Erschienen in: Computer Graphics Forum ; 30 (2011), 1. - S. 229-230

Eurographics 2010 Workshop on 3D Object Retrieval (EG 3DOR'10) in cooperation with ACM SIGGRAPH

The 2010 Eurographics Workshop on 3D Object Retrieval took place on 2 May 2010 in Norrköping, Sweden. After the workshops held in Crete (2008) and Munich (2009), this was the third edition of this event.

Since 2008, the goals of the workshop are to advance the state of art in 3D Object Retrieval, drawing on different fields including computer vision, computer graphics, machine learning and human–computer interaction, among others. It aims to stimulate discussion and provide a cross-fertilization ground for researchers interested in this topic, and to identify future challenges in this area.

The workshop co-chairs were Mohamed Daoudi and Tobias Schreck. The program co-chairs were Michela Spagnuolo, Ioannis Pratikakis, Remco Veltkamp and Theoharis Theoharis. A program committee of 26 international experts was assembled to help with the reviewing process.

In response to the call for papers, the workshop received 17 papers, which on average were reviewed by three reviewers for novelty, quality, contribution and presentation. Based on these reviews, eight papers were selected as full papers and four as short papers. With these accepted works, a program of sessions on 3D shape descriptors, part-based representation for retrieval, 3D face recognition and learning and benchmarking was formed.

In the sequel, short descriptions of the presented papers are given.

Raif M. Rustamov presented a volume-based shape descriptor that is robust with respect to changes in pose and topology. In this approach, shape distributions are aggregated throughout the entire volume contained within the shape thus capturing information conveyed by the volumes of shapes.

Ivan Sipiran *et al*. presented an interest point detector for 3D objects based on Harris Corner Detection, which has been used with good results in computer vision applications. They proposed an adaptive technique to determine the neighbourhood of a vertex, over which the Harris response on that vertex is calculated. This method is robust to affine transformations (partially for object rotation) and distortion transformation such as noise addition. Moreover, the distribution of interest points on the surface of an object remains similar in transformed objects, which is a desirable behaviour in applications such as shape matching and object registration.

Hamid Laga introduced a new framework for the automatic selection of the best views of 3D models. The approach is based on the assumption that models belonging to the same class of shapes share the same salient features that discriminate them from the models of other classes. The main issue is learning these features. Laga proposed a data driven approach where the best view selection problem is formulated as a classification and feature selection problem. The classifier learns the set of 2D views that maximize the similarity between shapes of the same class and also the views that discriminate shapes of different classes. The experiments using the Light-Field (LFD) descriptors and the Princeton Shape Benchmark demonstrate the performance of the approach and its suitability for classification and online visual browsing of 3D data collections.

M. Attene *et al*. proposed a new framework for an efficient detection of template shapes within a target 3D model, or scene. The proposed approach distinguishes from the previous literature because the part-in-whole matching between the template and the target is obtained by extracting off-line only the shape descriptor of the template, while the description of the target is dynamically and adaptively extracted during the matching process. This novel framework, called the Fast Reject schema, exploits the incremental nature of a class of local shape descriptors to significantly reduce the part-in-whole matching time, without any expensive processing of the models for the extraction of the shape descriptors. The schema has been tested on three different descriptors and results are discussed in details. Experiments show that the gain in computational performances does not compromise the accuracy of the matching results.

S. Marini *et al.* proposed, in the context of shape matching, a framework for selecting the Laplacian eigenvalues of 3D shapes that are most relevant for shape comparison and classification. Three approaches are compared to identify a specific set of eigenvalues such that they maximize the retrieval and/or the classification performance on the input benchmark data set: The first k eigenvalues, by varying k over the cardinality of the spectrum; the Hill Climbing technique; and the AdaBoost algorithm. In this way, they demonstrated that

the information coded by the whole spectrum is redundant and the shape matching results can be improved by using only a set of selected eigenvalues. Finally, they tested the efficacy of the selected eigenvalues by coupling shape classification and retrieval.

