1

From Interactive to Experimental Multimedia

Ioannis Deliyannis
*Department of Audio and Visual Arts,
Ionian University, Corfu,
Greece*

1. Introduction

Perhaps the most dramatic Information Society development witnessed today is the wide availability of social networking capabilities for the users, orchestrated through the wide variety of virtual multimedia communication tools. Mobile and networked interactive multimedia applications are employed to promptly capture or create user-centered content that after being processed and enriched with the appropriate context is relayed back to the community. Tools destined to serve various purposes emerge in various fields including entertainment, marketing, education, engineering, scientific research, medicine, business, art and communication (Jain et al., 2011). In the literature, their popularity is attributed to social multimedia dynamics (Naaman, 2010), combined with the wide accessibility of networking and networked devices (Castells, 2011). Other important factors that allow interactive access to multimedia content include the availability of virtual multimedia-data storage technologies, streaming and content-discovery repositories, simplified URL-based information linking across social software applications, cloud infrastructures and reduced wireless internet-access cost.

Naturally, the extensive use of multimedia introduces a high content volume produced and shared today, which is commonly referred to as "Big Data" (Manovich, 2011, Boyd and Crawford, 2011). Its management requires advanced indexing, tracking (Pino and Di Salvo, 2011) and retrieval techniques to be applied (Pino and Di Salvo, 2011, Lu et al., 2011, Lew et al., 2006). Currently, leading social software systems employ multimedia metadata standards and methods that permit direct content categorisation and effortless indexing through storage of temporal, geographical or context-based information alongside the submitted content (Schallauer et al., 2011). In some instances, partial metadata information may be added directly; for instance when a photograph or a video is captured, a GPS-enabled camera presents the user with the option to add a timestamp and location-coordinates. Additional information may be embedded by the user during the process of content-submission, as a result of social interaction where other users identify themselves in the audio-visual content, or via post-processing of image, audio and video analysis algorithms for landmark, voice and facial recognition (Wang, 2012, Mahapatra et al., 2011). Context exploitation poses practical challenges (Riek and Robinson, 2011), as it requires analysis on the situational context, identification of the social roles of individuals, the cultural context and the social norms that are in effect at that time (Hanjalic, 2012). Most algorithmic content-context analysis approaches suffer from various inefficiencies, particularly when they are employed to assess and decide on the social context captured in the content. Studies that relate the functionality of interactive multimedia systems to their content complexity have identified multiple areas that need to be addressed during design time in order to achieve a high-quality end-system. These include technical aspects, process engineering, content and context complexity issues (Webb and Gallagher, 2009).

Increased system complexity is also introduced when socially-sourced multimedia data are examined temporally (Baecker, 2011). Designing interactive multimedia applications that adapt to short-term and long-term user-needs is clearly an intricate process. Today leading social software developers have identified the significance of chronological user-driven information, as temporal data analysis can be employed to identify user trends, preferences, social context and other valuable information that may be employed to furnish systems with additional functionality. Take for example the physical and mental changes that occur during the second decade of a humans' life, alongside the surrounding cultural and social changes. Typical issues that need to be resolved by the designer of such an application include the construction of an adaptive user interface which should offer expressive flexibility to the user, provide the necessary age restrictions and parental controls, cover age-based usability issues while it adapts according to the wider cultural and personal aesthetic issues. In that respect, a developer needs to monitor particular user characteristics including the users' cognitive load and adjust the content appropriately (Kalyuga et al., 2011), while at the same time external social conditions and exploration of temporal changes can help identify correlation between user taxonomies (Cagliero, 2011, Nardelli, 2010).

1.1 Chapter aims

The interdisciplinary nature of interactive multimedia systems requires the combination of various scientific, research and creative fields. This introduces research and developmental complexities as multiple factors have an impact on the interaction process: stochastic processes, content demands cultural factors and the user senses. Selecting the appropriate underlying developmental methodology that suits best the end-user and system demands is the requirement here. This is not an easy task, as these methodologies are not categorised comprehensively under a single field. State-of-the-art scientific developments, theories and methodologies are referenced across multiple research fields, rendering hard the task to identify the most appropriate for the task in hand. To state an example, one may refer to recent educational research results that demonstrate how the development of interactive templates may support course evaluation, while the use of re-programming for each course is reduced (Koong and Wu, 2011). The presented concept and technology are not new, as similar ideas and their applicability have been tested approximately a decade ago, in fields of engineering science where a similar system was developed for the presentation of educational and research data (Deliyannis, 2002), and their commercial availability (INNFM, 2002). The proposed methodology allows course-oriented content-ontologies to be stored in appropriate multimedia templates, generate automatically their interaction structure based on content and destined use and allow students and scientists to use varying interaction modes in order to navigate through the data enabling learning and content-exploratory scenarios to be realised effortlessly. The same underlying system principles were later utilised with the use of the appropriate learning framework for students with learning disabilities (Deliyannis et al., 2008, Deliyannis and Simpsiri, 2008, Deliyannis, 2007), proving the flexibility of the methodology to adapt and evolve.

