

Leveraging Aesthetic Expression in Visualization to Communicate Positive Facts During COVID-19 Pandemic

Wei Li
wei.li@tue.nl
TU Eindhoven

Mathias Funk
m.funk@tue.nl
TU Eindhoven

Aarnout Brombacher
a.c.brombacher@tue.nl
TU Eindhoven

ABSTRACT

The COVID-19 pandemic is a global public health crisis. Alongside the rapid geographical development and constantly rising number of confirmed cases, mixed spread of information and disinformation also plagued the public with distress, fear, and anxiety, transmitting a negative sentiment across many groups. Facing this, we experiment with the aesthetics of visualizations in educating laymen about positive facts during the pandemic. By blending artistic expressions into the visual encoding, we intend to tell a compelling data story describing the international scientific dedication in fighting the disease collaboratively. We present the visualization to collect feedback and evaluate the expected functions from general audience instead of traditional expert user groups.

CCS CONCEPTS

• **Human-centered computing** → **Visualization systems and tools**; **Visualization application domains**; • **Information systems** → **Web applications**; Collaborative and social computing systems and tools; *Spatial-temporal systems*.

KEYWORDS

COVID-19, SARS-CoV-2, artistic visualization, aesthetics, information visualization, geo-spatial, 3D visualization, positive design

ACM Reference Format:

Wei Li, Mathias Funk, and Aarnout Brombacher. 2020. Leveraging Aesthetic Expression in Visualization to Communicate Positive Facts During COVID-19 Pandemic. In *The 13th International Symposium on Visual Information Communication and Interaction (VINCI 2020)*, December 8–10, 2020, Eindhoven, Netherlands. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3430036.3430063>

1 MOTIVATION

1.1 The Role of Aesthetics

Conventionally, visualization tools and systems are designed for professional use, where dealing with complexity of data for rigorous analysis or scientific discovery is the primary focus. The discussions regarding the aesthetic attributes of visualization and its implications for fostering novel experience, especially for non-experts, are not sufficiently elaborated. However, aesthetic expressiveness in visualization has achieved plausible results in public

spaces, promoting fact-based civic engagements on societal issues such as awareness of vulnerable groups [4], neighborhood mutual-understanding [2], energy consumption [7, 13], and government’s financial transparency [7]. Advantages in these explicit areas motivate us to further experiment the role of visual aesthetics to communicate educative contents on global issues, particularly during the global crisis of COVID-19.

1.2 Positive Facts During COVID-19 Pandemic

Studies show that, with the global spread of disease and still growing case numbers, social distress and panic have also proliferated with rumors, conspiracy theories [5, 12], and racism assertions [12] on social media, causing mental harm to many. The significance of this issue is verified by the United Nations’ recent warning on public mental health, predicting that “A long-term upsurge in the number and severity of mental health problems is likely” [9]. Following the call by World Health Organizations [14], visualizations become a sound communication format to update the public on credible, timely data regarding the pandemic situation [11]. Professional capabilities such as analysis [6], modeling [3] and predication [1] are also geared up for the vital mission of disease control. However, little attention has been paid to alleviate the psychological sufferings of the population.

Following Moere *et al.*’s triangle model of information visualization [8], we take a step forward with an instantiation of the *visualization exploration* category, which replaces the typical goal of “utility” or “soundness” with “idealistic and visionary”. Our visualization strives to balance the negative thoughts with less-noticed positive facts about the ongoing global scientific alliance against the virus while confronting the likely mental epidemic after the coronavirus outbreak.

2 IMPLEMENTATION

Our implementation output is a 3D web-based interactive visualization showing the rising number of COVID-19 pandemic cases and comparing it with the collaborating global research efforts.

2.1 Data

The raw data used in the visualization is aggregated from multiple sources, including the official release from European Centre for Disease Prevention and Control (for distribution of case numbers)¹ and a processed version of the Kaggle CORD-19 challenge data (for voluminous publication data that contributes to the COVID-19

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

VINCI 2020, December 8–10, 2020, Eindhoven, Netherlands

© 2020 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-8750-7/20/12.

<https://doi.org/10.1145/3430036.3430063>

¹<https://www.ecdc.europa.eu/en/publications-data/download-todays-data-geographic-distribution-covid-19-cases-worldwide>



Figure 1: Co-authorships Involving Chinese Institutions: paper titles are displayed in bold following mouse hovering on a link. Contributing institutions in the country are enlisted on the left.

situation)². The institution names are batch geocoded through Microsoft Bing's open API. Some incomplete data points are cleansed after the aggregation.

2.2 Aesthetics & Design

The infection percentage of each country is shown as a translucent crimson walls on its border (Figure 1). Higher walls indicate a more serious situation and therefore a stronger incentive to level up border restrictions. Locations of involved institutions who have contributed to the pandemic research are indicated by light blue points on the earth. They are organically wired together by international co-authorships, which is animated in blue. We display the paper title and collaborating countries under each link in the center, which, by itself, marks a small step ahead. As people generally tend to associate red with feeling of danger and intensity, we prime the red color with a shade of blue to make it less aggressive and more pinkish, where the more saturated red is only used at the edges of extruded walls to make the states' border shape more pronounced and recognizable for easier navigation. The dominating presence of collaboration links is expressed through an animation effect, retouched with a sense of energy and vibrancy (which is not observable with static figures).

