Message from the Chair

The Third International Conference on Digital Information Processing, Data Mining, and Wireless Communications (DIPDMWC2016) was held at Higher School of Economics (National Research University) during the period of July 06-08, 2016. DIPDMWC2016 is a major event in the area of Digital Information Processing, Data Mining, and Wireless Communications. It served as a forum for scientists and engineers to meet and present their latest research results, ideas, and papers in the diverse areas of Digital Information Processing, Data Mining, and Wireless Communications and other related disciplines. DIPDMWC2016 is jointly organized by the Society of Digital Information and Wireless Communications (SDIWC) and Higher School of Economics (National Research University) with co-host InfoWatch, Russia.

This scientific conference is comprised of keynote speakers, lectures, and research papers for presentation within three days. This meeting provides a great opportunity to exchange knowledge and experience for all the participants who joined us from all over the world to discuss new ideas in the areas of Information Technology and Computer Science. We are grateful to Higher School of Economics (National Research University) for hosting this conference. We would like to take this opportunity to express our thanks to the members of the DIPDMWC2016 committees and the external reviewers for providing proficient contribution in preparation for this conference. We also would like to take this conference. We extend a wholehearted welcome and we do hope that all participants have a pleasant time in Moscow, Russia.

It was my great honor and pleasure to accept the responsibilities and challenges as General Chair of this conference. I hope that the conference will be stimulating, informative, enjoyable and fulfilling experience to all who participated.

Ekaterina Pshehotskaya General Chair of DIPDMWC2016

Preface

On behalf of the DIPDMWC2016 program committee and hosting university, we are honored to welcome the attendees to Higher School of Economics (National Research University) to participate in the Third International Conference on Digital Information Processing, Data Mining, and Wireless Communications (DIPDMWC2016) during July 06-08, 2016.

DIPDMWC2016 is jointly organized by the Society of Digital Information and Wireless Communications (SDIWC) and Higher School of Economics (National Research University) with co-host InfoWatch, Russia.

In this edition, DIPDMWC2016 is providing a venue for high quality papers in a wide range of research areas in Digital Information Processing, Data Mining, and Wireless Communications fields. The accepted papers were authored by researchers from different countries. Wherein each paper was evaluated by a minimum of two reviewers and additional reviews were also conducted. Authors received reviewers' comments to be considered in the final camera ready of their papers. All registered papers will be submitted to IEEE for potential inclusion to IEEE Xplore.

We hope that the conference fulfills your expectations and that the proceedings' documents are among the best research in the studied areas. We express our thanks to the conference committee, authors, sponsors and the organizers of this conference.

DIPDMWC2016 Program Committees

General Chair Ekaterina Pshehotskaya, InfoWatch, Russia

Program Chairs

Fadhilah Ahmad, University Sultan Zainal Abidin, Malaysia Jan Platos, VSB-Technical University of Ostrava, Czech Republic

Program Co-Chair

Jacek Stando, Technical University of Lodz, Poland

Proceedings Chairs

Yoshiro Imai, Kagawa University, Japan Ousanee Sawagvudcharee, Stamford International University, Phetchaburi, Thailand

Publicity Chair

Tutut Herawan, University Malaysia Pahang, Malaysia

DIPDMWC2016 Program Committees

General Chair

Ekaterina Pshehotskaya, InfoWatch, Russia

Program Chairs

Fadhilah Ahmad, University Sultan Zainal Abidin, Malaysia Jan Platos, VSB-Technical University of Ostrava, Czech Republic

Program Co-Chair

Jacek Stando, Technical University of Lodz, Poland

Proceedings Chairs

Yoshiro Imai, Kagawa University, Japan Ousanee Sawagvudcharee, Stamford International University, Phetchaburi, Thailand