The wider need for interactive multimedia frameworks, methodologies and applications, and the effect that these present to society combined with the creative and communication aspects introduced by these technologies should clearly receive greater attention. It is imperative therefore to capture and organise comprehensively the underlying philosophy, emerging theories, novel research, technology and all the necessary building components that can furnish interactive multimedia research with the essential planning, design and development tools. This work may be considered as a starting point that touches upon a number of issues that need to be resolved. Chapter 2 discusses and proposes a contemporary definition for interactive multimedia. In chapter 3 the field of experimental multimedia is introduced, where novelty in technology and content are combined for the development of innovative systems, while chapter 4 discusses the creative and communication aspects introduced. Chapter 5 concludes this work that proposes possible future developments and directions for the field of interactive multimedia.

2. Interactive multimedia definition

According to New Oxford American Dictionary, the term "**Multimedia**" when it refers to computer applications, they are meant to "*incorporate audio and video, especially interactively*", while when multimedia refers to art or education systems then it is implied that they are "*using more than one medium of expression or communication*". Interpretation of the word "Expression" and "Communication" used in the definition, signifies implicitly the existence of interactive processes. Communication in that respect may be considered as an interactive process between two parties that exchange information and evolve or change as a result. Today, multimedia is used to define an extremely wide area that includes the fields of informatics, telecommunications, the audio-visual production sector, cinema and digital media. In that respect, the term "**interactive multimedia**" is used to describe a scientific and creative research field within "**multimedia**" that supports expression or communication through multiple media with the ability to influence and alter their content and context.

The same dictionary states that when the term "**Interactive**" is used in conjunction to two people or things, it means they have an effect or influence each other. To extend the interactive definition further, this effect may be identified in the physical world, i.e. an action that may trigger a reaction, or a change of the user's mental state and condition. Both conditions may also co-exist, particularly when the process is temporally examined. Take for example a painter who in order to create a painting interacts both mentally and physically when using the canvas, palette of colour and the appropriate tools. Although these processes stop for the artist when the painting is completed, the medium itself continues to instigate interaction when another person is influenced, inspired or moved by that painting. This in turn may result into a physical reaction expressed by the urge to capture the image or purchase a copy or the actual artwork, which may then be user as the starting point for new interactive behavior. Similarly, in New Media Arts this interactive process often involves multiple media.

The term "**Interactive Multimedia**" may be used to describe a physical or digital system where multiple media or people have an effect on each other through their interactive behavior. When "**Interactive Multimedia**" is used in fields such as art or education it implies the use of multiple media used for expression or communication and the existence of a dynamic user-state or content-altering capability.

2.1 Interactive media, the foundation of interactive multimedia

In his 2002 book, Manovich refers to "interactive media" and the varying interaction levels involved: "When we use the concept of "interactive media" exclusively in relation to computer-based media, there is danger that we interpret "interaction" literally, equating it with physical interaction between a user and a media object (pressing a button, choosing a link, moving the body), at the sake of psychological interaction". (Manovich, 2002). The hidden meaning of this statement beyond the danger to reduce the meaning of "interaction" to human "action-reaction" response is that computer-based media have the potential to become interactive, provided that they are used in a manner that enables interaction. Storing a movie on a computer does not make it interactive. Displaying the movie on a screen through a counter responsive system may trigger the user to interact, thus it may in that context be considered interactive. In order to clarify this argument, let us reverse the example. We can safely assume that if an analog media object such as a film enables psychological interaction, it will continue to do so when it is digitised, stored and reproduced by the computer, as the new presentation medium allows the user to comprehend the content using the psychological processes of filling-in, hypothesis forming, recall and identification.

