

**2007 IEEE Symposium on
Virtual Environments, Human-Computer Interfaces
and Measurement Systems**

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VECIMS 2007 Technical Program Tracks & Sessions

Monday, June 25

11:30 AM - 1:10 PM

Measurement system for virtual environment

Session Chair: Dan Ionescu (University of Ottawa, Canada)

Handbook for Evaluation Studies in Virtual Reality

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Salvatore Livatino (Aalborg University, Denmark)

Christina Köffel (Aalborg University, Denmark)

Abstract—Virtual reality (VR) applications are spreading and attract industries since VR technologies are becoming more affordable, powerful and robust. VR applications inherently call for human-computer interaction, which in turn calls for system and usability evaluations, typically through measurement of human behavior including aspects of perception, action, and task-performance. The evaluation issue calls for multi- and interdisciplinary research activities, where technical expertise is combined with humanistic knowledge and methodology. Several experts in the field of VR as well as in the field of usability studies call for helpful guidelines in order to be able to evaluate VR applications. This paper gives an overview of this problem and introduces a guideline which is supposed to assist researchers in evaluating VR applications. In particular, it aims at assisting those who are not experts in evaluation studies as well as students. The aim is also to facilitate multi-disciplinary activities through the use of an evaluation handbook which would be simple and focused on VR. The applicability of this guideline has been tested in two pilot studies, which showed how this handbook could successfully be employed to carry out pilot (and formal) evaluations.

A Device Independent Haptic Player

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Mohamad Eid (University of Ottawa, Canada)

Mohamed Mansour (University of Ottawa, Canada)

Rosa Iglesias (University of Ottawa, Canada)

Abdulmotaleb El Saddik (University of Ottawa, Canada)

Abstract—This paper presents the design, implementation, and quantitative evaluation of a haptic player system that is independent from the haptic device, in the context of our HAML-based authoring tool project at the University of Ottawa. The system comprises three components: a haptic repository, a feature extractor, and the haptic player. The haptic repository is capable of retrieving, filtering, and storing the data sent by a haptic device in a local database. The feature extractor generates a standardized description of the stored data by utilizing HAML schema. Finally, the haptic player component recreates a haptic stimulus by utilizing the HAML description of the corresponding stimulus. The experimental evaluation of the proposed HAML-based player showed that the haptic player system is independent from the device or application used during data recording.

Towards an Architecture for the Compression of Haptic Media

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Nizar Sakr (University of Ottawa, Canada)
Nicolas Georganas (University of Ottawa, Canada)
Jiyong Zhao (University of Ottawa, Canada)
Xiaojun Shen (University of Ottawa, Canada)

Abstract—In this paper, we present I-CHAM, an architecture for the Intelligent Compression of Haptic Media. The I-CHAM architecture enables both, lossy and lossless compression modes and it encompasses several modules that, together, attempt to intelligently and efficiently compress a haptic media file. Furthermore, the proposed architecture is designed in such a manner to be haptic-application and device independent. To the best of our knowledge, this paper is the first in the literature to propose an architecture for the compression of haptic media files. The experimental results demonstrate that I-CHAM can achieved great results in both, lossless and lossy modes, while preserving the immersiveness of the haptic-based environment.

A Haptic Data Repository Framework

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Fayez El-Far (University of Ottawa, Canada)
Abdulmotaleb El Saddik (University of Ottawa, Canada)
Mauricio Orozco (University of Ottawa, Canada)

Abstract—The concept of a data repository is not a new idea; almost any scientific approach to a statistical-based problem requires a data storage effort for the purpose of post-processing and post-examination of acquired data sets. When faced with haptic-data, however, we run into several problematic issues, such as high bandwidth requirements (sampling rates equal to or higher than 600 Hz), data accuracy and relevance, data filtration and presentation. In this paper, we propose a haptic-data repository proof-of-concept capable of retrieving, filtering, and storing the compacted data sets in a local database. We introduce an Intelligent Filtering Algorithm, a Thread Management Algorithm, as well as an I/O optimization algorithm. By combining these algorithms, and as our performance evaluation demonstrates, we have successfully been able to save accurate haptic data at sampling rates equals to or higher than 1 KHz.

