SÃO JOSÉ DOS CAMPOS
SIBGRAPI '16
XXIX CONFERENCE ON GRAPHICS, PATTERNS AND IMAGES

Tutorials (T) – Schedule

T1 – Introduction to Research in Magnetic Resonance Imaging
Tuesday (Oct, 4)
09:00 – 17:30
Fábio Cappabianco (UNIFESP), Claudio Shida (UNIFESP), Jaime Ide (Stony Brook University)

Abstract: The advent of magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI) of the brain has changed forever conventional patient diagnosis and treatment in medicine. Instead of employing invasive procedures, now physicians can not just literally see internal body structures but also understand and map more clearly brain functions related to specific tasks, feelings, and behaviors. This paper aims at introducing the acquisition process, image processing, analysis and evaluation, and the most popular tools for both structural MRI and fMRI. It is an opportunity for students and researchers who are interested in getting started in the area, understanding what are the challenges and unexplored fields, and how to avoid the most common traps and pitfalls.

T2 – An Overview of Max-Tree Principles, Algorithms and Applications
Tuesday (Oct, 4)
09:00 – 17:30
Roberto Souza (FEEC-UNICAMP), Luís Tavares (FEEC-UNICAMP), Letícia Rittner (FEEC-UNICAMP), Roberto Lotufo (FEEC-UNICAMP)

Abstract: The max-tree is a mathematical morphology data structure that represents an image through the hierarchical relationship of connected components resulting from different thresholds. It was proposed in 1998 by Salembier et al., since then, many efficient algorithms to build and process it were proposed. There are also efficient algorithms to extract size, shape and contrast attributes of the max-tree nodes. These algorithms allowed efficient implementation of connected filters like attribute-openings and development of automatic and semi-automatic applications that compete with the state-of-the-art. This paper reviews the max-tree principles, algorithms, applications and its current trends.

T3 – Tensor Fields for Multilinear Image Representation and Statistical Learning Models Applications
Tuesday (Oct, 4)
14:00 – 17:30
Tiene Andre Filisbino (LNCC), Gilson Antonio Giraldi (LNCC), Carlos Eduardo Thomaz (FEI)

Abstract: Nowadays, higher order tensors have been applied to model multidimensional image data for subsequent tensor decomposition, dimensionality reduction and classification tasks. In this paper, we survey recent results with the goal of highlighting the power of tensor methods as a general technique for data representation, their advantage if compared with vector counterparts and some research challenges. Hence, we firstly review the geometric theory behind tensor fields and their algebraic representation. Afterwards, subspace learning, dimensionality reduction, discriminant analysis and reconstruction problems are considered following the traditional viewpoint for tensor fields in image processing, based on generalized matrices. We show several experimental results to point out the effectiveness of multilinear algorithms for dimensionality reduction combined with discriminant techniques for selecting tensor components for face image analysis, considering gender classification as well as reconstruction problems. Then, we return to the geometric approach for tensors and discuss opened issues in this area related to manifold learning and tensor fields, incorporation of prior information and high performance computational requirements. Finally, we offer conclusions and final remarks.

T4 – Image Operator Learning and Applications
Tuesday (Oct, 4)
14:00 – 17:30
Igor Montagner (IME-USP), Nina Hirata (IME-USP), Roberto Hirata Jr. (IME-USP)

Abstract: High-level understanding of image contents has been receiving much attention in the last decade. Low level processing figures as a building block in this framework and it also continues to play an important role in several specific tasks such as in image filtering and colorization, medical imaging, and document image processing. The design of image operators for these tasks is usually done manually by exploiting characteristics specific to the domain of application. An alternative design approach is to use machine learning techniques to estimate the transformations. Given pairs of images consisting of a typical input and respective desired output, the goal is to estimate an operator that transforms the inputs into the desired outputs. In this tutorial we present a rigorous mathematical formulation to the framework of learning locally defined and translation invariant transformations, practical procedures and strategies to address typical machine learning related issues, application examples, and current challenges. We also include information about the code used to generate the application examples.