Publicity Chair

Tutut Herawan, University Malaysia Pahang, Malaysia

International Program Committee

A.V.Senthil Kumar, Hindusthan College of Arts and Science, India Alexey Vinel, Halmstad University, Sweden Ali Sher, American University of Ras Al Khaimah, UAE Allaoua Chaoui, University Mentouri Constantine, Algeria Andre Leon S. Gradvohl, State University of Campinas, Brazil Awanis Romli, Universiti Malaysia Pahang, Malaysia Azizah Abd Manaf, Universiti Teknologi Malaysia, Malaysia Dariusz Jacek Jakobczak, Koszalin University of Technology, Poland Duc T. Pham, Cardiff University, United Kingdom E.George Dharma Prakash Raj, Bharathidasan University, India Elboukhari Mohamed, University Mohamed First, Morocco

Ezendu Ariwa, London Metropolitan University, United Kingdom Faith Shimba, The Institute of Finance Management, Tanzania Genge Bela, University of Targu Mures, Romania Gintautas Daunys, Siauliai University, Lithuania George B. Rinard, Frostburg State University, USA Guo Bin, Institute Telecom & Management SudParis, France Hadj Hamma Tadjine, Technical University of Clausthal, Germany Haikal El Abed, Technische Universität Braunschweig, Germany Haziq Jeelani, Galgotias University, India Hassab Elgawi Osman, University of Tokyo, Japan Hatem Haddad, Mevlana University, Turkey Hocine Cherifi, Universite de Bourgogne, France Iskandar Ishak, University Putra Malaysia, Malaysia Jasni Mohamad Zain, Universiti Malaysia Pahang, Malaysia Jose Filho, University of Grenoble, France Juan Martinez, Gran Mariscal de Ayacucho University, Venezuela Ladislav Burita, University of Defence, Czech Republic Liviu Octavian Mafteiu-Scai, West University of Timisoara, Romania Maitham Safar, Kuwait University, Kuwait Majid Haghparast, Islamic Azad University, Shahre-Rey Branch, Iran Martin Dudziak, Stratford University, USA Massudi Mahmuddin, Universiti Utara Malaysia, Malaysia Mazdak Zamani, Kean University, USA Mazlina Abdul Majid, Universiti Malaysia Pahang, Malaysia Mirel Cosulschi, University of Craiova, Romania Mohammad Shukri Salman, Mevlana University, Turkey Mohamed Amine Ferrag, Guelma University, Algeria Monica Vladoiu, PG University of Ploiesti, Romania Muhammad Javed, Dublin City University, Ireland Muhammad Zarlis, University of Sumatera Utara, Indonesia Muhanned Alfarras, Gulf University, Bahrain

Nan Zhang, Geroge Washington University, USA Noor Khalid, Universiti Teknologi, Malaysia Noraziah Ahmad, Universiti Malaysia Pahang, Malaysia Norozzila Sulaiman, University Malaysia Pahang, Malaysia Pasquale De Meo, University of Applied Sciences of Porto, Italy Pasquina Campanella, University of Bari Aldo Moro, Italy Paulino Leite da Silva, ISCAP-IPP University, Portugal Radhamani Govindaraju, Damodaran College of Science, India Rajina bt M A Raj Mohamed, Technology Park Malaysia, Malaysia Riaza Mohd Rias, University Technology MARA, Malaysia Ritesh Chugh, Central Queensland University, Australia Rohani Abu Bakar, Universiti Malaysia Pahang, Malaysia Ruzaini Abdullah Arshah, Universiti Malaysia Pahang, Malaysia S.Hariharan, Pavendar Bharathidasan College of Engineering & Technology, India Sabira Khatun, Universiti Malaysia Pahang, Malaysia Saleh Alwahaishi, King Fahd University of Petroleum and Minerals, Saudi Arabia Sarunas Paulikas, Vilnius Gediminas Technical University, Lithuania Shin-ya Nishizaki, Tokyo Institute of Technology, Japan Suphan Nasir, Istanbul University, Turkey Talib Mohammad, University of Botswana, Botswana Todor Todorov, Bulgarian academy of sciences, Bulgaria Tuty Asmawaty Abdul Kadir, Universiti Malaysia Pahang, Malaysia Viacheslav Wolfengagen, JurInfoR-MSU Institute, Russia Wan Maseri Wan Mohd, Universiti Malaysia Pahang, Malaysia Waralak V. Siricharoen, University of the Thai Chamber of Commerce, Thailand Wojciech Zabierowski, Technical University of Lodz, Poland Yusnita Yusof, Asia Pacific University College of Technology & Innovation, Malaysia Zanifa Omary, Dublin Institute of Technology, Ireland Zeeshan Ahmed, University of Wuerzburg, Germany Zuging Zhu, University of Science and Technology of China, China Zuriati Zukarnain, Universiti Putra, Malaysia