One may call on a different example to clarify things further. Can we characterise as interactive the "Newspaper" exhibit displayed in the year 1979 at the Museum of Science and Industry in Chicago that used laserdiscs to allow visitors to search for past issues of the front page of the Chicago Tribune newspaper? What if we stapled together the same newspaper covers in printed format and we provided an installation next to the "Newspaper" exhibit enabling users to "interact" with? That new system would still be an analog analogy of the digital system that allows user-system interaction through multiple-media (image and text). The significance of the above examples is identified in the fact that the system provides the potential for interaction, not the computerisation of the content. In that respect, the answer to the above questions is that these systems may be characterised interactive. The example stated above identifies clearly the need to utilise an appropriate taxonomy in order to classify interactive multimedia systems and applications. This categorisation may serve multiple purposes, depending on the factors used for system-classification.

2.2 Activity theory, interactivity and system taxonomy

Interactive multimedia systems incorporate a number of important characteristics (Bryant et al., 2005) enabling them to be perceived as a socio-technical systems where humans the leading role within their "social situatedness" (Lindblom and Ziemke, 2002): they support object-oriented actions, a notion that under this context refers towards the objective of the actions, not the computer science term; humans are actors engaged in activities; they are influenced by the community and the current state; they use the tools that are available to them which in most cases were created by others and are influenced by the culture and social knowledge; creation is a shared process between acting members and there are rules that regulate the activities in the system. The activity theory model seems to describe the interactive multimedia design and development process more accurately than traditional cognitive science approaches as it may be used to explain the underlying process used under "consciousness". At the system level, most contemporary computer-based interactive multimedia applications and tools demonstrate typical data-processing behavior based on a point-and-click interface that triggers the underlying processes.

In contrast to many purely cognitive approaches, the psychological model termed "activity theory" that Lev Vygotsky, Alexander Luria and Alexei Leont'ev started developing in the 1920's and 1930's is today used to describe interaction between humans and interactive multimedia systems. A temporal perspective is employed where humans are born and start their personal development in a created environment which is already shaped by the needs and tools of others (Bertelsen and Bødker, 2003). A person is influenced and in turn influences the environment and others as human mind and human activities are linked under the model. As a result, the changes that a person introduces to the environment influence humans that are born within this environment. These principles may apply to both narrow and wide human-computer interaction contexts (Nardi, 1996).

Interestingly, some of the most informative examples of interactive multimedia system taxonomies were developed with multimedia art systems in mind as they pose complex and novel interaction requirements (Nardelli, 2010, Edmonds et al., 2004, Hannington and Reed, 2002, Sommerer and Mignonneau, 1999). This categorisation may be attributed to the fact that interactive new media art systems utilise technology in an experimental manner. This non-conventional use of technology that aims to fulfil the artists' presentation requirements often results into the expansion of the technical limits through innovation. In other words, it is common for artists to experiment with issues such as multisensory inputs, parallel projections, immersion, interaction, virtual worlds, audio-visual effects and other sense-enhancing technologies in a non-conventional manner, a process that furnishes their new media art creations with interactive multimedia capabilities in an attempt to communicate with their audience. We refer to this type of interactive multimedia systems with the term "Experimental Multimedia" first used in 2009 by Dr Ioannis Deliyannis to name a new course taught at the department of Audio and Visual Arts, Corfu, Greece. In this course student-artists were guided to envision, design and create interactive multimedia systems that combine technological and artistic innovation. Typical examples of such systems include original interactive multimedia installation art systems produced as a result of a Ph.D degree within Interactive New Media Arts, or other systems that fulfil the above requirements (Karydis et al., 2011, Deliyannis and Karydis, 2011, Deliyannis and Pandis, 2009). Under activity theory, one may categorise interactive-art and experimental multimedia systems as experimentation tools, which may be used to influence and advance further the technological and social proficiency. It is informative to examine these taxonomies and assess whether they may be used to describe Interactive Multimedia Systems according to their functional characteristics.

3. Experimental multimedia

Artists often extend system capabilities as they deliver their message through multimedia communication processes and systems designed to use the maximum potential of the underlying interactive multimedia technologies. This is certainly a task that requires the combination and coordination of interdisciplinary research fields in order to fulfil the artist's requirements and aesthetic result (Trifonova et al., 2009, Trifonova et al., 2008). In order to describe their functionality in terms of complexity, scientists have proposed various taxonomical methods (Pino and Di Salvo, 2011, Nardelli, 2010, Edmonds et al., 2004, Hannington and Reed, 2002). Interestingly, these taxonomies may be applied to non-artistic interactive multimedia systems and they describe the degrees of freedom supported by the end-system.

