

TOPICALITIES

Edited by Markéta Držková

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News & more

Recent news from CIE



In 2023, the International Commission on Illumination made the overview of the CIE datasets included in various CIE Technical Reports and International Standards available online. A dedicated CIE website provides the list of the datasets with links to their details, including brief descriptions, metadata files and references to the CIE publications where they were originally published. Some datasets are provided open access, such as for the CIE indoor daylight illuminant ID50 or the new CIE reference spectrum L41 – see the report CIE 251:2023 presented on the next page.

Also, CIE released two technical notes, which are, as usual, freely downloadable from the CIE website. The first one, CIE TN 014:2023, was prepared under Division 3, Interior Environment and Lighting Design. It is related to the discomfort caused by glare; namely, it provides an example HDR luminance image measurement setup for UGR (Unified Glare Rating). The method to determine the glare source area for luminaires with a non-uniform source luminance, which is typical for light-emitting diodes, is provided in the technical report CIE 232:2019.

The other, CIE TN 015:2023, prepared under Division 6, Photobiology and Photochemistry, reports on the Second International Workshop on Circadian and Neurophysiological Photoreception, held in 2019. Among other details, it provides the resulting thresholds for healthy day-active adults expressed in terms of the melanopic EDI, i.e. equivalent daylight (D65) illuminance defined in the standard CIE S 026, see also JPMTR Vol. 7 No. 4. The recommended minimum melanopic EDI during the daytime is 250 lx, while the recommended maxima are 10 lx during the evening (at least three hours before bedtime) and 1 lx during the night. Further, a new Joint Technical Committee, CIE JTC 20, was formed under Division 6 and Division 2, Physical Measurement of Light and Radiation. It deals with the current wearable α -opic dosimetry and light logging methods, as well as related limitations, device calibration, metadata and data schemes. Its work builds on the α -opic metrology defined in the standard CIE S 026, which provides the spectral sensitivity functions describing the ability of optical radiation to stimulate each of the five photoreceptor classes and has introduced α -opic as a common term for S-cone-opic, M-cone-opic, L-cone-opic, rhodopic and melanopic.

Another newly established Technical Committee, TC 3-63 under Division 3, aims to define a method for determining the indoor lighting requirements for different visual tasks while considering aspects beyond those usually covered in existing standards, such as personal and contextual variables. At the same time, the definition of a decision scheme to tailor the design values according to the specific lighting needs is in line with the approaches recently adopted in guidelines and standards for the lighting of indoor workplaces. In the summer months, a call of CIE TC 4-50 Road Surface Characterization for Lighting Application was open to collect data for the reflectance tables to be included in the update of CIE 144:2001 to represent modern pavements and road surfaces better. Several other standards also are currently under development. The two released in 2023 are presented on the next page.

An update on Fogra research projects in 2023



The projects with the timescale ending in 2023 cover all six main areas

of Fogra research. The project in the field of security applications aimed to develop standardised performance tests in near-field communication technology based on ISO/IEC 14443 Cards and security devices for personal identification – Contactless proximity objects and in cooperation with the relevant card and reader manufacturers to identify all tasks essential for smart cards functionality. The standardised performance tests can be used for individual transponders and readers as well as for testing the interoperability of a particular transponder–reader combination.

Three projects concerned the areas of offset printing with materials and environment and were solved jointly by the corresponding Fogra Technical Committees. The project dealing with the on-demand inactivation of microbial contamination in the fountain solution circuit of offset printing presses was carried out in cooperation with the wfk – Cleaning Technology Institute. The need to solve this issue substantially increased with the reduced use of isopropanol and biocide additives in the fountain solution. The proposed system capable of dosing a tailored amount of antimicrobial substances is based on 3D-printed, biodegradable hydrogels with antimicrobial peptides in microcapsules that can be degraded by contamination and thus release the active substances when and where appropriate. This year, a new project on this topic was started with the same partner, aiming to develop a system for optical monitoring and minimising microbial contamination in the fountain solution circuit using photosensitisers with the aggregation-induced fluorescence emission and photodynamic inactivation of bacteria.