Table of Contents

Artificial Intelligence

Improvement and Discussion on Pronunciation Method of DIVA Model Based on Auditory Perception Space	1-7
Automatic Detection of Books based on Faster RCNN	8-12
Ellipsoidal Support Vector Data Description in Kernel PCA Subspace*	13-18

Bioinformatics & Biomedical Imaging

Research of Heart Failure Bas	sed on Heart Model and S1	complexity	19-25
-------------------------------	---------------------------	------------	-------

Data Mining

Predicting IT Employability Using Data Mining Techniques	26-30
Multi-objective Selection Approach for Association Mining Based on Interesting Measures	31-35
Monitoring of Urban Subsidence in Coastal Cities: Case Studies Vancouver and Seattle	36-39
Application of Data Mining for High Accuracy Prediction of Breast Tissue Biopsy Results	40-45
Problem of Identifying Destructive Informational Influence in Social Networks	46-51

Data Mining Techniques

A Harmony and Disharmony in Mining of the Migrating Individuals	52-57
A Computational Model for Refining Data Domains in the Property Reconciliation	58-63
Towards Ranking Cultural Terms from Originating Source	64-68
A Generalized Probabilistic Approach for Managing Inconsistency to Improve Classifier Accuracy	69-74
LionBEAR: A Location Based Energy Aware Routing Scheme in DTNs	75-80

Digital Information Processing

Taxonomy for Unsecure Digital Information Processing	81-86
Feature Extraction and Recognition Methods Based on Phonocardiogram	87-92
An Adaptive Image Mixed Noise Removal Algorithm Based on MMTD	93-98
Origin (Dynamic Blacklisting) Based Spammer Detection and Spam Mail Filtering Approach	99-104
Replica Selection in The Cloud Environments Using An Ant Colony Algorithm	105-110

Variable Decomposition in Total Variant Regularizer for denoising/deblurring Image	111-116
Text Watermarking Algorithm Based on Semantic Role Labeling	117-120
High-Speed Smoothing Filter in the Residue Number System	121-126
MSSA of Globally Gridded OAM from ECCO, AAM from ECMWF, and Gravity from GRACE	127-132
A Tool for Morphologically Ambiguous Text Processing	133-136
Identification of JPEG Files Fragments on Digital Media Using Binary Patterns Based on Huffman Code Table	137-141
A Robust Eye Gaze Estimation Using Geometric Eye Features	142-147
Scalable Processor Core for High-speed Pattern Matching Architecture on FPGA	148-153
E-Marketing	
Impact of Trust and Perceived Content of Advertisement on Intention to Accept Mobile Advertisement	154-159
Information Security and Cryptography	
Probabilistic Models of Cryptographic Systems and Their Applications	160-163
Android Applications and Security Breach	164-169
Network and Cyber Security	
Secure Public-Auditing Cloud Storage Enabling Data Dynamics in the Standard Model	170-175
Combining MIC Feature Selection and Feature-based MSPCA for Network Traffic Anomaly Detection	176-181
New Educational Programs in Security	
A Proposal of Educating Brazilian Police Officers for Cybercrime Investigation & Prosecution	182-187
Current Issues in Education as Pertaining to the Realm of E-Commerce Legal Protection	188-193
A Syllabus on Data Mining and Machine Learning with Applications to Cybersecurity	194-199
A Course of Mathematical Logic and Theory of Algorithms as a Mathematical Background of Modern Cryptology	200-204
Cybersecurity Culture as an Element of IT Professional Training	205-210
Practical Training	

Serious Game Design for Digital Forensics Training	211-215
Development Approach to the Attack Modeling for the Needs of Cyber Security Education	216-220