"**Experimental multimedia**" is a term used to describe the interdisciplinary field where novel interactive works are implemented through the use of customised interactive multimedia systems and applications designed to cater for their specific content presentation-demands and advanced interaction-requirements. This implies that the originality of the work is traced both at content and system levels. Typical examples of such systems include pioneering interactive artwork, research-based works, and the end products of doctoral and postdoctoral research in the field of interactive multimedia and new media arts.

Those who are familiar with the term multimedia may argue that there is no need for experimental multimedia, as multimedia itself may be used to describe the above works. A typical definition used to support such an argument may be found at the New Oxford American Dictionary: "*using more than one medium of expression or communication: a multimedia art form that is a mélange of film, ballet, drama, mime, acrobatics, and stage effects*". We argue that this is true: all experimental multimedia instances may be categorised under the generalised multimedia definition. The word experimental is used in this context as an adjective in order to express explicitly their combined innovative attributes and characteristics introduced within their technological and artistic forefronts. Similarly, various categorisations are often introduced under the classical Multimedia definition, classifying further the main focus: analog, digital, linear, non-linear, interactive, adaptive etc.

3.1 Artists and engineers: Combining creativity with innovation

Researchers and philosophers have examined from various standpoints the issues that arise when art and technology are combined in order to create an expressive tool, in a process that combines culture, history, theory and technology (Turner, 2007, Popper, 2005, Hansen, 2004, Lister, 2003). The fundamental objective of an experimental multimedia system under an art-bases scenario is communication between the artist and the audience, where technology assumes an active role as the medium that materialises the artists' ideas. Many have studied the inner-workings and have proposed system-development methodologies employed within multidisciplinary teams (Trifonova et al., 2008, Jaccheri and Sindre, 2007, Biswas and Singh, 2006).

Interactivity is a key factor, as it furnishes experimental multimedia systems with communication capabilities (Stromer-Galley, 2004). In that respect it is used beyond the typical point-and-click setting of a computer-based application, providing interactive experimental functionality able to trigger the human senses through multiple communication channels, thus providing multi-sensory communication. The use of technology as a rich interactive method of expression clearly offers increased artistic flexibility.

3.2 Invisible places – Immense white

A typical interactive video installation that may be categorised as an experimental multimedia instance is the work by the Greek video-artist Marianne Strapatsakis entitled "Invisible places – immense white" (Strapatsakis, 2008). Here, biometric activity is utilised to detect what state the user is in: relaxed or stressed. The collected data are then used for the adjustment of the audio-visual environment, and direct interaction with the artwork via interactive drawing of a coloured line directly on the video, based on the user's mental state and its alterations. The installation consists of five synchronized screens that project a continuous and dynamically adjusting/rendering video sequence in an attempt to affect the user's stress levels, under a cinematic audio-visual scenario. A corridor where each wall is a reverse-projection display, leads to a cyclic projection comprising of three arc-shaped screens. An appropriately edited video is displayed across the five screens, while on the left corridor wall the user's stress level is drawn dynamically. Sensors measuring brain wave activity, complete with batteries and a Bluetooth wireless network were appropriately fitted originally into wearable items of clothing in order users to be able to move freely within the installation. User-system interaction under the currently examined project extended beyond the development of a simple action-response system to a fuzzy decision process that temporally tracks, senses and plots directly in the artwork the state of multiple users that experience the environment.

4. Creative and communication aspects of interactive multimedia

The term interactive multimedia is used to describe the combination of technology and multimedia content for the development of interdisciplinary systems employed in a wide array of applications including research, education and interactive art. The plethora of creative and communication aspects offered by interactive multimedia, present multifaceted complexities, particularly as the development of real-life applications is viewed from multiple user-perspectives. Some believe that developments are driven by the dynamics of information (Dezsö et al., 2006), others that innovation precedes technology (Nonaka and Takeuchi, 1995), or simply that it is a matter of sensation and perception (Mather, 2011). It is informative therefore to examine diverse perspectives, in order to identify the aspects of communication and creativity of importance to each group.