A Collision Detection Algorithm for Point-Like Haptic Interactions in Highly Detailed Virtual Environments

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Naim El-Far (University of Ottawa, Canada)
Nicolas D. Georganas (University of Ottawa, SITE, Canada)
Abdulmotaleb El Saddik (University of Ottawa, Canada)

Abstract—In this paper, we present a collision detection algorithm designed for virtual haptic-visual environments containing models that are complex and highly detailed (i.e. contain a large number of vertices). Our algorithm treats these complex models as dense point clouds bounding each point in the cloud with a small axes-aligned bounding box, and organizing the aforementioned boxes in a standard octree. Collision detection is then performed by searching for the coordinates of the point-like haptic probe in the vertex axes-aligned bounding boxes. Locating the spatial region containing the relevant boxes is facilitated by the octree. For static virtual environments with rigid bodies, we show that our algorithm runs in $O(\log n)$ time where n is the number of model vertices in the scene. For dynamic virtual environments with rigid bodies, our algorithm, in an implementation that uses simple 1-dimensional arrays and a spatial hashing function instead of octrees, runs in $O(n)$ time where, again n is the number of vertices in the scene. Worth noting here, is that our collision detection algorithm is general-purpose for complex models and can also be applied to computer graphics with excellent results.

3:00 PM - 5:00 PM

Human-computer interaction

Session Chair: Salvatore Livatino (Aalborg University, Denmark)

Expressions of Emotions in Virtual Agents: Empirical Evaluation

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Ildikó Pelczer (Universidad Nacional Autónoma de México, Mexico)
Francisco Cabiedes (Universidad Nacional Autónoma de México, Mexico)
Fernando Gamboa (Universidad Nacional Autónoma de México, Mexico)

Abstract—Introduction Human communication is mainly based on speech, gestures, facial and bodily expressions. Non-verbal expressions, as body posture and small movements, regulate social interactions. On other hand, psychological studies have shown that more than 65% of the information interchanged in a conversation is transmitted through non-verbal channels (Argyle, 1988). These results lead to an ever-growing effort from behalf of researchers in the human-computer interaction field to include emotions and emotional expressivity in their projects. The ability to show emotions and reason about other's emotional state, from its expression, assures a special connection between participants of a virtual environment (a computer defined space populated by animated agents or the space defined by a user and the system). Ekman & Friesen (1978) affirm that the major part of the nonverbal emotional information is transmitted by the face. Therefore, in the community of avatar designers there is a special interest in establishing simple ways of effective facial expressions of emotions.

HI3 Project: Design and Implementation of the Lower Level Layers

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G. Varela (Universidad de la Coruña, Spain)
A. Paz-López (Universidad de la Coruña, Spain)
S. Vázquez-Rodríguez (Universidad de la Coruña, Spain)
Richard Duro (Universidad de la Coruña, Spain)

Abstract—We are interested in the development of human-centered and ubiquitous technologies in social environments. In this line and in the framework of a global software architecture (HI3) for this type of applications, this paper is devoted to the presentation of the work carried out for the design and implementation of the layer that is more closely linked to the hardware. It is in charge of communicating with the physical layer and it is responsible for the abstraction of the field elements. Special attention has been paid to the coherence with the philosophy, design premises and functionalities of the whole system. We have also determined a hardware configuration that, integrating standards where possible, is better adapted to the requirements of the architecture. The elements introduced here were validated on a real implementation of the system.

A New Graphical Interface For Web Search Engine

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Alberto Amato (Politecnico di Bari, Italy)
Vincenzo Di Lecce (Politecnico di Bari, Italy)
Vincenzo Piuri (University of Milan, Italy)

Abstract—Aim of this work is to present a new human computer interface for web search engines. Despite the noteworthy improvements introduced in the web search engines, their human interface still remain surprisingly based on a textual sorted list. The position of a site in this list expresses its distance from the user's query. The authors propose a graphical user interface for search engines based on the geomorphologic metaphor. This interface makes user aware of the semantic distribution of the web sites retrieved by the search engine. The proposed interface is implemented as a browser plug-in and it is able to work with all the modern search engines.