Forensic Handwriting Examination and Human Factors: Improving the Practice through Automation and Expert Training	221-226
Practical Studying of Wi-Fi Network Vulnerabilities	227-232
Managing the Loss of Control Over Cyber Identity	233-238
Professional Competencies in Security	
Effective Strategy for Competences Forming	239-244
Factographic Information Retrieval for Competences Forming	245-250
Identifying Core Disciplines to Foster the Development of Professional Competences	251-255
Staffing Policy for Information Security Maintenance Tasks Solution	256-261
Wireless Communications	
Two Layers of Beam Alignment for Millimeter-Wave Communications	262-267
Entropy-based Clock Skew Measurements for Mobile Devices	268-271
RFID in the Library: Economic, Social and Environmental Perspectives	272-277
A Study of QoS Feedback Schemes on WiFi Multicast for Media Streaming Services	278-283
Wireless Sensor Networks	
Optimized Energy Distribution in Wireless Sensor Networks	201 201
	204-291
Miscellaneous	204-291
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand	292-296
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand Hardware and Software Implementation of New Induced Polarization Detection System	292-296 297-301
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand Hardware and Software Implementation of New Induced Polarization Detection System Research and Development of ADS1271 Based Distributed Engineering Seismic Acquisition Unit	292-296 297-301 302-306
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand Hardware and Software Implementation of New Induced Polarization Detection System Research and Development of ADS1271 Based Distributed Engineering Seismic Acquisition Unit	292-296 297-301 302-306
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand Hardware and Software Implementation of New Induced Polarization Detection System Research and Development of ADS1271 Based Distributed Engineering Seismic Acquisition Unit Recognition for Objects by Relationship between Attributes	292-296 297-301 302-306 307-312
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand	292-296 297-301 302-306 307-312 313-318
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand Hardware and Software Implementation of New Induced Polarization Detection System Research and Development of ADS1271 Based Distributed Engineering Seismic Acquisition Unit Recognition for Objects by Relationship between Attributes PoN: Open Source solution for Real-time Data Analysis The Monitoring of the Spacecraft Equipment Thermal Modes	292-296 297-301 302-306 307-312 313-318 319-323
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand	292-296 297-301 302-306 307-312 313-318 319-323 324-326
Miscellaneous The Information Technologists that were Desired by Enterprises in Thailand	292-296 297-301 302-306 307-312 313-318 319-323 324-326 327-331

The development of mobile applications for the capturing and visualization of stereo and spherical panoramas

Zaitseva A.O., Deryabina K.A., Rolich A.Y., Moscow Institute of Electronics and Mathematics, Higher School of Economics, Moscow, Russian Federation, arolich@hse.ru

Abstract — This paper overviews and analyzes existing technologies for creation the three-dimensional spherical panoramic images and their visualization via mobile device using virtual reality(VR)-glasses. The goal is to design a new application for recording and processing panoramic images with a further adaptation for VR-visualization. The description maintains methods that are used for app-development.

Keywords — three-dimensional space(3D), stereoscopic photo, spherical photo, virtual reality, mobile application.

I. INTRODUCTION

Nowadays, the plenty of virtual reality devices amazed us by its diversity and variety of capabilities. The relevance of this topic is based on fast development of VR technologies and advantages of new developments over the outdated. For instance, 3D cinema today — is relatively old invention, compared to new analogues. Another example — HMD today is advanced technology. For the best immersion in virtual reality these devices can be equipped by motion tracking systems for head, eyes, body, etc. Nevertheless, the price of these devices starts from \$500, so, not everyone can afford this purchase for himself.

The costs of the screen, due to which we can see the displayed objects, is more than half of the total cost of the helmet. For this reason, the idea of creation of VR glasses has been proposed. VR glasses — is the peculiar device with special lenses and a compartment for a mobile device. The quality of 3D effect depends on characteristics of the mobile device (display resolution, the presence of the accelerometer, gyroscope, etc.) and lens quality. It is also important to take into account the quality of mobile applications, which interact with VR-glasses.

