Towards Empathy in Computational Design:
Co-Design and Semantic Metrics
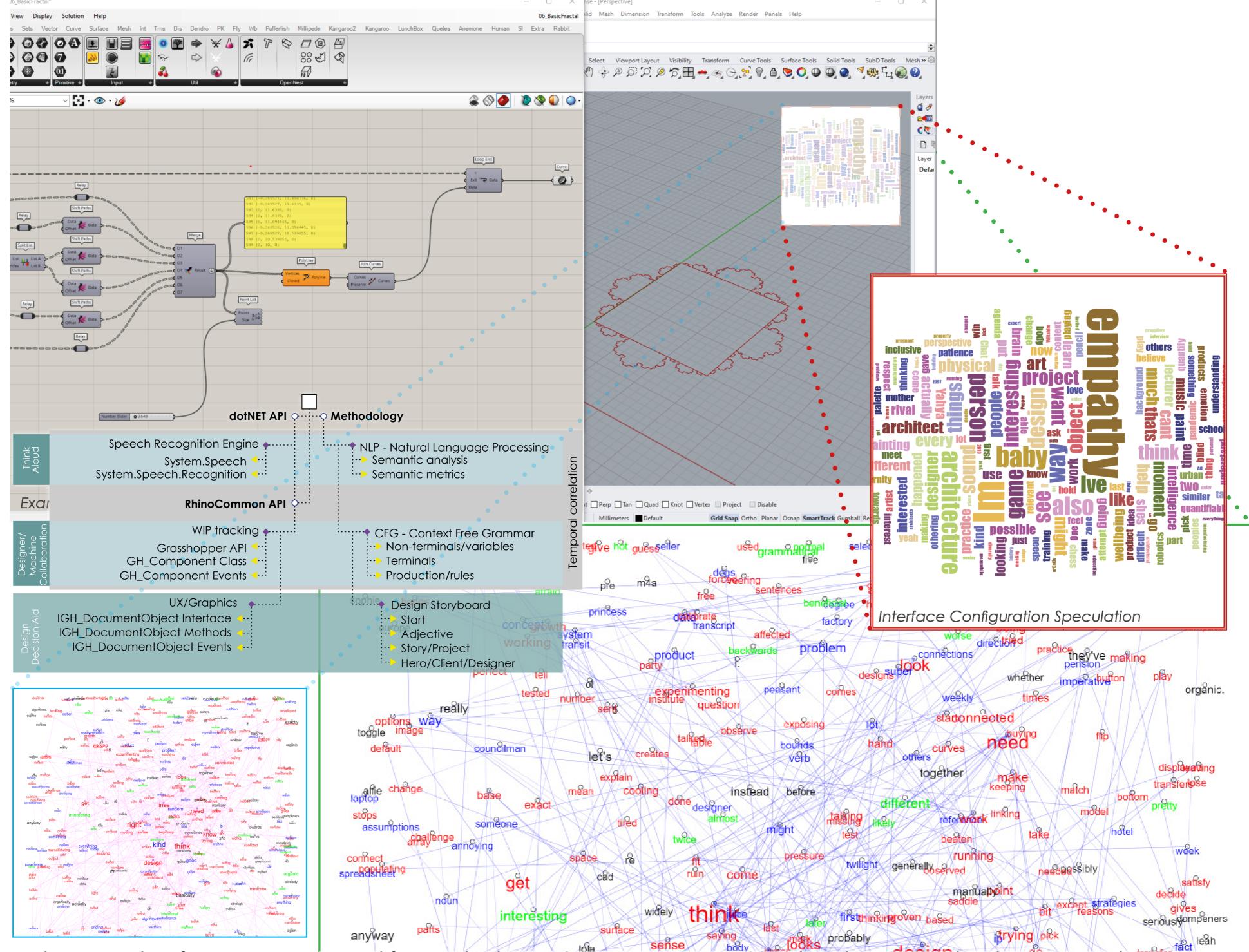
connected everything.

