Pervasive Eyes Asturias

A wider representation through performative feedback

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The project explores the ecological foundations of ideas of digital participation aiming at offering a better understanding of the complex nature of collective feedback within the setting of immersive geographical representation and analysis as the basis for co-creative spatial practices. Drawing on contemporary psychogeographic methods that use Galvanic Skin Response (GSR) for emotional mapping as well as previous research by the author that explored the use of GSR signals within the context of collective knowledge construction and co-creative practice, the project explores, within the settings of a VR experience, the use of performative feedback as a method for collective spatial cognition and sense-making with a wider representation. The resulting VR installation, Pervasive Eyes Asturias, was firstly exhibited at LABoral Centro De Arte y Creación Industrial in Gijón (ES) in 2021. The paper describes the theoretical framework that spurred its realisation as well as its technical settings, before tracing critical steps for further advances within the practice of ecological and performative co-creation that the project outlines.

***Keywords**: Collective Authorship, Social Media Analysis, Galvanic Skin Response, Performative Feedback, Automated Cognition.*

INTRODUCTION

The project explores the ecological foundations of ideas of digital participation aiming at offering a better understanding of the complex nature of collective feedback within the setting of immersive geographical representation and analysis as the basis for co-creative spatial practices. For this purpose, it draws on Gilbert Simondon's notion of *transindividuality*, as the sensual, affectual, and ecological interpretation of the social model of becoming and of collective cognition (Simondon 2001), continuing the exploration of *transindividual* design-research methods and protocols to address the endemic disconnection of agencies and technological infrastructures within current digital participatory practices (Papeschi, 2019).

Within this line of enquiry, the project draws on ideas of cultural mapping through social online media (Williams 2020; Kamvar and Harris 2011) to construct a VR archive of photographic memories that engages the inhabitants of the Metropolitan Area of Asturias (Spain) in a self-centred exploration of their collective identity. Using geographical social media analyses to gauge social interactions and behaviours at the territorial scale, Pervasive Eyes works on the basis of a rich dataset of information downloaded from

the social media platform Flickr, offering a sectional representation of the complex correlations between the Metropolitan Area of Asturias and its inhabitants.

Exploring alternatives solutions to the generational bias posed by popularity-based methods of social-media visualisation and analysis, the project further draws on contemporary psychogeographic methods that use Galvanic Skin Response (GSR), an indicator of the emotional status of participants also used in lie-detection, for emotional mapping (Nold 2009 and 2018) and previous research by the author that explored the use of GSR signals within the context of co-creative practice and collective knowledge construction (Papeschi 2019), to investigate, within the settings of the VR experience, ideas of *performative feedback* as a spatial method for collective sense-making with a wider representation.

Co-funded by the Creative Europe Programme of the European Union: European Media Art Platform (EMAP), the resulting VR installation, Pervasive Eyes, was firstly exhibited at LABoral Centro De Arte y Creación Industrial, Gijón (ES) in 2021. This paper outlines the theoretical framework that spurred its realisation as well as the technical settings and the challenges encountered during its development, before outlining future steps for the critical development of the emerging area of design-research practice outlined by the project.

Figure 1
Copyright of Flickr posts in Oviedo ©FLOW Architecture

FEEDBACK AS AN EXPERIENCE-BASED PROTOCOL OF COLLABORATION

The project draws on ideas of *feedback* as a method of collaboration between human and artificial intelligence, as it emerges from ground-breaking cybernetic theory and practice in the 40s and 50s. Firstly, described as *negative feedback*, the prediction and control method to obtain specific goals and decrease any departure from the desired behaviours within circular causal systems, theorised by Norbert Wiener as part of servo-mechanics (Pierce 1980), and widely applied during WW2 in the construction of self-correcting engineering devices (Boden 2006). And later, in the form of the interaction protocols that leading the adaptive behaviour exhibited by some post-war cybernetic devices, such as the Tortoises developed by Grey Walter from 1949 to explore life-like action models, or CORA, a device that, developed as a model of neural communication based on pavlovian ideas of conditioning and training, displayed capacities of associative learning as a reflexive response to repetitive stimuli (Boden 2006).

Varela, F. J. et al. illustrate how the exploration of emergent capacities of learning involving experience-dependent transformation was in fact one of the key goals of some of the early cybernetic research. Relying on an approach to the cognitive sciences in which the brain and its structure and mode of functioning became the main source for ideas, this trajectory drew on the work of Donald Hebb, who firstly described in 1949 how learning derives from the degree of correlated activity between neurons, where connections are strengthened by the degree of correlated activities that two neurons share, to develop models of artificial intelligence as an open and non-linear distributed system in which internal connectivity was inseparable from the history of the system's transformation (Varela, F. J. et al., 1991).