Distributed Database for Environmental Data Integration

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Alberto Amato (Politecnico di Bari, Italy)
Vincenzo Di Lecce (Politecnico di Bari, Italy)
Vincenzo Piuri (University of Milan, Italy)

Abstract—The air quality monitoring systems are increasing in number and complexity all over the world due to an expanding consciousness about the value of a high-quality environment and the specific Laws and Acts. The interest and the attention devoted to the environmental thematic, to monitoring and to the control activities about air quality are in fact growing quickly. Many Government Agencies for environmental protection (i.e., the Italian ANPA) are imposing the implementation of environmental monitoring stations located in a wide geographic area, in order to: • supply significant real data; • document the air quality in time; • characterize the causes that determine the atmospheric pollution; • foresee the biological effects due to exposure to the pollutants in the long term. This work proposes a multi-agent system to air quality monitoring. The focus of the work is database integration.

Development of A Quality Computation System for Color Filter Inspections

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Fu-Shin Lee (Huafan University, Taiwan)
Li-Shang Chen (Huafan University, Taiwan)
Shao-Chun Tseng (Huafan University, Taiwan)
Po-Jia Chen (Huafan University, Taiwan)

Abstract—The object of this research is to develop a fully automatic computation algorithm for quality control purposes during inspecting color filters. The hardware setup can analyze dyed pixels on the color filters upon acquiring the transmitted through light waves ranging from 350 nm to 850 nm and a light wavelength resolution up to 3.49 nm once a micro-spectrometer is employed. With the acquitted information this research builds a quality inspection algorithm to analyze the color properties of the dyed pixels, and performs dedicated statistics computations of the color filters automatically. With the analysis results of the typical color filter, its color quality can be justified using the developed quality computation algorithm, and any defects of the pixels on the filter can also be detected. Hence, the automatic inspection system can analyze the statistics of the acquired information and identify the grade of the inspected ones in order to assure the quality of each fabricated color filter. Keywords — color filter, CIE chromaticity, saturation, quality control diagram, micro-spectrometer.

A Virtual Assistant for Safety Measurements Evaluating the Worker Hand-Arm Exposure to Percussion Machines Vibration

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Claudio De Capua (University of Reggio Calabria, Italy)
Antonino Battaglia (University Mediterranea of Reggio Calabria, Italy)
Rosario Morello (University Mediterranea of Reggio Calabria, Italy)
Bruno Piccolo (University of Reggio Calabria, Italy)

Abstract—This paper proposes an innovative virtual assistant able to check the safety requirements concerning vibration exposure of workers using hand-held percussion machines. Typically, the exposition to high and continual vibrations with the passing of time may facilitate the onset of pathologies affecting vascular and neurological systems, or because of syndromes to hand-arm bones and muscles. So Standards and regulations impose exposure limits in order to prevent health hazards. The projected system is able to measure and estimate the daily worker exposure to vibration according to the Standard ISO 5349. User identification is performed by a personal memory device storing data and information concerning the worker and his daily activity. Three orthogonal transducers measure the acceleration transmitted to the hand-arm system and a DSP unit has the task to process data in order to estimate the vibration exposure during the working activity. If the law safety limits are overcome, the device shows on display an alert message followed by an acoustic alarm so to force the worker to stop the machine usage. The aim of the proposed system is to provide a prevention tool for assuring safe working conditions. The system assists the worker exposed to vibrations in order to avoid the absorption of levels above the maximum tolerable or permitted daily limits.

