# Real-Time Texturing for Multi-Camera 3D Modeling

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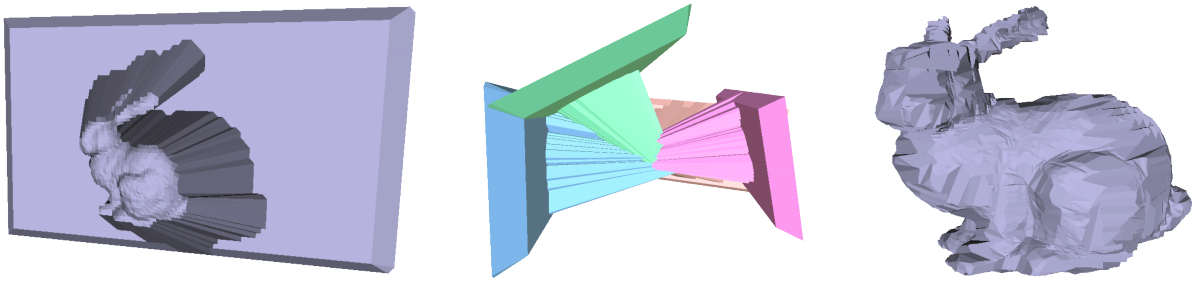

Multi-camera environments, based on classical cameras and/or depth sensors (Kinect), are today commonly used to investigate the next generation of telepresence systems. A few years ago we developed EPVH, a classical 3D modeling algorithm that builds a 3D geometry (mesh) from the silhouettes extracted from the images taken by the cameras surrounding the scene. EPVH[1] has been successfully used for off-line 4D video processing [7] and online 3D interaction and telepresence [2,3]. The current EPVH implementation runs in real-time (30fps) with 12 2Mpixel cameras. But today as we have a platform with 68 cameras, each one capture 4Mpixel images at 30fps (http://kinovis.inrialpes.fr). The challenge we are facing is to enable real time modeling at this very large scale. We recently developed a new 3D modeling algorithm, mKCSG, able to produce at high performance the 3D mesh from these 68 cameras. But for rendering this mesh needs to be textured from the color information extracted from the camera images. The difficulty is to select the relevant data from the cameras and assemble them to build a texture of the computed 3D mesh. A naïve solution that consists simply in forwarding all camera images to a single machine to compute this texture fails due to the too large amount of data. The goal of this internship is to develop new texture computing solutions, mixing solutions like image compression, specific indexation technics and taking benefit of the computing power of GPUs.

We are looking for students with a good background in either computer vision, computer graphics, and strong motivations and interest for 3D algorithms, acceleration data structures, computational geometry.

The candidate will be able to rely on our simulation infrastructure with synthetic and real data sets. This will enable her/him to focus on the texturing problem itself and not the secondary tasks (camera calibration for instance). For performance experimentations, (s)he will have access to the 68 camera platform driven by a high performance PC cluster.

**References:**

[1] J.S. Franco and E. Boyer, “Efficient Polyhedral Modeling from Silhouettes,” IEEE Transactions on PAMI, Vol. 33, issue 3, pp. 414-427, March 2009. hal.archives-ouvertes.fr/docs/00/34/91/.../pami-epvh-final.pdf

[2] Multi-Camera Real-Time 3D Modeling for Telepresence and Remote Collaboration. Benjamin Petit, Jean-Denis Lesage, Clément Ménier, Jérémie Allard, Jean-Sébastien Franco, Bruno Raffin, Edmond Boyer and François Faure. International Journal of Digital Multimedia Broadcasting, 2010. http://www-id.imag.fr/~raffin/papers/ID/ijdmb10.pdf
[3] A 3D Data Intensive Tele-immsersive Grid. Benjamin Petit, Thomas Dupeux, Benoit Bossavit, Joeffrey Legaux, Bruno Raffin, Emmanuel Melin, Jean-Sébastien Franco, Ingo Assenmacher and Edmond Boyer. ACM Multimedia (ACMM'10), 2010. http://www-id.imag.fr/~raffin/papers/ID/acmm10.pdf.
http://www.dailymotion.com/swf/video/xe03fq_daliafinalacmm2010_tech
[4] Grimage platform at INRIA. http://grimage.inrialpes.fr
[5] J.S. Franco, B. Petit and E. Boyer. 3D Shape Cropping. VMV 2013.
[7] 4D Repository. http://4drepository.inrialpes.fr/