Titolo: Semantic and Quality Oriented View Reconstruction Algorithms (SEQUOIA)

Codice Progetto: 2022KCKYA2

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CUP: C53C24000800006

Bando: PRIN 2022 - Decreto Direttoriale n. 104 del 02-02-2022

Durata: 05/02/2025 – 04/02/2027 (24 mesi)

Budget totale progetto: 229.395,00 €

Budget UNIPD: 155.248,00 €

Abstract del Progetto: Recent years have seen the development of multiview systems that allow an immersive and realistic experience of multimedia content. Multiview content can be exploited in several contexts and applications and it offers two main capabilities: a 360-degree representation of the scene, and the possibility of choosing the preferred point of view. While these features are appealing, the flexibility they offer comes with a cost: the recording, storage and transmission of multiple views require significant hardware and computational resources. For this reason, the scientific community has focused on the possibility ofsynthesizing new views from a limited number of real acquisitions. The challenges offered by these approaches are multiple and are related to the realistic and accurate prediction of geometry and appearance. The recent literature has shown how Deep Learning based architectures can significantly boost the quality of the synthesis, and the results have confirmed that neural-based rendering is currently the most promising research direction to be investigated, thanks to the ability of effectively understanding the captured scene, yet delivering a compact representation that can be easily stored and transmitted.

Neural-based rendering approaches are able to preserve the visual consistency with the training images; however, they are agnostic with respect to the semantic content of the underlying data. SEQUOIA will target the joint optimization of the visual consistency with quality features and a semantic understanding of the acquired scene. This can be achieved by: i) relying on the capabilities of deep learning based techniques for semantic segmentation, ii) exploring quality features related to the characteristics of synthesized views. Those aspects have been investigated in the past only partially, and their exploitation as driving inputs for neural-based rendering techniques has not been studied yet. The benefits of such an architecture are multiple and include, for example, the development of data augmentation strategies. This will allow to tackle the challenging problem of acquiring huge amounts of data to train a semantic segmentation model by virtually augmenting the number of available views.

Furthermore, the adoption of neural-based rendering techniques allows to greatly reduce the amount of data needed to synthesize new views. The transmission of the network parameters only will allow to perform the rendering in a lightweight fashion while preserving quality. The outputs of the system will be assessed both objectively and subjectively. To this aim, a new objective quality metric for multiview content will be defined and subjective tests will be designed and performed. Finally, SEQUOIA will provide a flexible framework that can be exploited in several application scenarios, such as autonomous systems or the recently born Metaverse.