5:30 PM - 6:10 PM

Augmented and virtualized reality

Session Chair: Abdulmotaleb El Saddik (University of Ottawa, Canada)

A New Approach For Handling 3D Medical Data In An Immersive Environment

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Giuseppe De Pietro (ICAR CNR, Italy)
Luigi Gallo (ICAR-CNR, University of Naples "Parthenope", Italy)
Ivana Marra (ICAR-CNR, Italy)
Carmela Vanzanella (ICAR-CNR, Italy)

Abstract—Usually in the medical imaging field in order to produce high quality 3D models, volume rendering techniques are used; this derives from the capability of such techniques to render objects with a realistic and efficient visualization, also inside the models. However, in absence of geometric structures, it is more difficult to select and extract the details of interest from the visualized model, thus most of medical imaging software tools offer only visualization and navigation, without allowing inside inspections and interactions. In this paper we present a new approach for visualizing and inspecting fine details of medical data, directly within the Volume Of Interest (VOI) for training, examination and diagnosis aims. In particular, starting from high-fidelity 3D medical models of real anatomical structures, reconstructed from DICOM data, the user can perform medical imaging functionalities directly on 3D model inside the virtual scene, without switching between 2D and 3D data representation, so improving the sense of realism and enhancing the exploration of virtual structures. The new functionalities have been developed by using the most widely open-source used library for 3D computer graphics, image processing, and visualization, the Visualization Toolkit (VTK), and have been tested by integrating them into an open-source and cross-platform Medical Imaging Toolkit, we developed.

A Projection-based User Interface for Industrial Robots

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Gunther Reinhart (Technical Univ. Munich, Germany)
Wolfgang Vogl (Technical University Munich, Germany)
Ingo Kresse (Technical University Munich, Germany)

Abstract—This paper presents a novel spatial user interface system for industrial robots, which relies on interactive projection in conjunction with a handheld stylus as the central medium for user-interaction. This way, complex spatial trajectories and other information can be edited directly in the workspace of the robot. Calibration mechanisms, interaction metaphors and methods for multi-projector-setups will be discussed. The system relies on an active optical tracking system, with a dedicated handheld probe that is suitable for robot teaching and the implied handling in six degrees-of-freedom. Both, laser projectors and video beamers have been incorporated into the system and will be evaluated for their specific properties in the context of a spatial user interface. Interaction mechanisms and metaphors include e. g. free editing, drag-and-drop for 3D-trajectories on workpiece surfaces, virtual menus projected into the workspace and interactive modeling of collision geometries and workpiece shapes.

Tuesday, June 26

9:30 AM - 1:00 PM

Human-computer interface in applications

Session Chair: Shervin Shirmohammadi (University of Ottawa, Canada)

Using the Interleaved Sampling of the Multi-Channels to Broaden Bandwidth of Embedded Oscilloscope Systems **72**

Ying-Wen Bai (Fu Jen Catholic University, Taiwan)
Hsing-Eng Lin (Fu Jen Catholic University, Taiwan)

Abstract—As the previous embedded oscilloscope system uses a single-channel sampling, the system bandwidth is still limited by the bandwidth of the components or chips. In this paper, we propose an interleaved sampling method of the multi-channels to broaden the bandwidth of an oscilloscope. Let us take interleaved four-channel sampling as an example. We use four sets of ADCs, buffer chips, and 3 sets of I/O chips including a buffer component for the sampling signal of each channel. Through an embedded system programmed for control, four data sets can be merged into a measured signal.

GIS-based System for Landslide Early Warning Index Measurement **78**

Fabio Bovenga (Dipartimento Interateneo di Fisica, Bari, Italy)
Elena Miali (Planetek Italia, Italy)
Raffaele Nutricato (Dipartimento Interateneo di Fisica, Bari, Italy)
Maria Chiaradia (Politecnico di Bari, Italy)

Abstract – Landslides are one of the most serious natural and man induced hazards. The paper presents an innovative system dedicated to the measurement of landslide warning index. The system is based on a Geographic Information System (GIS) inference engine which properly combine satellite Earth Observation (EO) measurements and static geophysical parameters. The system has been developed in the framework of an FP5 European project and it is aimed to provide an operative and flexible tool for public and private entities involved in land management, and in particular in mitigation of both landslide hazard and risk. Particular attention will be devoted to the role that the GIS environment plays as optimal measurement environment since it provides flexible interface between human (both high level geophysical experts and low level end users) and data (heterogeneous data in input to the geophysical model, warning maps in output).