Active users in social networks perceive interactive multimedia applications as a tool that allows them to be informed virtually about the developments within their social circle, where direct one-to-one or mass-communication is permitted. In fact, what social networking technology offers to users is the ability to adjust their social interaction timeframe by exchanging digitised multimedia content and experiences within their social circle at their own pace and location (Camarillo and Garcia-Martin, 2011). When social networking systems are used in passive mode they may be contrasted to non-interactive media such as television where the user can sit back and observe what others do. Even so, multimedia content displayed in a live-mode triggers the user to react introducing an action-reaction response that is channelled through the system in an iterative multimedia cycle.

From the developers' perspective, building interactive multimedia applications in the past was an expensive production task that required a team of experts, industrial-level equipment and access to marketing routes. The availability of open-source software, libraries and tutorials has enabled non-professional developers to design, implement and provide new tools, applications and services. These offer innovative data access and manipulation capabilities through intuitive interfaces, deal with technological issues that often arise in rich-media applications such a quality of service (QoS) issues and they are able to compete with industrial-level competitors (Holzer and Ondrus, 2011). Software developers believe that the principal factors that support the growth of the Interactive Multimedia sector include the increased user-researcher interest, the oversized market demand and the availability of open access programming-development tools. As a result, the software development process today is simplified, as a personal computer with the appropriate software may be utilised to create high-level multimedia applications featuring interactive scenarios (Garrand, 2010), that may then be distributed through proprietary web-based application stores (Sans and Diaz, 2011). Multimodal user-input is also supported at the technological level, as portable devices offer advanced processing and multimedia delivery capabilities, while they support a wide range of sensor-based inputs. It is common for a handheld communications device to feature internet access, built-in and wireless microphones, camera-based video tracking capabilities, multi-touch screen, support for GPS, compass, altimeter, movement and other multi-sensory information (Ghinea et al., 2011).

5. Conclusion

The field of interactive multimedia has matured as it provides the underlying tools that are required in order to design and develop new sense-enabling communication media. Recent developments in popular fields such as mass communication media (Deliyannis et al., 2011b) and computer games (Deliyannis et al., 2011a), have shown that these systems have the ability to shape the society as they clearly extend the virtual communication capabilities offered today. The developments are so rapid that they even introduce new legislation issues that need to be resolved (Deliyannis et al., 2011b).

This work touched upon the issues of definition clarification, taxonomies and applications that trigger further research in multiple forefronts under interactive multimedia, a field that clearly requires further analysis. Finally, the introduction of experimental multimedia as an interdisciplinary field that introduces a high volume of innovation is considered necessary, as it enables clear identification of the level of proficiency offered by interactive systems today.

6. References

Baecker, D. 2011. Why Complex Systems Are Also Social and Temporal.

Bertelsen, O. W. & Bødker, S. 2003. Activity theory. *HCI models, theories, and frameworks: Toward a multidisciplinary science*, 291-324.

Biswas, A. & Singh, J. 2006. Software Engineering Challenges in New Media Applications. *Software Engineering Applications SEA 2006.* Dallas, TX, USA.

Boyd, D. & Crawford, K. 2011. Six Provocations for Big Data.

Bryant, S. L., Forte, A. & Bruckman, A. Becoming Wikipedian: transformation of participation in a collaborative online encyclopedia. 2005. ACM, 1-10.

Cagliero, L. 2011. Discovering temporal change patterns in the presence of taxonomies. *IEEE Transactions on Knowledge and Data Engineering*.

Camarillo, G. & Garcia-Martin, M. A. 2011. *The 3G IP multimedia subsystem (IMS): merging the Internet and the cellular worlds*, John Wiley & Sons.

Castells, M. 2011. *The Rise of the Network Society: The Information Age: Economy, Society, and Culture Volume I*, Wiley-Blackwell.

Deliyannis, I. 2002. *Interactive Multimedia Systems for Science and Rheology.* Ph.D, Ph.D Thesis, University of Wales.

Deliyannis, I. 2007. Exploratory Learning using Social Software. *Cognition and Exploratory Learning in the Digital Age (CELDA).* Algarve, Portugal.

Deliyannis, I. & Karydis, I. 2011. Producing and Broadcasting Non-Linear Art-Based Content Through Open Source Interactive Internet-TV. *ACM EuroITV.* Lisbon, Portugal.