Another project studied, in partnership with the Technical University of Darmstadt, coldset inks formulated without mineral oils to gain insight into their deinkability, which is essential for paper recyclability, and the compatibility with elastomers to avoid damage of printing press components. The third project from the areas of offset printing and materials comprised a comprehensive characterisation of orange, green and violet printing inks together with folding boxboard and label papers to create the basis for the seven-colour offset packaging printing standard. The commercially available materials were tested in laboratory conditions and on the sheet-fed offset press with different process parameters and using linearisation based on the spot colour tone value (SCTV) defined in ISO 20654.

Further, two projects dealt with print finishing. One was dedicated to film lamination and aimed to develop a prediction model to help identify and prevent possible production risks. The quality of film lamination can be adversely affected due to shortened production times and the use of inks and adhesives optimised with respect to other properties; in particular, time-delayed delamination is an issue. The project involved designing the laboratory laminating system and appropriate stress tests and thorough characterisation of relevant material and process parameters of film-laminated products and their resulting mechanical and thermal resistance. The second finishing project was also concerned with digital printing. It focused on the development of a method for evaluating the perfect binding capability of uncoated printing papers for high-speed inkjet printing used in book production. It paid attention to characterising the specific types of uncoated paper and process influences and comparison of model predictions and practical results. In addition, Fogra participated in the EU-funded ApPEARS project (Appearance Printing – European Advanced Research School), which shall be included in the regular overview of the EU research projects in JPMTR Vol. 13 No. 2.

ISO/CIE 23539:2023

Photometry – The CIE system of physical photometry

This edition from March 2023 is the first published as an ISO/CIE standard. It cancels and replaces ISO 23539:2005 (CIE S 010:2004), which has been technically revised to incorporate the photometric units as defined in the International System of Units (SI) since 2019 and other changes implemented in the report providing the basis of physical photometry, CIE 018:2019, see also JPMTR Vol. 8 No. 4, as well as in CIE 170-2:2015, which deals with the fundamental chromaticity diagram with coordinates corresponding to physiologically significant axes. In particular, the current version includes the reformulated definition of the candela, the spectral luminous efficiency functions for mesopic and 10° photopic vision, and the cone-fundamental-based spectral luminous efficiency functions for 2° and 10° field size. Also, a list of normative references and requirements on using units, tabulated values and interpolating intermediate values have been added.

CIE 251:2023 – LED Reference Spectrum for Photometer Calibration

This report was prepared under Division 2 and provides the tabulated data of CIE reference spectrum L41, which is based on new LED illuminants published in CIE 015:2018 Colorimetry (4th Edition), together with a quality metric for the selection of white LEDs for physical LED standard sources. This reference spectrum comprises the theoretical spectral distribution of a white LED with a correlated colour temperature of 4 103 K. It is intended as a complement to the reference spectrum of CIE standard illuminant A used in photometer calibration, reflecting the rapidly increasing use of lighting products based on light-emitting diodes and thus also their photometric measurement. According to the comprehensive analyses of the corresponding Technical Committee (CIE TC 2-90), the spectral errors in measurements of LED sources are reduced by a factor of two on average with this calibration as compared to the standard illuminant A. However, the measurement with photometers calibrated to L41 is not limited to LEDs.

The 9th drupa Global Trends report



This edition was published approximately a year after the 8th one, so, hopefully, the pause due to the pandemic can be considered a history. Also, the number of respondents has increased to more than 600, which is still less than in the 2010s but is an increase of over 20 % compared to the previous report. The surveys were circulated to printers and suppliers in May and June 2023. The main message is the return of economic confidence, with its levels growing in almost all regions and across all print industry markets, which is particularly good news for the commercial and publishing sectors. However, the data sets for the Middle East and Australia/Oceania are small, and the same applies to functional printing. The key findings include the rising prices and planned capital investments reported by printers for the second time in a row. Concerning printing technology, the most pronounced increase in print volume overall was reported for colour electrophotography, although in the case of packaging, it was outperformed by both flexography and sheetfed offset. The highest increase of the latter was achieved in the publishing sector. For web-to-print solutions, the situation remains stable, with installations reported by 25 % of printers, which is the same percentage as in the first report almost ten years ago. Besides other challenges, recruiting the conventional press operators and finishing staff is an issue; the perceived socio-economic risks are region-specific.