Before this reworked version, we have also experimented with a 2D design which, like many others, focuses on communicating the hazard of the disease (Figure 2). This version was abandoned because the design uses black borders on top of red areas as insets to resemble the wounds on the planet by COVID-19, which may distress the viewer. Through literature studies, we learned it is of much greater importance and urgency to communicate positive facts.

3 DISCUSSION & FUTURE WORK

As our work is oriented toward the general population, sophisticated visual and interaction techniques are avoided since perceived similarity is essential to the laymen's view of attractiveness [10].

²<https://www.kaggle.com/pgromano/cord19-paper-and-author-extract/metadata>

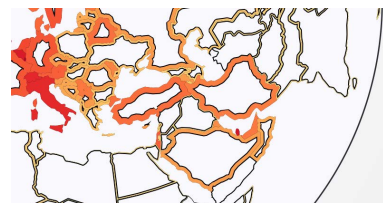


Figure 2: Cracking Globe: a previous design abandoned for its undesirable impact on social anxiety and distress.

We combined a straightforward origin-destination map with common interaction methods such as rotation, hovering, and inspection for easy adaptation and understanding. Our aim is to create societal awareness to the positive facts during the pandemic with an experience infeasible by texts or other static media. The work will be presented to non-scientific venues to collect comments and feedback for future discussions on the role of aesthetics in visualization.

REFERENCES

- [1] Jeremy Brice. 2020. Charting COVID-19 Futures: Mapping, Anticipation, and Navigation. *Dialogues in Human Geography* (June 2020). <https://doi.org/10.1177/2043820620934331>
- [2] Sandy Claes and Andrew Vande Moere. 2013. Street Infographics: Raising Awareness of Local Issues through a Situated Urban Visualization. In *Proceedings of the 2nd ACM International Symposium on Pervasive Displays (PerDis '13)*. Association for Computing Machinery, Mountain View, California, 133–138. <https://doi.org/10.1145/2491568.2491597>
- [3] Jack Dangermond, Corrado De Vito, and Cristiano Pesaresi. 2020. Using GIS in the Time of the COVID-19 Crisis, Casting a Glance at the Future. A Joint Discussion. *J-Reading-Journal of Research and Didactics in Geography* 1 (2020).
- [4] Patricio Dávila, Dave Colangelo, Maggie Chan, and Robert Tu. 2017. Expressive Cartography, Boundary Objects and the Aesthetics of Public Visualization. *Leonardo* 50, 5 (2017), 509–510. https://doi.org/10.1162/LEON_a_01233
- [5] Anneliese Depoux, Sam Martin, Emilie Karafillakis, Raman Preet, Annelies Wilder-Smith, and Heidi Larson. 2020. The Pandemic of Social Media Panic Travels Faster than the COVID-19 Outbreak. *Journal of Travel Medicine* 27, 3 (May 2020). <https://doi.org/10.1093/jtm/taaa031>
- [6] Franz-Benjamin Mocnik, Paulo Raposo, Wim Feringa, Menno-Jan Kraak, and Barend Kobbén. 2020. Epidemics and Pandemics in Maps – the Case of COVID-19. *Journal of Maps* 16, 1 (Jan. 2020), 144–152. <https://doi.org/10.1080/17445647.2020.1776646>
- [7] Andrew Vande Moere and Dan Hill. 2012. Designing for the Situated and Public Visualization of Urban Data. *Journal of Urban Technology* 19, 2 (April 2012), 25–46. <https://doi.org/10.1080/10630732.2012.698065>
- [8] Andrew Vande Moere and Helen Purchase. 2011. On the Role of Design in Information Visualization. *Information Visualization* 10, 4 (Oct. 2011), 356–371. <https://doi.org/10.1177/1473871611415996>
- [9] United Nations. 2020. *Policy Brief: COVID-19 and the Need for Action on Mental Health*. Technical Report.
- [10] Annemarie Quispel, Alfons Maes, and Joost Schilperoord. 2016. Graph and Chart Aesthetics for Experts and Laymen in Design: The Role of Familiarity and Perceived Ease of Use. *Information Visualization* 15, 3 (July 2016), 238–252. <https://doi.org/10.1177/1473871615606478>
- [11] Charlotte D. Smith. 2020. Incorporating Geographic Information Science and Technology in Response to the COVID-19 Pandemic. *Preventing Chronic Disease* 17 (2020). <https://doi.org/10.5888/pcd17.200246>
- [12] Monica Stephens. 2020. A Geospatial Infodemic: Mapping Twitter Conspiracy Theories of COVID-19. *Dialogues in Human Geography* 10, 2 (July 2020), 276–281. <https://doi.org/10.1177/2043820620935683>
- [13] Nina Valkanova, Sergi Jorda, Martin Tomitsch, and Andrew Vande Moere. 2013. Reveal-It! The Impact of a Social Visualization Projection on Public Awareness and Discourse. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. Association for Computing Machinery, Paris, France, 3461–3470. <https://doi.org/10.1145/2470654.2466476>
- [14] Yuxin Zhao, Sixiang Cheng, Xiaoyan Yu, and Huilan Xu. 2020. Chinese Public's Attention to the COVID-19 Epidemic on Social Media: Observational Descriptive Study. *Journal of Medical Internet Research* 22, 5 (2020), e18825. <https://doi.org/10.2196/18825>