Deliyannis, I., Karydis, I. & Anagnostou, K. 2011a. Enabling Social Software-Based Musical Content for Computer Games and Virtual Worlds. *4th International Conference on Internet Technologies and Applications (ITA2011).* Wrexham, North Wales, UK.

Deliyannis, I., Karydis, I. & Karydi, D. 2011b. iMediaTV: Open and Interactive Access for Live Performances and Installation Art. *4th International Conference on Information Law (ICIL2011).* Thessaloniki, Greece.

Deliyannis, I. & Pandis, P. An Interactive Multimedia Advertising System for Networked Mobile Devices. 4th Mediterranean Conference on Information Systems (MCIS), 2009 Athens.

Deliyannis, I. & Simpsiri, C. Interactive Multimedia Learning for Children with Communication Difficulties using the Makaton Method. International Conference on Information Communication Technologies in Education, 10-12 July 2008 Corfu, Greece.

Deliyannis, I., Vlamos, P., Floros, A. & Simpsiri, C. Teaching Basic Number Theory to Students with Speech and Communication Disabilities Using Multimedia. International Conference on Information Communication Technologies in Education, 10-12 July 2008 Corfu, Greece.

Dezsö, Z., Almaas, E., Lukács, A., Rácz, B., Szakadát, I. & Barabási, A. L. 2006. Dynamics of information access on the web. *Physical Review E,* 73, 066132.

Edmonds, E., Turner, G. & Candy, L. Approaches to interactive art systems. 2004. ACM, 113-117.

Garrand, T. 2010. Interactive Multimedia Narrative and Linear Narrative. *Write Your Way Into Animation and Games: Create a Writing Career in Animation and Games*.

Ghinea, G., Andres, F. & Gulliver, S. 2011. Multiple Sensorial Media Advances and Applications: New Developments in MulSeMedia. Information Science Reference.

Hanjalic, A. 2012. A New Gap to Bridge: Where to Go Next in Social Media Retrieval? *Advances in Multimedia Modeling*, 1-1.

Hannington, A. & Reed, K. Towards a taxonomy for guiding multimedia application development. 2002. IEEE, 97-106.

Hansen, M. B. N. 2004. *New Philosophy for New Media*, MIT Press.

Holzer, A. & Ondrus, J. 2011. Mobile application market: A developer's perspective. *Telematics and Informatics,* 28, 22-31.

INNFM. 2002. *Rheology Films* [Online]. Institute for Non-Newtonian Fluid Mechanics. Available: http://www.innfm.org.uk/Films.html 2012].

Jaccheri, L. & Sindre, G. 2007. Software Engineering Students meet Interdisciplinary Project work and Art. *11th International Conference Information Visualization (IV '07).* Zurich, Switzerland.

Jain, R., Del Bimbo, A., Chua, T. S. & Furht, B. 2011. Survey papers in multimedia-guest editorial. *Multimedia Tools and Applications*, 1-4.

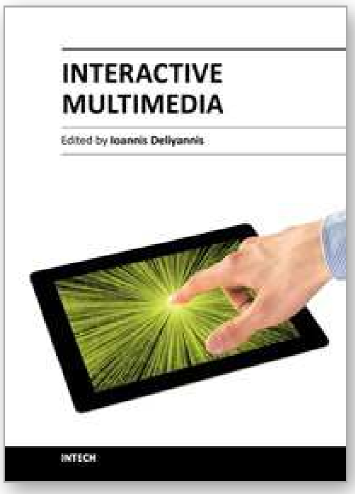
Kalyuga, S., Ayres, P. & Sweller, J. 2011. *Cognitive Load Theory*, Springer.

Karydis, I., Deliyannis, I. & Floros, A. 2011. Augmenting Virtual-Reality Environments with Social-Signal Based Music Content. *17th International Conference on Digital Signal Processing (DSP2011).* Corfu, Greece.

Koong, C. S. & Wu, C. Y. 2011. The applicability of interactive item templates in varied knowledge types. *Computers & Education,* 56, 781-801.

Lew, M. S., Sebe, N., Djeraba, C. & JAIN, R. 2006. Content-based multimedia information retrieval: State of the art and challenges. *ACM Trans. Multimedia Comput. Commun. Appl.,* 2, 1-19.

