Workshop on "Finding solutions to improve the reconstruction process in Region-of-Interest Tomography"

November 17 - 20, 2015

Elettra – Sincrotrone Trieste S.C.p.A., S.S. 14 – km 163.5 in Area Science Park, 34149 Basovizza (Trieste, Italy)

Local organizers: Lucia Mancini, Diego Dreossi, Giuliana Tromba (Elettra, SYRMEP Group), Francesco Brun (University of Trieste, Elettra).

Background & aim of the workshop:
The X-ray Computed Tomography (CT) technique has been heavily investigated and is continuously evolving over the last two decades.
To satisfy the heterogeneous needs of CT users, flexible solutions are required both from the hardware and software point of view. The use of synchrotrons and microfocus X-ray sources present complementary approaches to CT experiments being characterized by different properties in terms of achievable spatial resolution, field of view and image contrast. Moreover, the growing demand of quantitative image analysis imposes an integrated approach between the CT reconstruction process and the subsequent steps needed to extract quantitative parameters.
The main aim of this event is to bring together experimentalists, mathematicians and computing scientists and explore a specific topic in CT data collection and reconstruction.
This focused meeting will host a small group of mathematicians and computational scientists at the Elettra - Sincrotrone Trieste laboratory (Italy). The purpose of the meeting is to study in detail the Region-Of-Interest (ROI) problem in CT. In fact, in ROI-CT reconstructed images are often corrupted by artefacts that, in some cases, mask part of the information contained in the image itself. Find solutions require a full comprehension of the origin of these artefacts.
Micro-CT data will be analyzed on site having the ability to acquire the data at varying contrast and spatial resolutions on different instruments. The whole object will be imaged at medium spatial resolution by using a conventional CT instrument based on a microfocus source and then a ROI will be selected and imaged at higher spatial resolution. The same kind of approach will be adopted at the SYRMEP beamline of Elettra where a high spatial resolution micro-CT instrument based on a synchrotron source will be available. A mixed approach employing the conventional and synchrotron sources for the same object will be also explored.
At Elettra, we have developed a tomography-oriented scientific workflow which integrates the reconstruction process as well as data reduction and data analysis tools.
Some of the software solutions adopted by the SYRMEP Group of Elettra will be illustrated during hands-on sessions and the results will be discussed together with alternative solutions proposed by the participants.

To summarize, this focused meeting is primarily aimed at a) identifying the origin of artefacts in ROI-CT images, b) at finding specific approaches for their reduction/elimination, c) at gaining insight about image acquisition protocols and reconstruction algorithmes employed by other groups, and d) at identifying possible future collaborations.

Preliminary workshop program:

November 17 (Tuesday):

9 am – 10 am:	Arrival, distribution of access cards, setting up internet connection etc
10 am - 11 am:	Welcome, Visit to the Elettra site, SYRMEP beamline and TomoLab instrument.
11 am – 12.30 pm:	Introductory talks by Lucia Mancini and Diego Dreossi
12.30 pm - 2 pm:	Lunch break
2 pm – 5.30 pm:	Presentations by participants on their own CT-related work (~ 30 minutes each + questions)

November 18 (Wednesday):

8.30 am – 12.30 pm:	Lab session and introduction to data processing and image reconstruction in synchrotron X-ray CT.
12.30 pm - 2 pm:	Lunch break
2 pm - 5 pm:	Data analysis, discussion and hands on problem solving.

November 19 (Thursday):

8.30 am – 12.30 pm:	Lab session and introduction to data processing and image reconstruction in conventional X-ray CT
12.30 pm - 2 pm:	Lunch break
2 pm – 5 pm:	Data analysis, discussion and hands on solution approaches
Around 5 pm:	Departure followed by a social event.

November 20 (Friday):

9.00 am – 12.00 pm:	Round table about results, strategies for problem solving and potential for future collaborations
12 p.m. to 12.30 pm:	Closing remarks
12.30 pm - 2 pm:	Lunch break
	Departure of participants