Figure 2
Density of Flickr posts in Gijón
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Figure 3
Density of Flickr posts in Avilés
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TOWARDS PERFORMATIVE INTRA-ACTION AS FEEDBACK

Varela et al. use the evidence of the emergent capacities displayed by the AI systems further developed within the connectivist framework since the '80s, to support the argumentation of human cognition as a process of embodied action in their Theory of Embodied Mind (1991), according to which cognition depends upon

experiences that are contingent on having a body with sensorimotor capacities, capacities that are in turn embedded in larger biological, psychological and cultural contexts. The idea has been also endorsed and expanded more recently by the neurosciences, which have demonstrated how the same neural structures involved in the control of our acting bodies also contribute to interpreting and directly understanding the meaning of the actions performed by others as well as the emotions and sensations that they experience, providing basic forms of social understanding (Gallese 2005).

These ideas, together with Barad's notion of *intra-action* (2007), which describes how it's only through agential collaboration that the boundaries and the properties of reality become determinate, outline a profound conceptual shift that transcends the early cybernetic circularity of feedback to describe performative trajectories of human-machine and mediated human-human collaboration; a *performative feedback* protocol that ought to be explored within the domain of digital participatory practice. As already outlined elsewhere (Di Carlo and Papeschi, 2022), an approach to collaborative automation and mediated collective authorship as an inherently transindividual practice entails a series of strategies oriented towards the definition of emergent meaning potentially able to capture the weaker voices and signals, including a focus on the diverse sensual and affectual experiences and the orientation towards procedural indeterminacy and the exploration of material intelligence.

Figure 4
Pervasive Eyes Asturias at LABoral Centro De Arte y Creación Industrial in Gijón (ES) in 2021. Courtesy LABoral Centro de Arte y Creación Industrial © Marcos Morilla

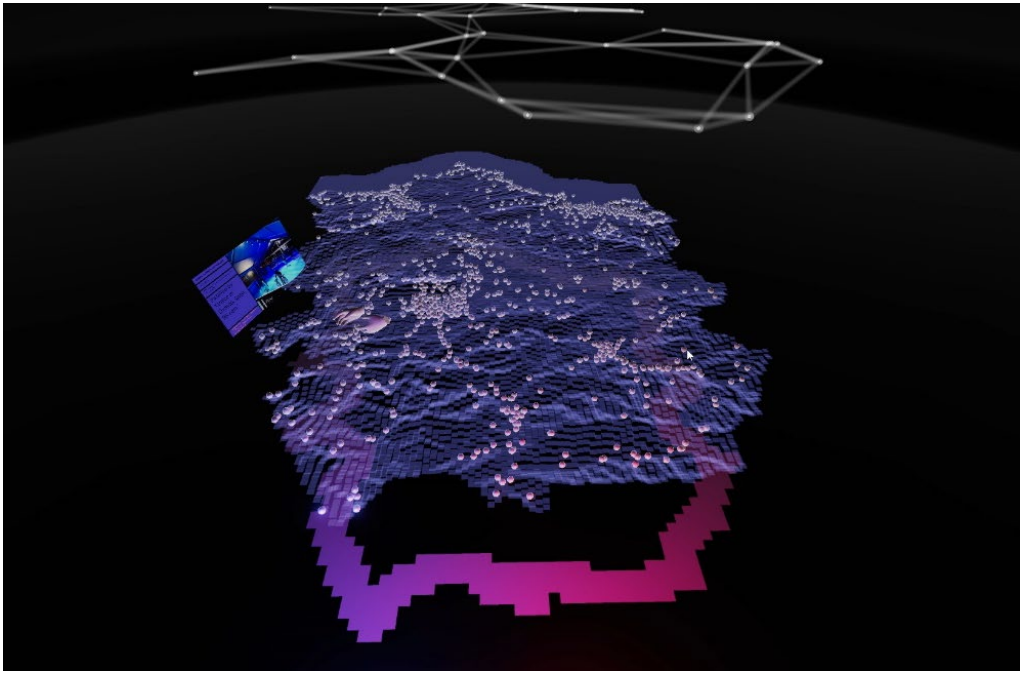

Figure 5
Frame from the adaptive video projection.

VR Experience: FLOW Architecture

In such context, the specific design of the infrastructure allowing for agential communication has the potential to work as the *co-evolutionary cognitive infrastructures* described by Parisi (2017), dealing with the intersection of different types of resource thinking. The project explored further the idea of co-evolutionary generative and adaptive infrastructure as a platform for collaborative cognition, purpose creation and spatial collaboration.

PERVASIVE EYES ASTURIAS

Geographical social media analyses offer the possibility to gauge social interactions and behaviours at the territorial scale, offering rich sectional representations of the complex correlations between places and their inhabitants. However, the limited access of specific age and social groups to online media is also at the base of a substantial bias onto which standard methods of social media analysis, based on the popularity of posts and traffic indicators, incur, constraining their results to the vision of the leading voices and narratives.

