Quality of Experience Evaluations for Multi-cloud Streaming

Problem Statement

Point clouds are widely used in immersive multimedia systems for building realistic and interactive 3D experiences
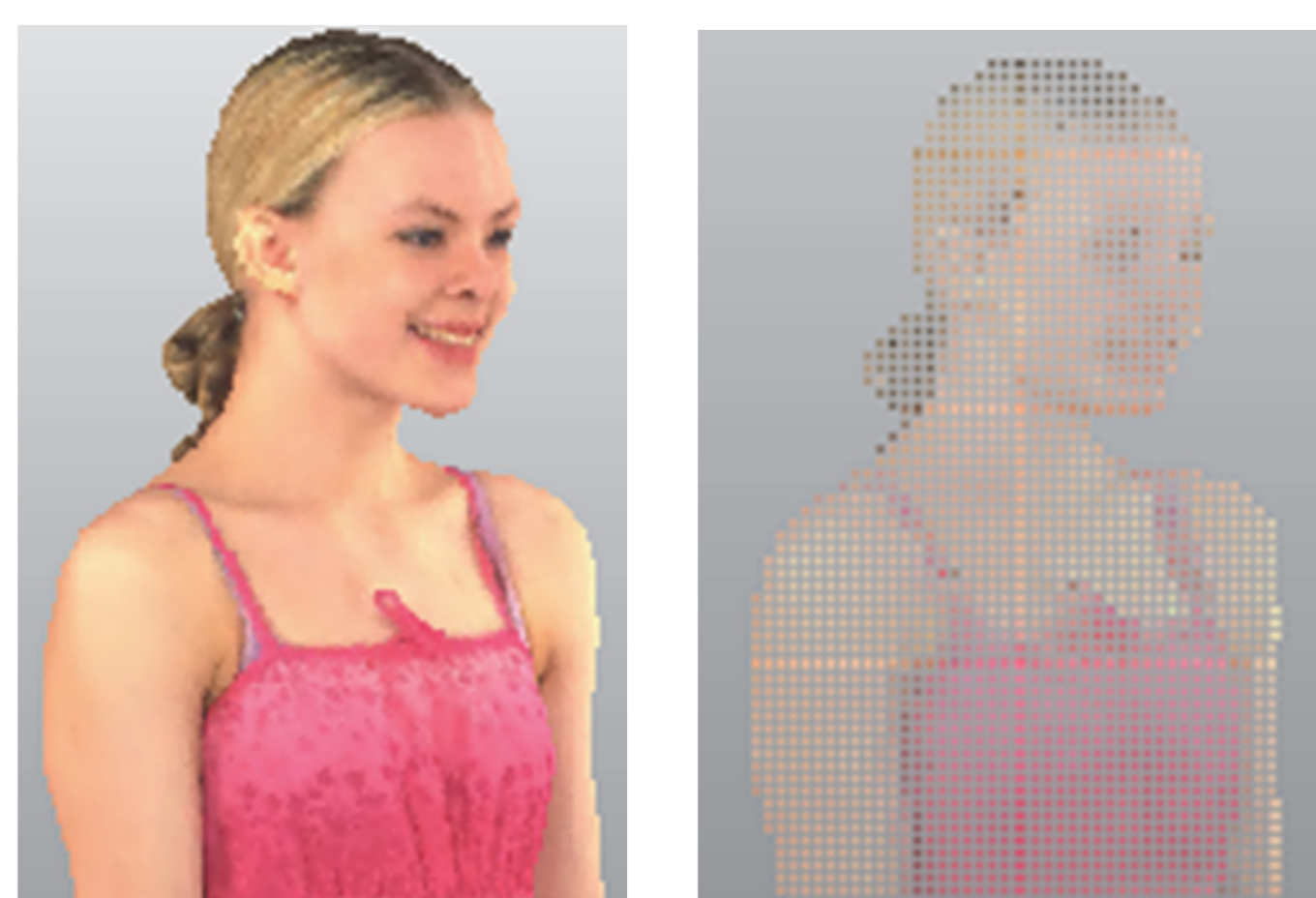
Problem: point clouds' large size introduces challenges for compression and streaming, especially in complex scenes with multiple objects viewed through head-mounted displays (HMDs)

Solution: develop dedicated applications to assess the Quality of Experience (QoE) of compressed point clouds on HMDs

**V-PCC**

G-PCC Octree

G-PCC Trisoup

App1: QoE Evaluation of Compressed Point Clouds on Modern HMDs

Objective: assess the perceived QoE of dynamic compressed point clouds in MR conditions on modern under-investigated HMDs: Meta Quest 3 and Apple Vision Pro

1. Development of a custom cross-platform application in Unity, compatible with Meta Quest 3 and Apple Vision Pro
   - Hand interaction without requiring physical controllers
   - Select a quality rating (from 1 to 5) for each point cloud

2. Conduction of two subjective quality assessment studies to evaluate the QoE of 48 dynamic compressed point clouds on the Meta Quest 3 and Apple Vision Pro HMDs
   - Dataset [1] includes 48 dynamic compressed point clouds