Last few years, the number of the applications for VRglasses are highly increased and usually published in online stores such as Google Play Market, Apple Store. Most of them have more entertainment value than practical. Therefore, the relevance of this project is to create a unique mobile application, which will have more entertaining character, but the 3D solution will be the best option for implementation. For example, a photo and video cameras can capture a visible front area similar to the human eye at an angle close to 180 degrees. Visualization of the captured by 3D-hardware photo/video [1,2,3] will add a little more realism to the screen, but it will change our perception not so much (e.g., we do not see the space located behind the camera).

One of the possibilities of using VR technology is to view the spherical stereoscopic panoramas using mobile phone and glasses or helmets of VR. However, there are some problems that do not allow the user to fully enjoy the benefits of the technology. For example, it is the absence of effective methods to capture spherical panoramas using a single camera of a mobile phone. Besides, there are no social services for storage and viewing of stereoscopic images. As a result, people have to view a limited number of collection images that were created by photographers and designers, while the level of technology currently allow to generate, store and view own stereoscopic images.

II. APPLICATION DEVELOPMENT

These algorithms assume a 3-parameter rotational motion model, that is more reliable and useful. However, such method will have a little more unknowns. In this algorithm the camera's focal length is important, so the main purpose is to develop a method for computing an initial focal length estimate based on the image registration process. Image registration (mapping, overlay) – a procedure for finding the best match between the pixels of image data. For successful implementation of this procedure the image should be similar to each other: the second image may be obtained (or portion thereof) by converting the first image (or any part thereof). In addition, it is necessary that the images in themselves must be in the approximate accordance, that is an initial approximation, which will search for the best images of the respective parameters must be set. In addition, the closing operation algorithms assemble "slot" (or reverse "overlap") due to the accumulated registration errors after a full panoramic sequence. The advantages of this algorithm is that we apply it to a sequence of images taken with a portable mobile phone camera.

In this paper, we present a set of mosaic change. Each transform corresponds to one frame image in the input image sequence, and is a correspondence between the image pixels and the viewing direction, that is, is a matrix camera [2]. During the crosslinking process, this approach does not provide any evidence to the final output representations (e.g., spherical or

cylindrical) that avoids singularities associated with such views.

Once the mosaic is built, it can be displayed in a cylindrical or spherical coordinates. However, such specialized representation are not necessary and are only a certain range of geometry and texture coordinate investments. Instead, we will determine how to convert our mosaic on the "card environment" [3], that is, how to display our mosaic texture to any polyhedron surrounding the origin. "Surrounded" - a 3D image of the scene in the form of textures used to simulate reflections on objects. This allows you to use the standard three-dimensional graphical interfaces and formats of 3D-models, and use threedimensional graphics accelerators for texture mapping [4].

Implementation of capturing stereoscopic spherical panoramas based on certain algorithms perform splicing frames for each pan individually. Next we get a stereo pair of two panoramas for the right and left eye, which can be adapted to most of the existing VR devices.



Figure 1. Block diagram describing the gluing of frames received in the panoramic view.

The background to the shooting interface point is a virtual "floor", consisting of a square "tiles", the corners of which are shown light cross-shaped marks. The position of the floor responds only to the evidence accelerometer, so it does not rotate when you turn the device around a vertical axis parallel to the action of gravity. Above the floor is a virtual sphere in which are placed photos of which will be composed of a spherical panorama. At the same time, after the capture of one frame sign appears, shifted a few centimeters to the right. This algorithm allows to compose a second sphere for the right eye, which the user does not see on the screen.

The first such point is always located at the center line and in the place where the "line of sight" for the first time crosses the center line. After the first image was taken, the following shots should be made in the same orientation (portrait or landscape), and according to this information camera puts the corresponding number of points on the parallels of the sphere; moreover, the background "floor" begins to respond to the rotation around the vertical axis. The point of the first image becomes the central point in the rectangle, shaped after transforming sphere into a plane. If the device is twisted or if you rotate it too fast (so that the image is smeared), the application will warn you about this. These algorithms are being developed. After performing the above procedure, using specific algorithms bonding is performed for each frame in the pan separately.

