

Research Topic 30 for the ParisTech/CSC PhD Program

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:

ali.siadat@ensam.eu AND yvon.velot@ensam.eu

Subfield: (Applied Mathematics, Computer Science)

ParisTech School: Arts et Métiers

Title: Shape modeling of the world through augmented reality

Advisor(s): (Ruding LOU, ruding.lou@ensam.eu, <http://institutimage.ensam.eu/>)

Short description of possible research topics for a PhD:

Nowadays the augmented reality (AR) technology become widely used in the daily life thanks to the newly innovated device such as Microsoft HoloLens. This technology usually allows people to interact with digital content in 3D (virtual mock-up) in the real world. In the literature, most of the research work have worked on how to visualize the virtual mock-up together with real elements, which let people believe it belongs to the real environment. The challenge was how to deduce the correct transformation (translation, rotation and scale) of the virtual mock-up according to the point of view on the real elements. Other works have illustrated various possibility to interact with the virtual mock-up as what people can do with a real object. One application is to reshape or modify geometrically the virtual mock-up with the consideration of the real environment to which it should belong. **The contribution of thesis is to propose a new AR system that allows people to redesign virtually the shape of the real objects.** The objects in the real world will be digitalized at first and then become the virtual mock-up to interact with in the real world with AR application. The digitalized object will be usually a triangle mesh to modify by the people, which needs also to modify the rest of the real world in order to adapt the change of the digitalized object.

Required background of the student: programming, geometric modeling, digitalization, mesh reconstruction and editing, augmented reality.

A list of 5 (max.) representative publications of the group: (Related to the research topic)

- R. Lou, A. Mikchevitch, J.-P. Pernot, P. Véron, Merging enriched Finite Element triangle meshes for fast prototyping of alternate solutions in the context of industrial maintenance, *J. CAD*, 42-8, pp. 670-681, 2010.
- R. Lou, F. Giannini, J-P. Pernot, A. Mikchevitch, B. Falcidieno, P. Véron, R. Marc, Direct modification of semantically-enriched Finite Element Meshes, *IJSM*, 16-81, pp. 81-108 (2010).
- R. Lou, J.-P. Pernot, F. Giannini, A. Mikchevitch, P. Véron, B. Falcidieno, R. Marc, *Semantic-preserving mesh direct drilling, proc. SMI'10*, pp.68-77, Aix-en-Provence, France, 2010
- R. Lou, J.-P. Pernot, F. Giannini, P. Véron, B.Falcidieno, Filleting sharp edges of multi-partitioned volume finite element meshes, *J. EC*, 32-1, pp. 129 - 154, 2014.
- B. Li, R. Lou, F. Segonds, F. Merienne, Multi-user interface for co-located real-time work with digital mock-up: a way to foster collaboration?, *IJIDeM*, pp. 1-13, 2016.