Historically characterized by a significant industrial focus, the Metropolitan Area of Asturias contains 18 municipalities articulated around the cities of Oviedo, Avilés, and Gijon. The region is also home to a growing ageing population, with a trend that places it within the first 10 regions by average age by 2050 (Sosa Troya 2021). In this context, the exploration of alternative methods of selection of meaning for social media analysis appeared to be of great relevance.

Figure 6
Frame from the VR experience. Shared on an Attribution Share-alike Creative Commons License. VR Experience: FLOW Architecture; Photography: mikelo

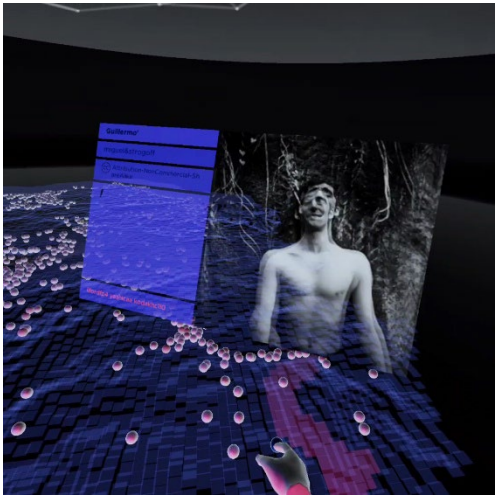

Figure 7
Frame from the VR experience. Shared on an Attribution Share-alike Creative Commons License. VR Experience: Flow Architecture; Photography: miguel&strogoff

The project explores the use of social media parsing in combination with live *performative feedback,* as gathered from the audience, for purpose and collective meaning creation. And with this aim, it chooses as a terrain for exploration a VR setting, for the anticipated capacity of enticing, through place, body ownership and copresence illusions, the realistic interaction of the users with the information displayed, despite the artificiality of the constructed environment (Slater 2022).

Drawing on previous projects (Papeschi 2019) that explored the use of Galvanic Skin Response visualisation for the deconstruction of the human agency through a mediated process of quantification of affect, *performative feedback* is constructed within the VR environment through the live collection of motion tracking and GSR to explore the collective affective connection to the territory.

An initial search, conducted on the photo-sharing platform Flickr using the Flickr Metadata Downloader in QGIS, revealed an archive of almost 260,000 posts geolocated within the geographical boundaries of the area in exam. Each data point listed location, date, and a link to the online image; further information regarding likes, tags, comments, and copyright were aggregated to the initial dataset using the Flickr's web API and a combination of HTTP requests and Pandas DataFrames in Python. About 30,000 posts shared on the basis of a Creative Commons License that also allowed for derivative work were chosen as the raw data pool for the construction of the immersive VR experience in Unity.

Initial data visualisations, displaying general information regarding density and locations of the data collected, had exposed early in the project, how an analytical approach that featured only the most visualised r or liked posts, resulted in constrained and biased representations. With the aim of developing a tool better fitted for the purpose of mapping the distributed nature of the region's polycentric landscape, the project focussed on the construction of a generative logic able to archive the fluctuating preferences of the audience interacting with the visual database as the basis for an adaptive and additive approach to the visualisation of the information.

Within the VR space, the Flickr archive is visualised as a three-dimensional map of the area.

Developed as a multiplayer experience using Unity Photon Fusion, the VR environment is accessible wirelessly via Oculos Quest 2 by two participants at the time; the participants are also equipped with Wi-Fi GSR sensing devices. Once in the VR space, the users can interact with a virtual display of geolocated spheres to access the photographic and text-based information linked to a specific location with the materials downloaded in real-time from the Flickr platform.

While accessing the information, the emotive response of the participants is tracked through GSR sensing, with the collective incoming signals transmitted to Unity with the Uduino plugin and used to additively inform the generative organisation of a three-dimensional proximity graph that maps the history of the collective affective response to the experience. As new visitors enter the VR space, the proximity graph is used as a navigational system to identify the location of specific posts with high affective engagement, while the affective data resulting from the new interaction inform new cycles of adaptation of the system. As such the process describes mechanisms of collective knowledge construction and learning leading to the construction of the virtual environment as a collectively informed navigational system.

Within the settings of the installation of the project at LABoral Centro De Arte y Creación Industrial, the VR stage was bordered by two large projections that rendered for the general audience the participants' immersive point of view and the overall process of additive *intra-action* between the participants and the immersive machine intelligence.

