action), Goal 6 (Clean Water and Sanitation), Goal 11 (Sustainable Cities and Communities), Goal 12 (Responsible Consumption and Production), and Goal 3 (Good Health and Well-being).

Finally, it aims to contribute an empirical method for the emergent More-than-Human Design framework in HCI, as well as a More-than-Human perspective in CSCW.

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