

idea is to set a limiter to the subtraction value between two pixels and to prevent the illegally large value from affecting the matching evaluation of a whole window. Our method can suppress the correspondence errors by a different approach to the conventional ones that try to avoid windows on boundaries. It needs no iterative computations and is effective for real-time processing. We first derive the conditions that the limiter value should satisfy for suppressing a correspondence error. By using the conditions we can estimate the effective limiter value. We next show that SEVL is not so sensitive to the value setting of limiter. This means SEVL is effective even by using a fixed limiter value. Experiments by using real stereo images show the effectiveness of the proposed method.

key words: *matching, occlusion, stereo, SAD, evaluation value*

Partial-Scrambling of JPEG2000 Images without Generating Marker Codes

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A method is described for efficient partial-scrambling of JPEG2000 images that avoids generating marker codes and improves the ability to control the degree, strength, and computational complexity of scrambling. This higher control ability is due to the use of a parameter. This parameter also controls the scrambling time, an important consideration for real-time processing.

key words: *partial-scrambling, marker code, JPEG2000, EBCOT, image-compressing*

Acceleration of Narrow Band Method and Its Application to Topology-Adaptive 3-D Geometrical Modeling

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We present a new fast method of modeling 3-D objects of arbitrary topology. The Level Set Methods have been used by many researchers to recover 3-D shapes. However, those methods are computationally inefficient. To reduce the computational cost, a new method named FNB (Fast Narrow Band Method) is proposed. FNB is based on the Narrow Band Method which is the well-known fast

method. The main idea is to exploit the combinative use of the narrow band and the distance from the front. We find that FNB is 5 times faster than the Hermes Algorithm, one of the fastest methods.

key words: *range image, topology-adaptive object modeling, level set method, surface evolution*

Associating Semantically Structured Cooking Videos with Their Preparation Steps

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We introduce a method to associate video segments with preparation steps in a supplementary cookbook by combining video structuring and text-based keyword matching. Although preparation steps in cookbooks are easy to browse, they lack visual information that videos contain. Since visual information is exceptionally important to understand cooking procedures, their integration should lead to efficient and thorough understanding. An evaluation experiment applied to 20 recipes showed high accuracy especially in association per video segments, i.e. indexing preparation steps to video segments. The results could be considered as an important step for video-oriented indexing applications such as video abstraction.

key words: *cooking video, textbook, association, video segment, video indexing*

Similar Music Retrieval Using Polyphonic Binary Feature Vectors and Its Acceleration

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We propose a method for retrieving similar music from a polyphonic-music audio database using a polyphonic audio signal as a query. In this task, we must consider similarities among polyphonic signals of the music, and achieve quick retrieval. Therefore, we first introduce a polyphonic binary feature vector to represent the presence of multiple notes. This feature is suitable for search based on the similarities among polyphonic audio signals. Then, we present a new search method, which is quicker than the exhaustive use of DP matching. The search is accelerated using a "similarity matrix" to limit the search space. Experiments using a test

database containing 216 music pieces show that the search accuracy using the proposed feature is higher than that using the conventional spectrum feature. For example, when the average length of the queries is 19 s, the accuracy is 89.3% for the proposed feature, whereas it is 62.5% for the conventional spectrum feature. It is also shown that the new search method retrieves similar music 1.6 to 18 times faster than the exhaustive use of DP matching without accuracy degradation.

key words: music retrieval, polyphonic music, audio signal search, polyphonic binary feature vector

Proposal of an Evaluation Set Selection Method for a Corpus-Based Speech Translation Technology

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We propose a test set selection method to sensitively evaluate the performance of a speech translation system. The proposed method chooses the most sensitive test sentences by removing insensitive sentences iteratively. Experiments are conducted on the ATR-MATRIX speech translation system, developed at ATR Interpreting Telecommunications Research Laboratories. The results demonstrate the effectiveness of the proposed method. Our method can reduce the test set size to less than 50% of the original size while improving evaluation reliability.

key words: speech translation, evaluation, evaluation set selection, paired comparison, ATR-MATRIX

Noninvasive Determination of Optical Parameters in Multi-Layered Scattering Media Using Finite Difference Time Domain Analysis

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Noninvasive determination of optical parameters for multi-layered inhomogeneous scattering media has been successfully formulated by minimizing mean square differences of measured and predicted reflectance based on finite difference time domain (FDTD) analysis. It has been become clear that iterative least mean square error correction for the three subsets of optical parameters characterized by time integrated differential reflectance amplitude with respect to the optical parameters and characterized by the differential

reflectance time profiles independencies gives the optical parameters images within the accuracy of 1% in three-layered adult head model.

key words: diffusion equations, finite difference time domain analysis, inverse problem solution, least mean square, optical parameters

The Development of a Physiological Simulation System for the Human Circulatory System Coupling Macro and Micro Models

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This paper describes the development of a physiological simulation system coupling macro and micro circulatory system models. The macro circulatory system model includes comprehensive functional units of the whole body, and the mathematical model represents the circulatory physiology. The micro circulatory system model describes the hemodynamics with the heart as a pump by differential equations, and analyzes the beat-by-beat blood flow in millisecond units. The integration of the general circulation with the beat-by-beat blood flow offers different perspectives on physiological changes and makes the model applicable for evaluation of micro changes in hemodynamics under a variety of parameters.

key words: circulatory system model, beat-by-beat heart model, cardiovascular system model, physiological simulation, macro and micro integrative physiology

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LETTERS

Pattern
Processing

Modeling Implicit Surfaces with Proliferating Sample Points

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Implicit surfaces are useful in 3D computer graphics, since they can express refined and/or complicated curved surfaces compactly and precisely. Visualization of an implicit surface often requires uniform sample points on it. In this paper we propose a sampling method based on the "proliferating-sample-point model." The method enables uniform and effective sampling and polygonization. We also apply the method to some complicated implicit surfaces and confirm its effectiveness.