R. Wessel *et al.* proposed a feature selection technique that decomposes 3D point clouds into sections that can be represented by a plane, a sphere, a cylinder, a cone, or a torus. They introduced a probabilistic framework for analysing and learning the spatial arrangement of the detected shape primitives with respect to training objects belonging to certain categories. The knowledge acquired in this learning process allows for efficient retrieval and classification of new 3D objects. They evaluated their algorithm on the recently introduced 3D Architecture Shape Benchmark, which mainly consists of 3D models representing man-made objects.

Berretti *et al.* addressed the problem of person-independent 3D facial expression recognition. To this end, an original approach is proposed that relies on selecting the minimal-redundancy maximal-relevance features derived from a pool of SIFT feature descriptors computed in correspondence with facial landmarks of depth images. Training a Support Vector Machine for every basic facial expression to be recognized, and combining them to form a multiclass classifier, an average recognition rate of 77.5% on the BU-3DFE database has been obtained. Comparison with competitors' approaches using a common experimental setting on the BU-3DFE database shows that the solution is able to obtain state of the art results.

A.P. Jagadeesan *et al.* reported a study which investigated the proposition that Internet Crowdsourcing could be used to quickly and cheaply provide benchmark classifications of 3D shapes. The collective judgments of the anonymous workers produce a classification that has surprisingly fine granularity and precision. The paper reports the results of validating Crowdsourced judgements of 3D similarity against Purdue's Engineering Shape Benchmark, and concludes with an estimate of the overall costs associated with large-scale classification tasks involving many tens of thousands of models.

The workshop furthermore included a poster session: in this authors introduced their work first by a short talk and then interactively discussed the posters with workshop attendants. Afzal Godil presented a poster on '3D Shape classification based on Multi-scale Integral Orientations'. Fabien Moutarde presented a poster on '3D Object Recognition and Person Facial Identification Using Time-averaged Single-views from Time-of-flight 3D Depth-Camera'. Li Dong presented two posters on 'A New Functionality-based Benchmark for Basic CAD Model Retrieval' and 'Shape Similarity Assessment Approach for CAD models based on Graph Edit Distance'.

In addition to the aforementioned oral paper presentations, 3DOR'10 hosted the 3D Shape Retrieval Contest (SHREC 2010), whose aim is to evaluate the effectiveness of 3D shape retrieval algorithms. This year's contest was organised by Remco Veltkamp and comprised three distinct tracks, namely, *Protein Models, Range scans, Generic 3D Warehouse, Feature detection and description, Robustness, Correspondences, Non-rigid shapes and Large scale retrieval.*

The workshop was attended by 29 participants who showed much enthusiasm and great interest in the research work presented in the workshop by their vivid participation. Fruitful discussions took place throughout the workshop program and also during a 'round table' session at the end of the workshop.

The possibility to publish extended versions of selected papers from the workshop in a Special Issue of the Springer Visual Computer Journal after a further review has been initiated and is currently being worked on.

We are grateful to the members of the IPC for reviewing the papers and ensuring a high-quality program. Also, we would like to thank the four Program Chairs for ensuring a high-quality final selection and acting as session chairs during the program.

We would also like to thank the Eurographics association as well as ACM SIGGRAPH for their support. Special thanks are due to Stefanie Behnke for her constant and timely involvement with the reviewing management system, proceedings publication, and registration system. We also cordially thank Camilla Forsell for her great help with the local arrangements of the workshop and for acting as a liaison to the main Eurographics conference. We also thank the Fraunhofer Institute for Computer Graphics Research for the financial backing.

It is planned to organize a fourth edition of this workshop in collocation with Eurographics 2011 in LLandudno, UK. Initial planning has already begun during the 2010 workshop, with Hamid Laga of Tokyo Institute of Technology offering to serve as one of the co-chairs of that event.

Mohamed Daoudi and Tobias Schreck