System Architecture for Personalized User Defined Web Information Retrieval on Demand using PDA or GSM Devices **84**

Roman Malaric (University of Zagreb, Croatia)
Kresimir Malaric (University of Zagreb, Croatia)
Tarik Mutapcic (University of Zagreb, Croatia)

Abstract—The GSM mobile phones are today widely spread around the world. One of the features of GSM phones are the capability to send Short Messages (SMS) up to 160 characters. Depending on the provider, the SMS can also be used to send e-mails using the SMS to e-mail gateway. The e-mails can be send using the PDA devices as well. These widely available devices are used for numerous value added servies (Fig.1). [1,2]. This paper describes the realization of one such service - a system for user defined Web information retrieval on demand using GSM phones or PDA devices. This is a modification of the a system for remote control of measurement system previously published [1]. The system can be easily adapted to retrieve any information from the Web, restricted only with the equipment capabilities on the receiving end. The GSM mobile phone can receive only text messages up to 160 characters, except Multimedia Messaging Service (MMS) messages, while PDA or handheld computers can receive whole internet pages, including pictures. The system is based on SMS/e-mail to e-mail communication, with the server computer automatically handling received e-mails. To make the system independent of GSM, the server does not need to have GSM modem installed, but only the valid e-mail account, with the server connected to the internet.

A distributed measurement system based on Peer-To-Peer architecture for River Monitoring

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Fabrizio Ciancetta (University of L'Aquila, Italy)
Giovanni Bucci (University of L'Aquila, Italy)
Biagio D'Apice (Second University of Naples, Italy)
Carmine Di Nucci (University of L'Aquila, Italy)
Maria Teresa Todisco (University of L'Aquila, Italy)

Abstract—Several applications require for a distributed measurement system able to measure the same or different parameters at different points in a wide area. Distributed systems based on smart web sensors represent the best solution to many different measurement problems. One of the main disadvantages of monitoring systems based on Smart Web Sensors is the difficulty to have a complete access to all data because they present a closed approach to interact with them, while Web Services are adopted in order to give a standard approach in developing a Service Oriented Architecture[1]. The main goal of this paper is to present an implementation of a environmental sensor for distributed measurement system based on the Web Service approach, adopting a freeware widely utilized technology, the Gnutella network, to route and share information adopting a low-cost hardware architecture. This solution offers great possibility in terms of fast and easy access to measured data, of integration of large complex Web sensor network, of realization of flexible custom applications and of service reusability developing new measurement application starting with different information also coming from different sensors.

Grid Services for SST Measures

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Andrea Guerriero (Politecnico di Bari, Italy)
Raffaella Matarrese (Politecnico di Bari, Italy)
Alberto Morea (Politecnico di Bari, Italy)
Ciriaco Pasquale (Politecnico di Bari, Italy)
Francesco Ragni (Politecnico di Bari, Italy)
Khalid Tijani (Politecnico di Bari, Morocco)

Abstract - The effects of the increase in the average temperature of the Earth's near-surface air and oceans in recent decades are dramatically manifest: desertification, glacier retreat, increased intensity and frequency of hurricanes and extreme weather events. Monitoring the ecosystem is currently the only way we have to assist Governments in making sound decisions concerning the reduction of these dramatic effects and the protection of our environment. Satellite remote sensing data, offering the possibility of covering large spatial area with a high temporal frequency, represents the ideal solution to monitoring, but the huge data volume to process, calibrate and validate by in-situ dataset, cannot be operated effectively by traditional database and computational resources. Grid technology, easily providing powerful computational resources and efficient distributed data management, is an excellent solution for remote sensed data processing and management system. In this paper we present a prototype of a Remote Sensed Data processing system on Grid technology that allows, by a graphical interface, data selection and processing to validate SST measure particularly in costal area.