Lindblom, J. & Ziemke, T. 2002. Social situatedness: Vygotsky and beyond.
Lister, M. 2003. *New Media: A Critical Introduction*, Routledge.
Lu, Y., Sebe, N., Hytnen, R. & Tian, Q. 2011. Personalization in multimedia retrieval: A survey. *Multimedia Tools and Applications*, 1-31.
Mahapatra, A., Wan, X., Tian, Y. & Srivastava, J. 2011. Augmenting image processing with social tag mining for landmark recognition. *Advances in Multimedia Modeling*, 273-283.
Manovich, L. 2002. *The Language of New Media*, MIT Press.
Manovich, L. 2011. Trending: The Promises and the Challenges of Big Social Data. *Debates in the Digital Humanities, ed MK Gold. The University of Minnesota Press, Minneapolis, MN.[15 July 2011]*.
Mather, G. 2011. *Sensation and Perception*, Taylor & Francis.
Naaman, M. 2010. Social multimedia: highlighting opportunities for search and mining of multimedia data in social media applications. *Multimed. Tools Appl.(in press), doi,* 10.
Nardelli, E. A classification framework for interactive digital artworks. International ICST Conference on User Centric Media, 2010 Palma, Mallorca.
Nardi, B. A. 1996. *Context and consciousness: activity theory and human-computer interaction*, The MIT Press.
Nonaka, I. & Takeuchi, H. 1995. *The knowledge-creating company: How Japanese companies create the dynamics of innovation*, Oxford University Press, USA.
Pino, C. & Di Salvo, R. A survey of semantic multimedia retrieval systems. 2011. World Scientific and Engineering Academy and Society (WSEAS), 353-358.
Popper, F. 2005. *From Technological to Virtual Art*, MIT Press Ltd.
Riek, L. D. & Robinson, P. 2011. Challenges and opportunities in building socially intelligent machines. *IEEE Signal Processing*.
Sans, V. & Diaz, J. Implementing a multimedia application on iPhone: a case study. 2011. IEEE, 233-238.
Schallauer, P., Bailer, W., Troncy, R. & Kaiser, F. 2011. Multimedia Metadata Standards. *Multimedia Semantics*, 129-144.
Sommerer, C. & Mignonneau, L. 1999. Art as a living system: interactive computer artworks. *Leonardo,* 32, 165-173.
Strapatsakis, M. 2008. Interactive art-installation: Invisible places - immense white. Strasbourg November 2008.
Stromer-Galley, J. 2004. Interactivity-as-Product and Interactivity-as-Process. *The Information Society Journal,* 20, 391-394.
Trifonova, A., Ahmed, S. U. & Jaccheri, L. 2009. SArt: Towards Innovation at the Intersection of Software Engineering and Art
Information Systems Development. *In:* Barry, C., Lang, M., Wojtkowski, W., Conboy, K. & Wojtkowski, G. (eds.). Springer US.
Trifonova, A., Jaccheri, L. & Bergaust, K. 2008. Software engineering issues in interactive installation art. *Int. J. Arts and Technology,* 1, 43-65.
Turner, G. 2007. *Supportive methodology and technology for creating interactive art.* PhD, University of Technology.
Wang, F. C. 2012. A Novel Approach to Mine Knowledge from Social Images. *Advanced Materials Research,* 430, 1068-1071.
Webb, B. & Gallagher, S. 2009. Action in context and context in action: Modelling complexity in multimedia systems development. *Journal of Information Technology,* 24, 126-138.



Interactive Multimedia

Edited by Dr Ioannis Deliyannis

ISBN 978-953-51-0224-3
Hard cover, 312 pages
Publisher InTech
Published online 07, March, 2012
Published in print edition March, 2012

Interactive multimedia is clearly a field of fundamental research, social, educational and economical importance, as it combines multiple disciplines for the development of multimedia systems that are capable to sense the environment and dynamically process, edit, adjust or generate new content. For this purpose, ideas, theories, methodologies and inventions are combined in order to form novel applications and systems. This book presents novel scientific research, proven methodologies and interdisciplinary case studies that exhibit advances under Interfaces and Interaction, Interactive Multimedia Learning, Teaching and Competence Diagnosis Systems, Interactive TV, Film and Multimedia Production and Video Processing. The chapters selected for this volume offer new perspectives in terms of strategies, tested practices and solutions that, beyond describing the state-of-the-art, may be utilised as a solid basis for the development of new interactive systems and applications.

INTECH
open science | open minds

InTech Europe
University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China
Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821