Fighting Pandemics With Computer Graphics and Applications

Soraia Raupp Musse, *Pontifical Catholic University do Rio Grande do Sul, Porto Alegre, 90619-900, Brazil*
Nuria Pelechano, *Universitat Politecnica de Catalunya, 08034, Barcelona, Spain*

Recently, the world's population has experienced a very complicated situation, which was the pandemic caused by the SARS-CoV-2 virus. While societies saw services closed as the health crisis set in, several markets reinvented themselves, and technology appeared as an emerging area with varied solutions that supported applications ranging from diagnostics to entertainment, passing through the areas of education, government, and finance.

The development of new algorithms and computational solutions to simulate, visualize, and predict scenarios in the pandemic world has been a reality in recent years. Many researchers at universities and companies pursued the objective of proposing alternatives that would help people in this challenging period. Many of these alternatives involve solutions that contain techniques such as image processing, visualization, animation, and interaction, in short, processing and generation of graphic data. All these proposed techniques and methodologies are of great value to society and must be recorded in an appropriate manner and for an appropriate period of time, so that they can continue to be used, applied, and improved.

For this special issue, we requested articles describing methodologies that have been or could be used to help fight pandemics with computer graphics (CG). Through the formal *IEEE Computer Graphics and Applications* review process of 13 submissions, we have accepted three articles for this special issue.

The process was competitive because we wanted to present relevant methodologies, using state-of-the-art CG techniques, and with potential application in health and pandemic situations.

In [A1], Usman et al. present a multiscale geospatial dataset that interlinks location geography, population demographics, nonpharmaceutical government interventions related to COVID-19, and timestamped population movement patterns. This platform enables users to visualize the spread of the disease at different scales (from the country level to individual neighborhoods), and allows users to interact with the policies enforced at these scales (e.g., the closure of borders and lockdowns) to observe their impacts on the epidemiology.

In [A2], Olaizola et al. present a system based on mobile phone activities, via Bluetooth low energy technology, to provide data for monitoring people. In addition, this work explores the potential of visual analytics to extract and summarize relevant data from digital contact tracing to provide subjective and objective information about contact patterns among people. Results suggest that continuous monitoring of volunteer people combined with visualization techniques can include insights from data-driven processes, which represents an improvement if compared to intuitive taken decisions.

In [A3], Cao et al. discuss the relevant aspect of people living in environments that need to maintain social distancing. The authors propose DistAR, an Android-based application that uses the augmented reality (AR) technique and smart sensors to create a real-time social application. Indeed, the proposed technique helps users to maintain their desired measures in terms of social distances, in public environments.

Indeed, this special issue aggregates technologies that can be useful from the global point of view, right down to the individual perception of the space around. While Usman et al. propose the global connection among multiscale datasets allowing users to visualize the spread of the disease at different scales (from the country level to individual neighborhoods), Olaizola et al. describe an application that can monitor individuals and groups to explore patterns of behaviors, and finally from the microscopic point of view, Cao et al. propose an application that can help the individual to learn and maintain social distances using AR. We hope you enjoy reading these manuscripts.

We wish to thank Pak Chung Wong for his guidance in producing this special issue, and we also wish to thank the authors and reviewers for their really hard work.

0272-1716 © 2023 IEEE
Digital Object Identifier 10.1109/MCG.2022.3231441
Date of current version 31 January 2023.

APPENDIX: RELATED ARTICLES

[A1] M. Usman, H. Zhou, S. Moon, X. Zhang, P. Faloutsos, and M. Kapadia, "A multiscale geospatial dataset and an interactive visualization dashboard for computational epidemiology and open scientific research," *IEEE Comput. Graphics Appl.*, vol. 43, no. 1, Jan./Feb. 2023, doi: 10.1109/MCG.2022.3230444.

[A2] I. G. Olaizola et al., "Visual analytics platform for centralized COVID-19 digital contact tracing," *IEEE Comput. Graphics Appl.*, vol. 43, no. 1, Jan./Feb. 2023, doi: 10.1109/MCG.2022.3230328.

[A3] J. Cao, H. Mehmood, X. Liu, S. Tarkoma, E. Gilman, and X. Su, "Fighting pandemics with augmented reality and smart sensing-based social distancing," *IEEE Comput. Graphics Appl.*, vol. 43, no. 1, Jan./Feb. 2023, doi: 10.1109/MCG.2022.3229107.

SORAIA RAUPP MUSSE is an associate professor at Pontifical Catholic University do Rio Grande do Sul, Porto Alegre, 90619-900, Brazil, where she coordinates the Virtual Human Laboratory. Her research interests are crowd simulation, virtual human animation and visual perception. Musse received her Ph.D. degree in computer science from EPFL, Switzerland, supervised by Prof. Daniel Thalmann. She is the corresponding author of this article. Contact her at soraia.musse@pucrs.br.

NURIA PELECHANO is an associate professor at the Universitat Politecnica de Catalunya, 08034, Barcelona, Spain. Her research interests include simulation and animation of virtual humans for virtual reality. Pelechano received her Ph.D. degree from the University of Pennsylvania, Philadelphia, PA, USA, as a Fulbright Scholar. She is the president of the Eurographics Spanish Chapter and member of the Spanish Society of Computer Science. Contact her at nuria.pelechano@upc.edu.