Influence of WiFi computer interfaces on RF measurement systems

99

Giovanni Betta (University of Cassino, Italy)
D. Capriglione (University of Cassino, Italy)
Luigi Ferrigno (University of Cassino, Italy)
G. Miele (University of Cassino, Italy)

Abstract—Nowadays wireless low-power technologies, such as Wi Fi™, ZigBee™, BlueTooth™, to cite a few, are often present in measurement environment. Even though designed and developed to reduce at minimum their emissions, however these wireless devices can potentially interfere with metrological performance of modern instrumentation. For these reasons, a careful investigation on the electromagnetic susceptibility of measurement systems, when subjected to interferences generated by short-range low-power wireless transmitters, is carried out. The effects of a Wi-Fi™ bridge operating close to a typical radio frequency measurement station are analyzed. The achieved results prove that the effects of the interferences due to the wireless module are not always negligible, thus potentially compromising its performance and the measurement results reliability.

A RF Identification System for the Improvement of Metrological Activities**105**

Claudio De Capua (University of Reggio Calabria, Italy)
Bruno Piccolo (University of Reggio Calabria, Italy)
Emilia Romeo (University of Reggio Calabria, Italy)

Abstract—This work describes the realization of a “radio-frequency identification system” for the improvement of the activities of a metrological laboratory. Some radio-frequency modules, called by the authors RF Smart Points (“radio-frequency smart points”), have been designed to store into their memories all data which are necessary for the instruments tracking (the type of instruments, their identification numbers or serial numbers, the manufacturer, the date when they have been admitted to the installed base of the laboratory, their working state, the elapsed time from the last calibration procedure). The insertion of the data and the inquiry of the instruments are executed by the technical staff of the laboratory through a PDA (Personal Digital Assistant) or a PC, which manage the radio-frequency communication by using the RS 232 interface for sending messages to a RF Transceiver. The executable software for managing the communication between the Smart Points and the “PDA/PC-Controllers” is realized in LabVIEW graphical programming environment.

Development of a system for soil microclimatic analysis**110**

Laura Fabbiano (Polytechnic of Bari, Italy)
Attilio Di Nisio (Politecnico di Bari, Italy)
Francesco Adamo (Politecnico di Bari, Italy)
Giuseppe Cavone (Politecnico di Bari, Italy)

Abstract—In this paper the design and the development of a moisture sensor for granular and porous mediums are presented. Also the first experimental results are illustrated and compared with those deriving by the proposed theory. The basic idea is to estimate the velocity of propagation of seismic waves (both compressional and shear ones) by measuring travel time in a complex medium using a transmitter and a receiver separated by a known distance.

3:00 PM - 5:10 PM**Object modeling**

Session Chair: Richard Duro (Universidad de la Coruña, Spain)

Constant bit rate Video Coding based on SVD video decomposition**113**

Cataldo Guaragnella (Politecnico di Bari, Italy)
Tiziano Politi (Politecnico di Bari, Italy)

Abstract—In this paper, a novel video coding technique is presented, based on the decomposition of the sequence spanned hyperspace in orthogonal components. Good quality video can be reconstructed at the receiver, particularly for very low bit rate applications, with low residual error and smooth appearance both in motion reconstruction and in the complete absence of crisp coding artifacts such as blocking structures, basing on a few proper selected examples of the speaker and a multidimensional interpolation algorithm. Principal Component Analysis exploited by Singular Value Decomposition has been used to decompose the video sequence into eigen-images. A limited set of eigen-images is chosen to span the whole video sequence subspace. Only coefficients to be used in the interpolation procedure are transmitted along the communication channel. Preliminary results are presented for Akyio QCIF video sequence.

Constructing 3D Virtual Reality Objects from 2D Images of Real Objects Using NURBS

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Philippe Lavoie (University of Ottawa, Canada)
Dan Ionescu (University of Ottawa, Canada)
Emil Petriu (University of Ottawa, Canada)

Abstract—A new method for capturing and reconstructing 3D representations of real objects in a virtual reality system is introduced. Virtual reality applications allow users to navigate and interact with the 3D objects through the environment. This interaction requires that the 3D representation of real objects be highly accurate in modeling the reality. The novelty of the new methodology proposed, consists on the fact that it uses only a high resolution digital camera and a projector in conjunction with 3D surface reconstruction techniques based on Non-Uniform Rational Bézier Spline (NURBS) functions. The 3D object reconstruction is based on finding unique control points on the 2D images of the object and constructing corresponding 2-D NURBS curves which contain the control points through a process of NURBS fitting. The 2-D NURBS curves are then projected into a 3-D space to eventually re-create the 3-D surface of interest. The method does not require any a priori knowledge of the absolute positioning or orientation of the camera and the projector as other 3D reconstruction techniques do. The precision of the method depends on the camera resolution and can attain sub-millimetres ranges. Examples illustrate the process.