Bookshelf

Springer Handbook of Augmented Reality

This new reference book brings a comprehensive, up-to-date account of augmented reality, i.e. the technologies that convey a sense of virtual and real environments blended to varying extents and provide a new interface to digital information. The publication reflects the recent significant progress achieved in this area thanks to the intensified research and development efforts in both academic and commercial spheres and a growing range of applications in different domains. At the same time, many challenges remain to be solved for augmented reality to deliver a truly immersive experience without the current limitations. Thus, this handbook, contributed by many leading experts in the field and covering the topic from the beginning to the development towards the so-called metaverse, can also be seen as a solid ground for further inventions. The text is supported by extensive references (however, some are repeating), complemented by numerous tables, schemes and other illustrations, and accompanied by a detailed index.

The content is organised into seven parts, where the first three provide the necessary background. Part I explains the fundamental concepts and elucidates the confusing taxonomies of virtual, augmented, mediated, multimediated, mixed, extended and other realities. Then, it brings a historical overview of augmented reality. Part II details the principles of object tracking and mapping, estimating a 3D pose for a hand and an object, mixed reality interaction techniques and interacting with characters controlled by artificial intelligence. Also, it discusses privacy and security issues and solutions. Part III is dedicated to hardware and peripherals for augmented reality, namely the optics of displays, calibration, hardware, and peripherals of tracking systems, the so-called embodied interaction on constrained interfaces, and networking and cyber foraging for mobile augmented reality.

The following three parts present the applications of augmented reality for various purposes. Part IV covers education and training in different areas, from arts to sports, serious games, cultural heritage, holocaust museums and memorials, live theatrical performances and tourist services. Engineering and science applications of augmented reality described in Part V include its use in aerospace and aviation, military and defence, shipbuilding, building maintenance and operation, maintenance, repair and troubleshooting of machinery and other products, remote assistance, and also for interactive finite element analysis. Part VI deals with augmented reality applications in health science, such as computer-guided interventions, healthcare exercise systems, and assistive systems for the cognitively impaired, as well as with considerations specific to its use by children and young adults. Finally, the last part explores the convergence of augmented reality with other emerging technologies, especially artificial intelligence, ubiquitous computing and the Internet of Things, and the potential of digital twins with strategies for their wider adoption, aspects to consider and example implementations.



Editors: Andrew Y. C. Nee, Soh K. Ong

Publisher: Springer
1st ed., January 2023
ISBN: 978-3-030-67821-0
948 pages, 526 images
Hardcover
Available also as an eBook



Innovative Technologies for Printing and Packaging

*Editors: Min Xu, Li Yang,
Linghao Zhang, Shu Yan*

Publisher: Springer
1st ed., March 2023
ISBN: 978-9811990236
677 pages, 473 images
Hardcover
Also as an eBook



This book includes over 80 peer-reviewed research papers from the 13th China Academic Conference on Printing and Packaging (Jinan, China, November 2022). Similarly to previous editions, the contributions cover technology related to colour science, digital media, printing, packaging, mechanical and information engineering, artificial intelligence, printing inks and substrates, and special functional materials. The papers deal e.g. with the calibration of grey balance for fluorescent inkjet image based on spectral calculation, spectral reflectance reconstruction of organic tissue from camera responses, structure design of 3D-printed Braille puzzles, preparation of durable superhydrophobic coating, research on control algorithm of solvent-free compound mixing ratio based on feedforward control, intelligent design of packaging layout using reinforcement learning, ink for electron-beam curing, and hyperelasticity of photosensitive resin plate, to name a few.

Image and Video Color Editing

Author: Shiguang Liu

Publisher: Springer
1st ed., March 2023
ISBN: 978-3031260292
86 pages, 16 images
Hardcover
Also as an eBook



This concise book is a part of the series called Synthesis Lectures on Visual Computing: Computer Graphics, Animation, Computational Photography and Imaging. It covers the advances in image and video colour editing, highlighting the fast

Advanced Technology in Textiles Fibre to Apparel

Current textile production is highly automated and efficient; nevertheless, there is still significant room for improvement, especially concerning the environmental impacts, from source materials to chemical treatments in individual processing steps up to solid waste management. This book brings an overview of the latest innovations in the field.

