Fully Funded SEAHA Studentship:

Mass digitization and metadata enrichment of 3D cultural heritage artefacts by automatic and user-based metadata acquisition

The pace at which digital assets for Arts, Heritage and Archaeology are being acquired continues to accelerate in both the raw volume acquired and the variety of datatypes being recorded. The Fraunhofer Institute for Computer Graphics Research IGD (Fraunhofer-IGD) has recently developed CultLab3D1, the worldwide first approach at fast and economic 3D mass digitisation of cultural heritage artefacts. Given a digitization frequency of 10 minutes or less per artefact, the need arises for automatic or semi-automatic acquisition of metadata to support integration of newly acquired artefacts into a collection through annotation of, or linkage between, digitised assets. This research project seeks to develop new methods to improve and speed-up metadata acquisition, using methods such as comparing similarity gradients to assess the geometric similarity between two objects or parts of two objects, or mining data sources accessible in the Internet for context information on digitized artefacts. The goal is to ease up the work of a curator or expert to a point where ideally he/she only needs to adapt or approve annotations suggested by the system.

Aims and methodology: The key research questions are:

1. What impact can mass digitization technology have on the working practices of cultural heritage organisations, and what metadata is required to support them?
2. What new opportunities for automatic and user-based metadata acquisition are facilitated by such technology and what tools are required to support them?
3. How can cultural heritage organisations deploy mass digitization and metadata acquisition approaches to undertake effective large-scale acquisition campaigns?

These broad questions will be addressed by considering more concrete technological questions such as:

1. How can current ontologies used in Cultural Heritage support different modalities of semantic enrichment (e.g. automatic, semi-automatic, crowd annotation)?
2. What type of interfaces could support experts and non-expert to guide semantic annotation of digitised artefacts?
3. How can the process of semantic enrichment be automated using the results of different shape analysis algorithms and existing semantic ontologies?
4. How can a practical workflow be developed to automate the digitisation and semantic enrichment of a large collection of artefacts?
5. How can the effectiveness of automatic identification of semantic content be measured?

The work will build on a web-based 3D-centered annotation platform which Fraunhofer-IGD have developed alongside their 3D digitization pipeline, supporting semantic enrichment using different types of ontologies (e.g. CIDOC-CRM, Dublin core, ESM) and database technologies (e.g. MySQL, Sesame). The approach will be to (a) develop research scenarios for new approaches to CH research that could be empowered by the availability of large-scale digital assets; (b) select an experimental set of artefacts to explore the practicalities of large scale digitisation and the balance of automatic vs manual annotation; (c) engage with potential CH researchers to explore relationships in the resulting digital collection and

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1 Website: [www.cultlab3d.de](http://www.cultlab3d.de) – last visited: June 28, 2015
evaluate the degree to which the automation of annotation can produce results that would not have been anticipated without the use of these technologies.

**Academic entry criteria:** We welcome students with a first or upper-second computer science (or equivalent experience), with experience of semantic technologies (ontologies, metadata, RDF, SPARQL), strong programming skills (Java, C#, C++) and web skills (HTML5, JavaScript and Apache Tomcat). Knowledge of the Repository Framework “Fedora Commons Repository” is also desirable. You need to have a commitment to working in a multi-disciplinary environment within a cultural context and excellent proficiency in English – knowledge of German would be an advantage. Please contact the academic lead supervisor Dr Roger Evans (R.P.Evans@brighton.ac.uk) if you have any queries about the project and your suitability for it.

**Further information:** The project is part of the EPSRC Centre for Doctoral Training in Science and Engineering in Arts, Heritage and Archaeology (www.seaha-cdt.ac.uk). SEAHA students are involved in activities ranging from residential events and group projects, to conferences and careers events. The SEAHA Studentship will cover home fees and a stipend of up to £16,726 per year (current rate) for eligible applicants (http://www.seaha-cdt.ac.uk/opportunities/eligibility-criteria/) and a substantial budget for research, travel, and cohort activities. The student will pursue the MRes SEAHA at UCL in year 1 and then be registered at the University of Brighton for years 2-4 of the SEAHA scholarship. The student will be resident for extended periods of time at Fraunhofer Institute for Computer Graphics, Darmstadt and supervisory arrangements will involve regular travel between Darmstadt and Brighton for the student and the supervisors, as well as participation in the cohort activities. Specialist training will be provided in the generation and analysis of environmental data, GIS and the use of NDT methods.

**How to apply:** Your application should include:

- A covering letter clearly stating:
  - Your motivation and how the course will contribute to your career development
  - Your residency status and eligibility for funding according to the information provided http://www.seaha-cdt.ac.uk/opportunities/eligibility-criteria/, or how you intend to sponsor your studies if not eligible for funding
  - Your academic eligibility
- Names of two academic referees (or one academic and one professional if applicable)
- Proof of meeting the UCL English language proficiency requirements where necessary. For SEAHA candidates, an advanced level certificate is normally required (details of English language proficiency requirements can be found at http://www.ucl.ac.uk/prospective-students/graduate/apply/english-language/index)
- A short research proposal (max. 2000 words) written by taking into consideration the above research questions

The award will be subject to a Grant Agreement between University of Brighton, Fraunhofer Institute for Computer Graphics Research, and partner cultural organisations.

Applications should be sent by email directly to the SEAHA Centre Manager: manager@seaha-cdt.ac.uk
UCL Institute for Sustainable Heritage
**Application deadline:** Open until filled
UCL Taking Action For Equality