Research on CMOS Image Preprocess Methods for Auto-Focusing System

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Chen Guojin (Hangzhou Dianzi University, P.R. China)
Zhu Miaofen (Hangzhou Dianzi University, P.R. China)

Abstract—The image preprocess is the first course after image sampling in an auto-focusing system based on the definition recognition technology. The image preprocess includes converting image data format, filtering for noise removal, reducing ray disturbing and so on. Considering the features of CMOS sensor's imaging, the paper discusses the image quantization method and the image format converting method, and analyzes the effects of applying the linear transform and histogram equilibrium of image gray value for the auto-focusing system with a CMOS image sensor. At the last, the discussion on the filtering method for noise removal was made. And the mean filter of neighborhoods and the median filter are optional to reduce positive noise. But according to the result of the experiments, the former will weaken the image edge and will not be good for reducing noise of spiced salts. The latter has a good effect to reduce positive noise and to conserve the image edge. As for the reduction of multiple noise, the homomorphic filter can be chosen, which separates signal and noise, filters noise, and then restores original signal. The filter's effect is determined by its design.

The Study of Image Definition Evaluation Function Based on Wavelet Filter

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Chen Guojin (Hangzhou Dianzi University, P.R. China)
Zhu Miaofen (Hangzhou Dianzi University, P.R. China)
Qiu Xiaoguang (Hangzhou Dianzi University, P.R. China)

Abstract—The auto-focus method based on digital image processing results from the innovation of the traditional auto-focus method. Generally speaking, the traditional auto-focus method needs extra focus equipment and can be disturbed easily by environment factors. So the application of the traditional auto-focus method is limited hugely. The auto-focus method based on digital image processing is usually achieved by image definition evaluation functions. The paper studies the structure of two-dimension minimum isotropy wavelet filters and propounds the image definition evaluation based on a wavelet filter. In the paper, the evaluation function based on the wavelet filter is compared with the evaluation function based on the Laplacian operator by using the auto-focus system of a microscope. The experiment results indicate that the auto-focus algorithm based on the isotropy wavelet filter has good performance.

A Force Feedback Virtual Simulator for Education and Training

135

Lucio De Paolis (Salento University, Lecce, Italy)
Euro Blasi (University of Salento, Lecce, Italy)
Alessandro De Mauro (University of Karlsruhe (TH), Germany)
Giovanni Aloisio (University of Lecce, Italy)

Abstract – The essential requirements of a virtual reality based simulator are a realistic virtual environment and a reproduction of haptic sensation due to the interactions in the virtual environment. The interactions need to be performed in real-time, since a delay between the user action and the system reaction reduces the user experience. Accuracy and efficiency are two opposite requirements; in fact, increased accuracy implies higher computational time and vice versa. So, it is necessary to find a trade-off according to the application and, sometimes, to reduce the realism in favour of the real-time interaction. In this paper is presented a virtual simulator provided of a haptic interface and a virtual environment reconstructed from real patient's medical images in order to have haptic sensations in addition to a very realist virtual environment.

Wednesday, June 27

10:00 AM - 11:40 AM

Collaborative distributed virtual environments

Session Chair: Gregorio Andria (Politecnico di Bari, Italy)

Building Learning Communities in Blended Classrooms Through an Innovative mLearning System 139

Xiaoyan Pan (Shanghai Jiaotong University, USA)
Ruimin Shen (Shanghai Jiaotong University, P.R. China)
Minjuan Wang (San Diego State University, USA)

Abstract—Chinese classrooms, whether on school grounds or online, have long suffered from a lack of interactivity. Many online classes simply provide recorded instructor lectures to which students listen after downloading. This format only reinforces the negative effects of passive non-participatory learning. At a major university in Shanghai, researchers and developers actively seek technologic interventions that can greatly increase interactivity in online classes. They have developed a cutting-edge mobile learning system that can deliver live broadcast of real-time classroom teaching to online students with mobile devices. Their system allows students to customize means of content-reception, based on when and where the students are tuning into the broadcast. The system also supports short text-messaging and instant polls. Through these venues, students can ask questions and make suggestions in real time, and the instructor can address them immediately. Here we describe this system in detail, and also report results from a test implementation of the system with a blended classroom of 1000 students (with 800 being online).