UWE Bristol · University of the West of England

Lancaster University

CARDIFF UNIVERSITY · PRIFYSGOL CAERDYDD

Yahya Lavaf Pour*[1], Merate Barakat[1], Mirian Calvo[2], **Anna Chatzimichali**[1]**

1. Department of Architecture and Build environment, UWE Bristol, UK
2. Lancaster Institute for the Contemporary Arts (LICA), Lancaster University, UK
*Corresponding Author: Yahya.lavafpour@uwe.ac.uk
**Presenter and PI

Today, computation design has provoked new theoretical frameworks on the systemic design processes (Derix & Izaki 2014). It is acknowledged that individuals possess varying "emotional intelligent quotients" at various levels. Indeed, Baron-Cohen and Wheelwright (Baron-Cohen and Wheelwright, 2004) refer to empathy as the measurable Emotional Quotient (EQ) factor that can be changed or improved through training and experience if individuals are willing to engage with empathic values. The study employed participatory design sessions (Co-design) and a series of sound-walks with experts in the design field to establish a taxonomy of empathy between designers and users. The participants mapped the empathic aspect of their design processes against the double diamond design process diagram. The co-design sessions and a separate focus group discussion were analyzed using an affinity diagram method, which identifies themes (patterns of meaning) in qualitative data and is well-established in many social science disciplines. Affinity diagramming resonates with context-based data analysis and is extensively used in design disciplines, management and anthropology (Simonsen & Friberg, 2014). It is equally valuable for idea generation, decision-making, and usability tests (Martin & Hanington, 2012).

Interface Configuration Speculation

The study aims to identify semantic metrics, codify empathy design aspects, and integrate them into the computational design ecosystem, namely Grasshopper3D, the most widely used computational platform. The Co-Design and focus group sessions and the varying EQ capacity of designers imply that the tool required should act as a design empathy coach that keeps track of the 1) design team brainstorming, 2) individual thought process, and 3) evolution of the Grasshopper definition. Figure 1 represents the WIP design development user interface using the developed tool. Currently, the tool is in its development stage employing Natural Language Processing NLP) to enable analyses of verbal design data (Becattini et al., 2020) and Context-Free Grammar (CFG) algorithms (Rao and Gudivada, 2018), shown in Figure 2. In addition, the tool will be integrated into the ecosystem of a computational design firm to test the user interface (verbal and graphic) and its effect on the design process. Further needed qualitative data includes design empathy terminology to build a database to inform the design storyboard resulting from the CFG, which further aids design. The focus of this project is the intersection of qualitative data analysis and computational methods; therefore, the further development of the tool will require alternating between disparate methodologies, pushing the boundaries of both fields.

References
Baron-Cohen, S. and Wheelwright, S. (2004) 'The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences.', Journal of Autism and Developmental Disorders, 34(2), pp. 163–175.
Becattini, N., Georgiev, G.V., Barhoush, Y. and Cascini, G., 2020, May. Exploring the applicability of semantic metrics for the analysis of design protocol data in collaborative design sessions. In Proceedings of the Design Society: DESIGN Conference (1), pp. 1205–1214. Cambridge University Press.
Cross, N. (2001) 'Can a machine design? Journal Item', 17(4), pp. 44–50.
Derix, C. and Izaki, Â. (2014) Empathic Space: The Computation of Human-Centric Architecture, John Wiley & Sons.
Simonsen, J. & Friberg, K. (2014). Collective Analysis of Qualitative Data. In Simonsen et al eds. Situated Design Methods. London, UK: MIT Press.
Martin, B. & Hanington, B. (2012) Universal Methods of Design. Beverly, MA: Rockport Publishers. Lavaf-Pour, Y., Barakat, M. and Chatzimichali, A. (2022) 'Embedded Intelligent Empathy: A Systematic Review Towards a Conceptual Framework'. Springer, Singapore, pp. 36–48. doi: 10.1007/978-981-19-1280-1_3.
Lavaf-Pour, Y., Barakat, M. and Chatzimichali, A. (2022) 'Embedded Intelligent Empathy: A Systematic Review Towards a Conceptual Framework'. Springer, Singapore, pp. 36–48. doi: 10.1007/978-981-19-1280-1_3.
Rao, C.R. and Gudivada, V.N. (2018) Computational analysis and understanding of natural languages: principles, methods and applications. Elsevier.