1 Year Software Engineer Position
Synthesis and Simulation of Surgical Process Models - International

Environment

To foster research and innovation at highest international level, the french government has launched the program "Investissements d'Avenir". As part of the former, the program "Laboratoires d'Excellence" is assigned 1 billion Euros in capital, for a 10 years period. The CominLabs (http://www.cominlabs.ueb.eu) is an initiative selected as part of the "Laboratoires d'Excellence" program by the French ministry of research and education. It has been assigned 40 Million Euros in capital, resulting in an effective annual funding of 1.4 Million Euros for a 10-year period. The CominLabs has been the only Laboratoire d'Excellence selected in the area of software sciences. One research area of CominLabs is ICT for personalized medicine. Within this challenge, the project S3PM (« Synthesis and Simulation of Surgical Process Models ») has been selected as one of the first funded projects.

The S3PM project developed a set of technologies for facilitating development of VR based procedural surgical training systems. It combined three technologies: description of observed surgical procedures by means of ontology, synthesis of surgical process models from observations allowing generalization, and VR based collaborative simulation of the process models. This innovative combination of technologies facilitates development and simulation of complex, realistic and highly-variable scenarios, which is a strong characteristic of sensitive professional contexts such as medicine and surgery. A patent was submitted on this aspect. A very first simple neurosurgical scenario was initially developed simulating 6 basic actions in the craniotomy phase where the user as a scrub nurse had to give the right instruments to the virtual surgeon in the right order. Recently, the project has implemented a scenario for training scrub nurses on surgical table installation. This scenario was implemented thanks to observations of real surgeries and interviews with scrub nurses. A 6mn scenario was simulated with about 150 surgical instruments and 50 different interactions between the user and the virtual environment. User experiments are starting to assess the user acceptability involving 10 senior and 10 junior neurosurgical scrub nurses.

The objective of the associated S3PM-Int project is to demonstrate the added value of the S3PM system by 1) adapting the surgical table installation scenario to the Japanese practice and culture, 2) performing user experiments, 3) adding the system into a curriculum, and 4) facilitating industrial transfer. The project involves two Japanese partners: the CAMIT research institute in Fukuoka (Japan) and a Japanese company.

Missions and activities

The software engineer will have to adapt the developed scenario to the Japanese specificities. It includes 1) identification of differences in term of objects and scenarios, 2)

search for 3D models of new objects, 3) developed the scenario to take into account differences, 4) test the acceptability of the scenario in collaboration with the Japanese group, 5) study and promote usage of the developed scenario. Travels to Japan will facilitate definition of specifications, transfer of development, and user studies.

Competence and Profile

The candidate should have a MD or an engineering school degree. Experience related to VR technologies. Programming skills are required (C++, Python) as well as Unity. Salary: about 2200 Euros / month (net). Two missions in Japan will be organized. Duration: 1 year. Location: MediCIS team, Laboratory of Signal and Image Processing, Medical University, Rennes, France.

Partners

Team MediCIS (P. Jannin, B. Gibaud) is one of the five research teams in the LTSI U1099 institute. This institute is dedicated to biomedical engineering, is composed by about 100 researchers and students and is part of the " Institut national de la santé et de la recherche médicale" (INSERM), which is the leading research institute in medicine in France. MediCIS has an extensive experience in Image Guided and Computer Assisted Neurosurgery, Augmented Reality, and Surgical Process Modeling.

Team HYCOMES (B. Caillaud) is a joint Inria Rennes / Irisa team. Its main objective is the development of mathematical models, algorithms and tools supporting rigorous contract-based reasoning methods in embedded systems design. The team has a strong background on the realization by algorithmic methods of concurrent reactive systems from partial and heterogeneous specifications combining both logical properties and operational scenarios.

Team Hybrid (ex VR4i) (V. Gouranton, B. Arnaldi) is a joint Inria Rennes / Irisa team. The main concern is to allow real users to interact naturally within shared virtual environments, as interaction can be the result of an individual interaction of one user with one object or a common interaction of several users on the same object.

Contact. Application and CV should be sent to Pierre JANNIN MediCIS/UMR U1099 LTSI ● INSERM/Université de Rennes I ● 2, Avenue du Pr. Léon Bernard CS34317 35043 Rennes Cedex France ● http://medicis.univ-rennes1.fr ● pierre.jannin@univ-rennes1.fr

Some practical information: http://medicis.univ-rennes1.fr/