Java-based Adaptable Middleware Platform for Virtual Instrumentation

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Juan Holgado-Terriza (University of Granada, Spain)
Alfredo Moreno Guillén (University of Granada, Spain)
Manuel Capel-Tuñón (University of Granada, Spain)

Abstract—The increasing heterogeneity of instruments, devices, and measurement systems with varying operating systems, processors, hardware devices, resources, etc. interconnected by different networks require the design and development of new middleware platforms, capable of managing the complexity of current distributed systems. In this work the design and development of a new adaptable middleware platform is proposed, based on the study of the state-of-the-art distributed systems technology and the development of novel mechanisms and services on top of known middleware architectures. The new platform will allow for easier instrument and data integration. This paper outlines the steps involved in the development of the proposed Jini-based middleware, JOVIM, establishing the requirements for such a platform and describing its main characteristics and mechanisms.

Supporting Large-Scale Networked Virtual Environments

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Dewan Ahmed (University of Ottawa, Canada)
Shervin Shirmohammadi (University of Ottawa, Canada)
Jauvane Oliveira (National Laboratory for Scientific Computation, Brazil)
Jimmy Bonney (University of Ottawa, Canada)

Abstract – In this paper, we introduce a framework that supports a large number of participants in a collaborative virtual environment (CVE). We consider object classification based on avatars' physical characteristics to define the overlay network used to disseminate update messages between participants. This concept systematically puts objects into different logical clusters where each cluster can be rated in terms of a persistency class. We integrate a greedy heuristic algorithm to form a better network structure and then apply the dominating set principle to build a routing table for intra-zone communication. In this paper, we have used OPNET to verify the applicability of these approaches to large-scale CVEs.

Topology Control Modeling and Measurement for Networked Virtual Environments

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Behnoosh Hariri (Sharif University of Technology, Iran)
Shervin Shirmohammadi (University of Ottawa, Canada)
Mohammad Reza Pakravan (Sharif University of Technology, Iran)

Abstract - In this paper we will propose a novel distributed architecture for overlay tree construction in collaborative virtual environments that is unlimitedly scalable due to its fully decentralized nature. The routing issue over this architecture will later be discussed and several forwarding schemes based on distributed hash tables (DHT) will be proposed. One of the main concerns for a routing algorithm is to keep a trade-off between the algorithm locality and the algorithm performance. In a global algorithm where nodes make the forwarding decision based on the information gathered from all other nodes in the network, the routing performance may obviously be better. However such a large group of neighbors result in a large topology discovery cost and huge routing tables when the number of nodes exceeds a certain limit. In this article we will try to find the best trade-off among these factors therefore proposing an optimum neighborhood radius for each node. Finally a comparison will be made regarding path delay criteria among several proposed forwarding schemes at the optimum neighborhood radius point.

L-VCONF: A Location-Aware Infrastructure for Battlefield Videoconferences

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Abstract—Audio and videoconference technologies make complex coordination processes easier, especially when mobile participants need to synchronize their action in critical environments. The need for an infrastructure providing such a functionality may arise in complex scenarios where an IP network is not available, as for instance in battlefield or other critical environments. This paper describes L-VCONF, an architecture for geo-located conferencing based on a mobile/cellular network (i.e. GPRS, UMTS, WiMax technologies), quick-and-dirty mobile/cellular geolocation, SIP protocol and presence server. Our architecture supports IP audio/videoconferences enriched with geo-located coordination functionalities in complex environments. The approach described in the paper is robust w.r.t. uncertainty while handling location update notification for SIP presence server.