

3D TERRESTRIAL LASER TECHNOLOGY IN SPORTING CRAFT 3D MODELLING

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Abstract

The urgent need to increase productivity and competitiveness demands from sporting craft builders the incorporation of newer design and manufacturing technologies, as CAD/CAM and CNC machining systems. This paper describes the sporting boats' 3D surface modelling, needed for automated manufacturing processes, through terrestrial laser scanner technology. The methodology followed for data collection and data processing is described in detail, advantages and limitations of this technique are displayed and the accuracy of the obtained results is also estimated. According to obtained results, this technology proves to provide accurate results and to be cost and time effective. 13 refs.

(Extended paper from the International Symposium CompIMAGE – Coimbra, Portugal, 20-21 October 2006.)

Key Words: *Sporting Craft, Terrestrial Laser Scanner, 3D Modelling*

COMPUTING STATISTICS FROM MAN-MADE STRUCTURES ON THE EARTH'S SURFACE FOR INDEXING SATELLITE IMAGES

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Abstract

Indexing and retrieval from remote sensing image databases relies on the extraction of appropriate information from the data about the entity of interest (e.g. land cover type) and on the robustness of this extraction to nuisance variables. Other entities in an image may be strongly correlated with the entity of interest and their properties can therefore be used to characterize this entity. The road network contained in an image is one example. The properties of road networks vary considerably from one geographical environment to another, and they can therefore be used to classify and retrieve such environments. In this paper, we define several such environments, and classify them with the aid of geometrical and topological features computed from the road networks occurring in them. The relative failure of network extraction methods in certain types of urban area obliges us to segment such areas and to add a second set of geometrical and topological features computed from the segmentations. To validate the approach, feature selection and SVM linear kernel classification are performed on the feature set arising from a diverse image database. 11 refs.

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Key Words: *Road Network, Indexation, Retrieval, Feature Statistics*

EFFICIENT APPROXIMATION OF THE MAHALANOBIS DISTANCE FOR TRACKING WITH THE KALMAN FILTER

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Abstract

In this paper, we address the problem of tracking feature points along image sequences efficiently. Thus, to estimate the undergoing movement we use an approach based on Kalman filtering, which performs the prediction and correction of the features' movement in every image frame. Measured data is incorporated by optimizing the global association set built on efficient approximations of the Mahalanobis distance (MD). We analyze the difference between the usage in the tracking results of the original MD formulation and its more efficient approximation, as well as the related computational costs. Experimental results which validate our approach are presented. 14 refs.

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Key Words: *Tracking, Data Association, Mahalanobis Distance, Kalman Filter, Computational Vision*

TEXTUAL DESCRIPTION OF IMAGES

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Abstract

We present in this paper a new method for image description based on the description of encompassed regions. Image is firstly segmented in meaningful regions and in the next step these regions are represented semantically in a tree structure. Regions are described by means the geometry of their outline contours and the description of encompassed internal regions. An XML language XLWDI (XML Language for Writing Descriptors of Images) is proposed to write these descriptions. This method may be used for image coding in multimedia applications or for image description in computer vision applications for well contrasted images. Experiments conducted over real images are presented and explained. 36 refs.

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Key Words: *Image, Region, Silhouette, Descriptor, XML Language*

INTEGRATED GRAPHICAL ENVIRONMENT FOR SUPPORT NONLINEAR DYNAMIC SOFTWARE FOR THE ANALYSIS OF PLANE FRAMES

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Abstract

Nonlinear structural analyses allow reproducing in a more realistic sense the behaviour of structures subjected to several types of complex loading conditions, e.g. earthquakes. However, it is largely recognized that these analyses normally generate a considerable amount of results, being difficult its interpretation. Over the last years considerable progresses have been made in structural nonlinear behaviour modelling, associated to the fast growing development of numerical algorithms for structural analysis and computer capacities. However, a similar growth in the development of graphical results visualization tools has not been witnessed. To face this, a graphical processor called VISUALANL was developed for an existing nonlinear dynamic analysis program for plane frame structures, PORANL. 14 refs.

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Key Words: *Visual Interface, Engineering Software, Structural Analysis, Non-linear Models, RC Structures*

EFFICIENT STOCHASTIC GRADIENT SEARCH FOR AUTOMATIC IMAGE REGISTRATION

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Abstract

This paper focuses mainly on an efficient stochastic gradient search algorithm for the study of optimal registration transformation. A simultaneous perturbation stochastic approximation technique is successfully implemented on image registration by optimizing mutual information based similarity measures. The hill climbing search and simplex direct search are also conducted in the experiments for the comparative purpose. The registration experiments are associated with the pairs of optical sensor images, synthetic aperture radar images and medical multimodality images, which are misaligned by the rigid or affine transformations. The experimental results show that in general the stochastic gradient search yields significant improvements on the optimal solution over the conventional hill climbing and simplex direct search in terms of accuracy and robustness. The main contribution of this paper is the first accomplishment of an efficient stochastic gradient search strategy on the mutual information based automatic image registration. 16 refs.

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Key Words: *Image Registration, Optimization Technique, Stochastic Gradient, Mutual Information, Affine Transformation*

THE USE OF VIRTUAL REALITY MODELS IN CIVIL ENGINEERING TRAINING

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Abstract

Virtual Reality techniques were used to develop educational didactic models in the area of Civil Engineering. The visualization of the distinct physical steps of a construction is shown in the virtual applications here presented. The developed models bring new perspectives in the teaching activity as a support to expose new curricular programmes or complex sequence construction. In order to obtain models, which would be able to visually simulate the geometric evolution of the construction activity, techniques of geometric modelling and virtual reality were used. The models make it possible to view the physical evolution of the work, to follow the planned construction sequence and to visualize details of the form of every component of the works. They also support the study of the type and method of operation of the equipment necessary for these construction procedures. These models have been used to distinct advantage as educational aids in first-degree courses in Civil Engineering. 11 refs.

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Key Words: *Engineering Education, Visual Simulation, Virtual Reality, 4D Models*