After introducing the basics of textiles and textile fibres, one chapter discusses various aspects of the management and maintenance of textile machinery necessary for achieving the required quality. The following five chapters present the advanced technology in fabric manufacturing, textile dyeing, textile printing, fabric finishing, and apparel manufacturing. With respect to textile printing technology, the text covers innovative screen printing, transfer printing, cool transfer printing, inkjet printing and 3D printing processes, including state-of-the-art as well as emerging methods, tools and machinery. Next, the book deals with non-woven materials, their unique features, manufacturing and applications, the recent research on applying structural colours to textiles, waste management and the use of biochemical engineering in the textile industry. The last chapter reviews the use of nanomaterials for special treatment in the finishing of textile materials.



*Editors: Md. Mizanur Rahman,
Mohammad Mashud, Md. Mostafizur Rahman*

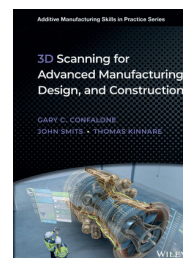
Publisher: Springer
1st ed., June 2023
ISBN: 978-981-99-2141-6
357 pages, 137 images
Hardcover
Available also as an eBook

3D Scanning for Advanced Manufacturing, Design, and Construction

The authors of this new book share their expertise in 3D scanning technology, which expands into various industries, together with 3D printing and other cutting-edge technologies. The text begins with the history of metrology and systems of units, the basics of lasers and their use for 3D scanning, including the principles, limitations and accuracy. Then, it describes scanning equipment and data acquisition and processing software, explaining the procedures and related terms, such as point cloud and polygonal mesh, and the importance of appropriate post-processing. Two chapters deal with reverse engineering for industrial and consumer applications and for architecture, engineering and construction. The text concludes with future directions, incl.

*Authors: Gary C. Confalone,
John Smits, Thomas Kinnare*

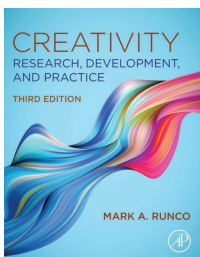
Publisher: Wiley
1st ed., March 2023
ISBN: 978-1-119-75851-8
224 pages
Hardcover
Available also as an eBook



extended reality, autonomous and unmanned aerial vehicles, and industry trends. At the end, an overview of resources and references and a glossary of metrology terms are provided.

Creativity Research, Development, and Practice

The content of this textbook reflects that, due to the nature of creativity, its studying and understanding require combining diverse perspectives. The third edition brings reorganised text with many updated, extended and added parts. First, it discusses the relationships with cognition, personality and motivation. The new chapter on the psychometrics of creativity stresses the need for validity and reliability; recently, quality control in considering new information gained even more importance. The next one brings many new biological insights thanks to the intensive neuroscientific research; on the other hand, their applicability in different contexts is often uncertain. Four chapters deal with clinical, social, attributional, organisational, cultural and historical perspectives. The coverage of relationships with politics is extended not only in the dedicated chapter. There, the deliberately harmful, malevolent creativity is also analysed. Further, age differences, developmental trajectories and educational perspectives are discussed, as are creative potential and prerequisites of its fulfilment and enhancement. The last two chapters review philosophical perspectives and refine the definition of creativity and other concepts, such as intelligence, invention, innovation, imagination and adaptability; computer and animal creativity are also explored.



Author: Mark A. Runco

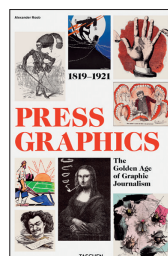
Publisher: Academic Press
3rd ed., March 2023
ISBN: 978-0-08-102617-5
612 pages
Hardcover
Available also as an eBook

History of Press Graphics 1819–1921

Spanning over a hundred years considered the golden age of graphic journalism, this collection showcases the influential magazine and newspaper illustrations, from those documenting events to political agitations to sharp caricatures, that inspired the art then – and still do today. Besides the works of famous artists, it brings to light many less-known ones and puts the role and evolution of press graphics into context.

Author: Alexander Roob

Publisher: Taschen
1st ed., April 2023
ISBN: 978-3-8365-0786-8
604 pages
Hardcover
Available also as an eBook



and easy-to-use techniques developed in the 21st century thanks to the rapid development of computer graphics, digital cameras and mobile phones. The chapters present colour transfer, emotional colour transfer, colourisation, decolourisation, style transfer, and enhancement of low-exposure image and video assets.

