## Visionair Report

*Project*: "A high-quality distributed collaborative virtual environment based on low-cost depth cameras"

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## Challenges and Work description

The work developed during the visit is part of a large project aimed at realizing an immersive Distributed Collaborative Virtual Environment. One of the main challenges of the project is the transmission of the depth information towards remote locations. Such a depth information is acquired using low-cost RGBD camera such as Microsoft Kinect. For the purpose of transmission, a novel algorithm capable of meshification and compression of depth images has been developed. The algorithm is based on a particular remeshing technique based on a selective refinement of a Delaunay triangulation [1]. This step transforms in real-time a range image into a good-quality triangle mesh that is then compressed using a special implementation of the state-of-the-art single-rate mesh compression.

## Results and future work

The developed algorithm transforms a depth frame into a good quality mesh made of about 2000 triangles. Once compressed, it requires about 50kbit of memory. Since the Microsoft Kinect device acquires at the frame rate of 30 Hz, our compressed depth stream requires a bandwidth of about 1.5Mbps, against the 73Mbps of raw data. This result allows to stream data coming from an array of RGBD devices over a good network connetcion. The work developed during the visit has been published at VRCAI 2012 [1] and has been integrated into the BEAMING project as illustrated in the following picture. It shows a CAVE running an interactive telepresence session where two main entities are rendered: a static model of a remote room acquired offline by a moving Kinect and rendered as a point cloud; a time varying model of a few people working at the desk acquired in the CAVE and the remote people can interact in real-time.



References:

[1] "Real-time compression of depth streams through meshification and valence-based encoding",F Bannò, PS Gasparello, F Tecchia, M Bergamasco, VRCAI '12 Proceedings of the 11th ACM SIGGRAPH International Conference on Virtual-Reality Continuum and its Applications in Industry