ΤΜΗΜΑ ΜΗΧΑΝΙΚΩΝ Η/Υ ΚΑΙ ΠΛΗΡΟΦΟΡΙΚΗΣ ΠΑΝΕΠΙΣΤΗΜΙΟ ΙΩΑΝΝΙΝΩΝ
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ΠΑΡΟΥΣΙΑΣΗ
ΔΙΔΑΚΤΟΡΙΚΗΣ ΔΙΑΤΡΙΒΗΣ

ΗΜΕΡΟΜΗΝΙΑ: Δευτέρα, 15 Δεκεμβρίου 2014

ΩΡΑ: 16.00

ΑΙΘΟΥΣΑ: Αίθουσα Σεμιναρίων (ισόγειο Ι1-Ι2)
Κτήριο Τμήματος Μηχανικών Η/Υ & Πληροφορικής

ΟΜΙΛΗΤΗΣ: **Δημήτριος Γερογιάννης**

Θ έ μ α

«Feature Extraction for Image and Point Set Analysis»

«Εξαγωγή Χαρακτηριστικών για Ανάλυση Εικόνων και Συνόλων Σημείων»

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ΤΜΗΜΑ ΜΗΧΑΝΙΚΩΝ Η/Υ ΚΑΙ ΠΛΗΡΟΦΟΡΙΚΗΣ ΠΑΝΕΠΙΣΤΗΜΙΟ ΙΩΑΝΝΙΝΩΝ
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Περίληψη

This thesis is divided into two parts. The first part focuses on an algorithm that fits line segments to a set of unordered points and its application to computer vision problems.

The method is based on the observation that a set of collinear points are characterized by a covariance matrix whose minimum eigenvalue is low and therefore defines an eccentric (elongated) ellipse. At first, a single ellipse is fitted to the whole set of points which is then iteratively split to a large number of highly eccentric ellipses. Then, a merge process follows in order to combine neighboring ellipses with almost collinear major axes to reduce the complexity of the model. Experimental results on various databases show that the proposed scheme is an efficient technique for modeling unordered sets of points and shapes by line segments. A number of computer vision application of the method are also presented: the localization of the vanishing point in an image sequence, the detection of retinal fundus image features, such as end-points, junctions, and crossovers, an algorithm for sampling image edges and a framework for modeling and removing outliers from a set of unordered points. All of the above methods were successfully compared to various alternative methods of the related literature and provided in general better results.

The second part of the thesis focuses on the problem of image and point set registration. Registration is the process of determining the parameters of a geometric transformation that brings into alignment two images or point sets. In this work, the images/point sets to be registered are modeled by a mixture model and a method relying on the minimization of the distance between distributions is proposed. We address the problems of single and multimodal registration by employing both Gaussian mixture models and mixtures of Student's t distributions, which are robust to outliers. Moreover, we express the task of registration as a Bayesian regression problem with by modeling the non rigid transformation by relevance vector machines which provide a closed form solution for the estimation of the transformation. An iterative algorithm is presented which first determines the correspondence between pixels/points in the two data images/points sets and then the non rigid transformation is estimated based on that data association.