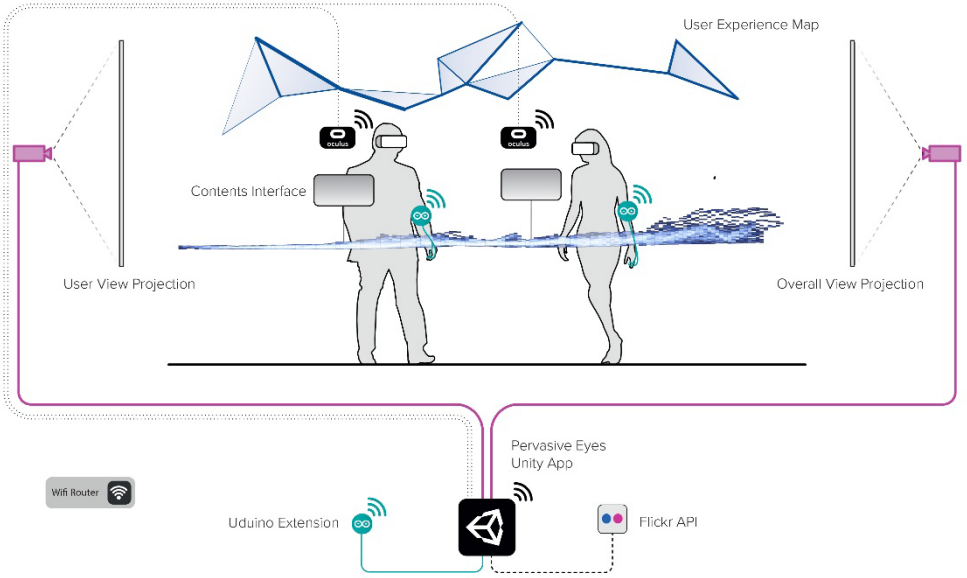

Figure 8
The digital infrastructure and the data flow.
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EVALUATION AND SIGNIFICANCE

Constructed as an adaptive informational landscape, the VR experience materialises for the participants and the general audience the layered geographical narratives, exploring the diverse range of affective connections to places displayed by the Flickr archive as the basis for an exercise of collective knowledge creation and spatial decision-making that uncovers fluctuating correlations across the metropolitan area, ultimately revealing how similar experiences might occur pervasively, cross-scale and cross-boundaries.

Figure 9
The wearable Wi-Fi GSR sensing device was built with Arduino Grove GSR sensors and WeMos D1 ESP 8266 microcontrollers. ©FLOW Architecture

Within the process of construction of the virtual archive of photographic memorabilia as a wayfinding system, a diverse set of agencies, comprised of a range of strong and weak messengers as well as their mediated representation, is explored with equal access. Displayed within the immersive VR, the results provide the audience with an instrument of self-reflection, a *co-evolutionary cognitive infrastructure* that engages the participants and the generative AI through mechanisms of spatial learning in a process of collective co-creation that offers opportunities for the exploration of local cultural niches and large-scale geographical correlations.

Along these trajectories, the project offers a timely understanding of contemporary psychogeographic methods for regional analysis and the construction of immersive ethnographic atlases, offering alternative strategies for the use of GSR sensing and immersive visualisation as a tool for collaborative self-reflection and practices of collective accountability. And by using spatialised and immersive human-machine collaboration enabled through mechanisms of *performative feedback*, it outlines novel strategies for geographical knowledge aggregation, collective automated learning, and reasoning,

The results offer a collective mediated practice that by layering cultural media and bodily phenomena develops novel aesthetics that emerge from the collaboration of technological infrastructures and human behaviours. And with the collective construction of an experiential archive of sensual and affective knowledge that maintains tight connections with the history of *intra-active* events that allowed for its description, they further outline novel strategies for a collective practice that, by dwelling on ideas of open attribution of significance, outlines new models for automated group negotiation and collective decision-making in a spatialized context.

While a revised production of the project would certainly benefit from improvements in the usability of the VR experience, including the introduction of a more natural touch-based interaction that avoids the use of controllers, further advances within the *practice of ecological*

and performative co-creation, as outlined by the project, should take the opportunity to develop further the methods of digital *intra-action* between the diverse agencies and the miscellaneous datatypes in consideration, exploring these ideas further within the context of multi-agential open systems that could include not only spatialised but material organisations.

AUTHORSHIP INFORMATION

Pervasive Eyes Asturias is a project by FLOW Architecture - Annarita Papeschi & Vincent Nowak. Project Team: Sohyun Ahn, Yusuf Ali, Vincent Nowak, Annarita Papeschi; Soundtrack: Floating In by xname, courtesy Nebularosa Records – © Eleonora Oreggia 2016.

Following Creative Common protocols, the VR installation Pervasive Eyes Asturias uses photographic materials and texts from the social media platform Flickr and remains licensed under an Attribution Share-alike Creative Common License.

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Figure 10
Pervasive Eyes Asturias at LABoral Centro De Arte y Creación Industrial in Gijón (ES) in 2021. Courtesy LABoral Centro de Arte y Creación Industrial © Marcos Morilla

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