Compression		Quality Levels				
		Q1	Q2	Q3	Q4	Q5
V-PCC	Geometry QP	36	32	28	20	16
	Texture QP	47	42	37	37	22
G-PCC Octree Prediction	QP	-	-	40	34	28
	Depth	-	-	0.5	0.75	0.875
G-PCC Trisoup RAHT	QP	40	34	28	22	-
	Level	5	4	3	2	-
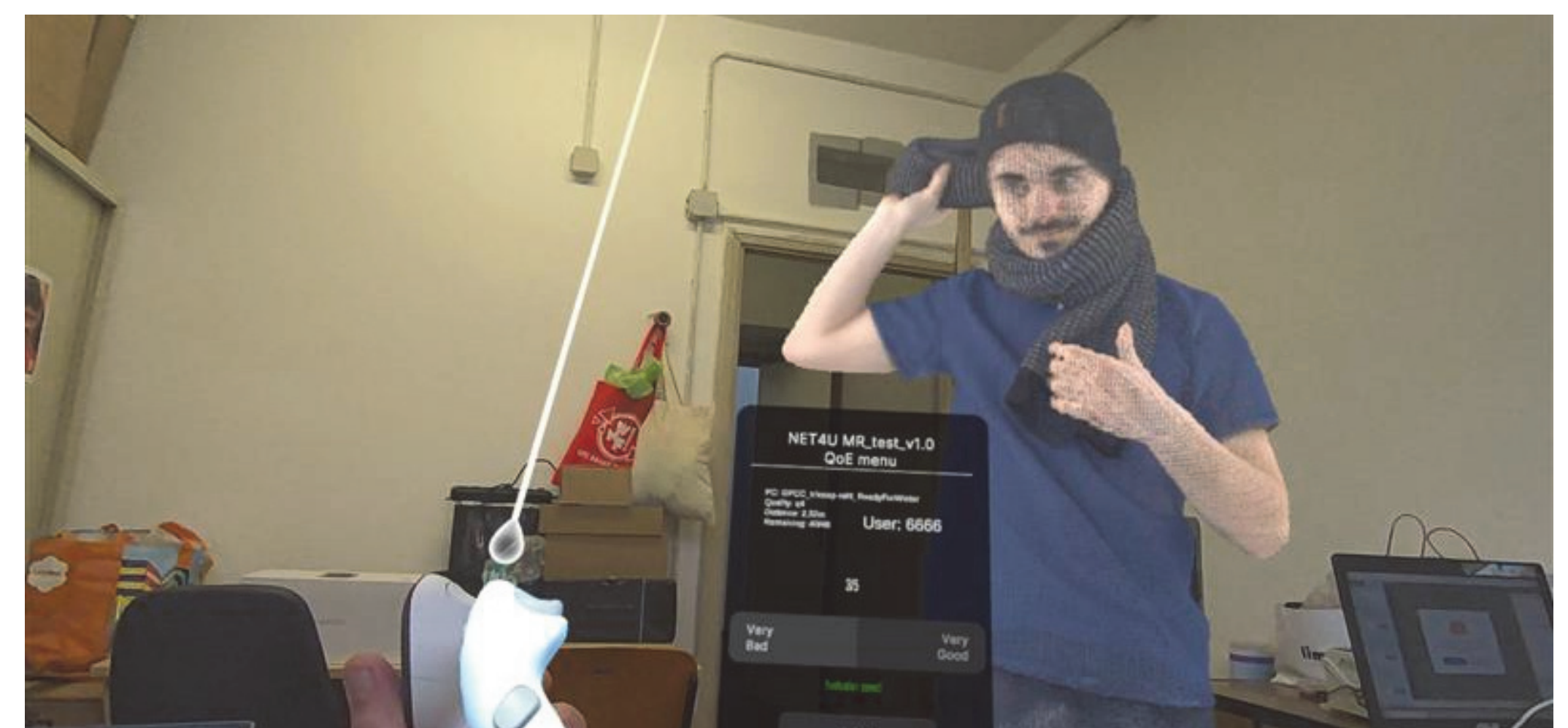
App2: Streaming of Multiple Point Clouds with Adaptive Quality

Objective: definition of an adaptive algorithm to stream multiple point clouds compressed at different levels of detail (LoD)

1. Novel dataset of point clouds of Pinuccio Sciola's sound stones
2. Compression of the point clouds at different LoD using V-PCC and G-PCC
3. Development of a custom cross-platform application in Unity, compatible with both Meta Quest 3 and Apple Vision Pro
4. Conduction of two subjective quality assessment studies to evaluate the QoE of compressed point clouds on Meta Quest 3 and Apple Vision Pro
   - Each scene contains three point clouds compressed at a different LoD and placed at a different distance from the user's point of view
5. Adaptive streaming algorithm that adjusts the quality of each point cloud based on the user's field of view, the number of visible objects, the available network bandwidth, and the rendering capacity of the HMD

References

[1] https://ftp.itec.aau.at/datasets/ComPEQ-MR/Compressed-point-cloud/

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