To view correctly took the entire spherical surface of the virtual scene, you need to implement two main tasks (Figure 2.)



Figure 2. Implementation of spherical mapping textures using OpenGL.

Generating a full display image texture:

Step 1: For each pixel (i, j) in the output image display data calculate polar coordinates (theta, phi):

a) Normalization of origin

$$x = 2 * i/width - 1$$

y = 2 * j/height - 1
y) are in the range from -1 to 1.

where (x, y) are in the range from -1 to 1 b) Preparation of polar coordinates

theta =
$$x * pi$$

 $phi = y * (pi/2)$
ge theta $\in [-pi, pi]$ $\bowtie phi \in [-pi/2, pi/2]$

Step 2: Calculate the corresponding 3D vector position (display beam from the center), indicating the unit sphere

$$p = \begin{pmatrix} cos(phi) * cos(theta) \\ sin(phi) \\ cos(phi) * sin(theta) \end{pmatrix}$$

Step 3: For each row define its display in each image k, using $p' = VR_kp$;

Where p'- 2D point in the image, R_k - total rotation matrix,

$$v = \begin{bmatrix} f & 0 & 0 \\ 0 & f & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

Step 4: Mixing

Г

Each pixel is weighted with the distance to the nearest edge of the image n-th degree:

$$I_{final}(p) = \frac{d_1^n I_1(p') + d_2^n I_2(p') + d_3^n I_3(p')}{d_1^n + d_2^n + d_3^n}$$

where n = 3



Figure 3. Finding the weight of the pixel closest to the three borders

The resulting spherical texture mapping using OpenGL:

- Create a sphere.
- Loading of the output image.

• Implementation of texture mapping using OpenGL functions.

• Design a simple and convenient user interface.

Conclusion and future work

In this work we have been considered a software development concept for the capture and visualization of stereoscopic images for mobile devices that interact with the VR devices. The paper presents an approach to the creation of a full spherical panorama mosaic of the captured image sequences. Unlike current methods for panorama stitching, which generally require pure horizontal camera pan, this system does not require strict limitations associated with how the images are taken (as long as there will be no strong motion parallax). For example, pictures taken with mobile phone cameras can easily be stitched into a panorama mosaic. They were presented mosaic image subjected to a plurality of transformations which shows the absence of singular problems, for example, existing at the top and bottom of the cylindrical or spherical panorama. This algorithm is fast and reliable, because it restores the 3D rotation, instead of using a standard algorithm for transforming a flat outlook for 8 parameters. Also provided methods of reconstructing the focal distance of the camera. By comparison the mosaic of arbitrary polyhedron structure, shooting environment, we can re-create the virtual environment with tools for the development of the Android SDK and OpenGL libraries and plug OpenCV.

Considered shooting mosaic panorama for right and left eyes (to achieve the stereoscopic effect), were analyzed by the idea of a planar stereoscopic panoramas using a single camera. This paper presents algorithms for creating spherical panoramas for a single point of view. Similar operations will be carried out the shooting and gluing and for the other eye, but under a different elevation angle.

References

- Mentz J., Caldwell S. Method of stereoscopic 3d viewing using wireless or multiple protocol capable shutter glasses : заяв. пат. 12/699,685 США. – 2010.
- [2] S. Li and K. Fukumori. Spherical stereo for the construction of immersive vr environment. In Virtual Reality, 2005. Proceedings. VR 2005. IEEE, pages 217–222. IEEE, 2005.
- [3] L. E. Gurrieri and E. Dubois. Acquisition of omnidirectional stereoscopic images and videos of dynamic scenes: a review. Journal of Electronic Imaging, 22(3):030902–030902, 2013.
- Lamkin P. The best VR headsets: The virtual reality race is on. 2015. URL: http://www.wareable.com/headgear/the-best-ar-and-vr-headsets (20.04.2016).
- [5] O.Faugeras.Three-dimensionalcomputervision: Ageometric viewpoint. MIT Press, Cambridge, Massachusetts, in 1993.
- [6] N. Greene. Environment mapping and other applications of world projections. IEEE Computer Graphics and Applications, 6 (11): 21-29, November 1986.