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Issuing Digital Color Imaging in Biomedicine

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1. Introduction

One essential problematic factor involved with digital imaging in biology and medicine is color itself and another is medical imaging. The study of the former has a fairly long history in the field of engineering and that of the latter, especially monochrome images, also has a long history in the medical field. There have been some individual cooperative researches between these two fields, but it was not easy to make comprehensive studies required to solve the emerging color problem.

To resolve this situation, some new movements have arisen recently. In April 2000, a new academic society, which is aimed at a wide range of research collaboration between the engineering and medical fields, was established after a couple of symposia focused on the color of digital imaging in biology and medicine. Furthermore, the first textbook of digital color imaging in biomedicine was written by the leading members of the Society and was published last February.

In this paper, an outline of this state-of-the-art textbook of this research field is described.

2. Steps to Publication

As a new research field grows, demand for a comprehensive literature that gives newcomers a guide to the field becomes larger. In June 2000, an application for a Grant-in-Aid from the Japanese government for publishing the English version of the Proceedings of the 1st Symposium of the 'Color' of Digital Imaging in Medicine was accepted. Because the estimated publishing date is almost two years after the appearance of the original Japanese version and the progress in this research field has been so rapid, we have negotiated for permission to modify the title of the publication and to add an important guest editor and a small number of substantial co-authors for the purpose of updating the contents.

In consequence, four co-editors and 17 co-authors were engaged in rewriting 14 articles in English. Finally a separate volume named 'Digital Color Imaging in Biomedicine' was completed and published on 28 February 2001.

3. Editing Policy

The editing process was carried out under the leadership of the guest editor, who is the Chairperson of Committee of Publication of Digital Biocolor Society. Reflecting the recent rapid and large progress in this area, some papers required updating with the hottest discoveries made after the symposium and others

required summarizing and editing of outdated paragraphs - therefore large differences in length among them were allowed.

In order to avoid the confusion caused by erroneous color reproduction that can occur in printed material, the editors decided that all the tables and the figures would be printed in black and white and their colored versions distributed with the digital version of each paper. You will find them either in the attached CD-ROM or at the URL indicated beside the abstract of each paper.

Every digital version can be read free at <http://biocolor.umin.ac.jp/book200102/> and Digital Biocolor Society will guarantee every version of each paper to be the original one according to the Document Identification Number (DIN) indicated beside the abstract of each paper.

4. Contents at a Glance

Rapid Progress of Multimedia in Medicine and the Increasing Importance of Color

Key factors that cause the rapid spread of information technologies in medicine and key strategies to establish some rules for transferring color data in medical fields in order to prevent inaccurate reproduction of colors leading to erroneous diagnosis are reviewed.

How to Manage Color in Telemedicine

Color transmitted to a distant place and reproduced on a display unit may possibly be affected by differences in illumination, characteristics of the camera and modification made during transmission. A technique of compensating for distorted color is discussed in detail, in which a color chart taken simultaneously with the object is used to adjust color values of displayed images.

Applications of Color Image Processing Based on Spectral Information

The conventional RGB systems cannot reproduce precise colors required for reliable diagnosis and multispectral imaging will give an important solution. After an outline of the use of the spectral reflectance of the object for color image processing, transmission and reproduction are reviewed, most recent research on the analysis and estimation of spectral reflectance, and some applications are described.

Medical Application of a Color Reproduction System with a Multispectral Camera

A medical imaging system using a multispectral camera for accurate color reproduction under various illuminations is described. A data format for the transmission and storage of multispectral images together with the information that can be used for these color adjustment processes is also discussed.

A New Instrument for Measuring the Human Skin Color

A new measuring system for skin color is described, which was developed based on a noncontact-type spectrophotometer equipped with a globe for light integration to eliminate significant problems of conventional instruments.

Capturing and Reproducing Colored Images Used in Medicine

A developing plan of a new medical imaging system is mentioned, in which colors are observed uniformly under different conditions of illumination.

Medical Application of Digitized Movies and the Status of Their Color Management

The history of movies used in medicine, the relationship between the characteristics of the human visual sense and the performance of color reproduction, and the present state of color management of movies from the standpoint of both video and computers are mentioned.

Proposal for Standardization of Digital Color Imaging in Morphological Laboratory Diagnosis

Diagnostic problems of unstable color reproduction revealed by recent studies in laboratory medicine and

possible strategies, including introduction of ‘diagnostic equivalence’, to standardize color of digital image are discussed.

The Color of Digital Imaging in Pathology and Cytology

A history of color in pathology and its significance are reviewed, and then pathological digital imaging, telepathology and computerized screening in cytology are discussed in the aspect of color.

From the Standpoint of Dermatology

After reviewing the great significance of skin color in dermatology and a history of recording media for skin color, diagnostic problems of present digital imaging technology and expectations towards future technology are discussed.

Digital Imaging in Forensic Medicine

Significance of color in forensic medicine is mentioned and a new method using advanced image processing software for superimposing the image of a skull on the image of a face in order to identify a deceased individual from his/her skeleton is discussed.

From the Standpoint of Neurosurgery

Significance of color is mentioned in relation to some advanced medical technologies realized in neurosurgery such as minimally invasive surgery, stereoscopic video microscope systems and an augmented virtual reality technology.

From the Standpoint of Otorhinolaryngology

Possible color problems in otorhinolaryngology and a temporary solution, in which a color chart taken simultaneously with the object, are mentioned.

From the Practical Aspects of Nursing

Adaptation in nursing of rapid changes in medical, economical and social factors and expanding significance of visual data, including color data, are mentioned.

5. Conclusion

Editors would be very pleased if the results of large endeavors made by every author of the papers compile in ‘Digital Color Imaging in Biomedicine’ would contribute to providing the first comprehensive guidebook for everyone interested in this field.

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