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Keynote speech #2

2D/3D Image Morphing Technology from Traditional to Modern

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SUMMARY

Image morphing technology is a crucial area in computer graphics and computer vision, enabling various effects such as transformation, rotation, and deformation of 2D and 3D images. It has become essential in the metaverse, virtual reality (VR), industrial design, and so on. In recent years, the emergence of artificial intelligence (AI) has brought significant changes to image-morphing technology, impacting deformation effects and technological development profoundly. A comprehensive introduction of image morphing strategy is provided from three perspectives: (1) Linear deformation methods based on control points of topological network structures, focusing on techniques such as free-form deformation, Laplacian deformation, mesh deformation, etc., and introducing and exploring the fundamental principles of these methods. (2) Nonlinear deformation methods based on conditional constraints, addressing the limitations of linear deformation by using constraints on position, volume, and area, as well as linear blend deformation method of dual quaternions, and discussing the technical limitations of nonlinear deformation. (3) Image generative morphing methods based on large neural network models, analyzing cutting-edge techniques of the Diffusion models, Generative Adversarial Networks (GANs), and Sora world model architecture. They can fuse information from different datasets or modalities, and learn hidden distributions to achieve image generation, style transfer, and so on.

Index Terms— image morphing, linear and non-linear deformation, dual quaternion, image generative morphing, diffusion model, GAN, Sora.

BIBLIOGRAPHY

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Speaker's short biography:

Dr. Lin Jianchu, currently assuming a Master supervisor, member of IEEE, CAAI, CCF, is graduated from the University of Chinese Academy of Sciences (UCAS) in 2019 with a Ph.D. in Engineering, and has led research projects funded by the National Science Foundation of China (Granted No. 62341118; Granted No. U24A20330), the Jiangsu Province Education Department (Granted No. 21KJB52002), and companies, with a total funding of over 2 million RMB. His work focuses on transfer learning and 3D vision technology based on high-dimensional spatial geometric analysis. He has been honored as Outstanding Backbone Teacher of the Jiangsu Provincial Qinglan Project, Jiangsu Provincial Dual-Innovation Doctorate Scholar, Jiangsu Provincial Science & Technology Vice President, and Huai'an City Huaishang Yingcai. Additionally, he serves as the editorial board member of Journal Innovative Applications of AI, and reviewer for some top-tier journals such as the Pattern Recognition (PR), IEEE Transactions on Geoscience and Remote Sensing (TGRS), IEEE Transactions on Intelligent Transportation Systems (TITS), and IEEE Transactions on Consumer Electronics (TCE). He was invited as the Publication Chair for IEEE ICCD-2024, the Public Chair for ISRAI-2025, and the Program Chair for OCSA-2025.