Communication Design and Branding A Multidisciplinary Approach

Editors: Nuno Martins, Daniel Raposo



Publisher: Springer
1st ed., August 2023
ISBN: 978-3031353840
374 pages, 144 images
Hardcover
Also as an eBook

This book includes 20 peer-reviewed contributions presenting the current knowledge and main research directions in communication design and branding. Combining theoretical and practical perspectives, it highlights the benefits of design and branding synergy in business as well as for academic purposes.

Advances in Design and Digital Communication III

Editors: Nuno Martins, Daniel Brandão



Publisher: Springer
1st ed., October 2022
ISBN: 978-3031203633
844 pages, 298 images
Hardcover
Also as an eBook

This volume presents the Proceedings of the 6th International Conference on Design and Digital Communication (Barcelos, Portugal, November 2022). It collects almost 70 papers in the areas of digital and interaction design, societal challenges and concerns of communication and design, graphic design and branding, and audiovisual design and communication. The topics include, for example, the artistic use of dynamic typography and the role of data visualisation in science communication.

Handbook of Biopolymers

Editors: Sabu Thomas, A. R. Ajitha,
Cintil J. Chirayil, Bejoy Thomas

Publisher: Springer
1st ed., April 2023
ISBN: 978-9811907098
1568 pages, 390 images
Hardcover
Also as an eBook

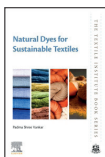


This extensive handbook, printed in two volumes, covers a wide range of biopolymers, their preparation, properties and applications. After the brief introductory part, the second one presents biopolymers from renewable sources, bacterial nanocellulose, marine prokaryotes, humus oils and soy protein, the third one describes their piezoelectric, optical, mechanical, thermal, gas barrier, structural, morphological and textural properties, and the fourth one deals with modifications to tune their hydrophilic or hydrophobic behaviour. The fifth part reviews biopolymer-based blends, interpenetrating polymer networks, gels and composites. The main part of the second volume is dedicated to applications of different types of biopolymers, including printing (especially printed electronics, 3D printing and bioprinting). The last part outlines the future scope, where biodegradation, waste management, safety, environmental and health effects and other challenges are discussed.

Natural Dyes for Sustainable Textiles

Authors: Padma S. Vankar,
Dhara Shukla

Publisher: Woodhead Publishing
1st ed., September 2023
ISBN: 978-0323852579
220 pages, Softcover
Also as an eBook



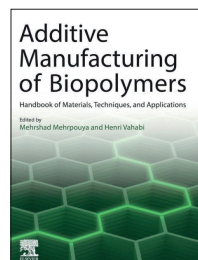
This book covers various aspects of natural dyeing to increase sustainability in textiles, including the application of inks by both traditional and modern printing techniques.

Additive Manufacturing of Biopolymers Handbook of Materials, Techniques, and Applications

This volume, contributed by 36 researchers affiliated with universities across the world, brings an overview of the state of the art in the area of rising importance due to the rapidly growing use of additive manufacturing and related sustainability concerns. The first three chapters introduce and then detail additive manufacturing and 3D printing techniques, considerations specific to printing biopolymers, and recent advances in biopolymer materials, both natural and synthesised. The following chapters deal with 3D printing of biopolymer hydrogels, fire-retardant biopolymers, biopolymer composites and nanocomposites, shape-switching biopolymers, and 4D printing of biopolymers in general. Principles and mechanisms, suitable 3D printing techniques, and example applications are discussed, among others. One chapter presents post-processing methods, which are usually needed to achieve the required mechanical and surface properties of 3D-printed biopolymers. Two chapters then focus on 3D-printed biopolymers and hydrogels for tissue engineering, medical applications and devices; attention is paid to mechanochemistry, mechanical deterioration and degradation of biopolymers, products under development to be adapted to clinical routine and the regulatory questions. The last two chapters discuss potential applications of 3D and 4D printing of biopolymers and the development towards a circular economy.

Editors: Mehrshad Mehrpouya, Henri Vahabi

Publisher: Elsevier
1st ed., April 2023
ISBN: 978-0-323-95151-7
422 pages
Softcover
Available also as an eBook

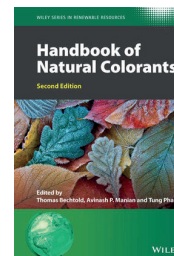


Handbook of Natural Colorants

The current edition builds on recent intensive research in the field of natural dyes and pigments, driven by the significantly increased environmental awareness and the need for industrial solutions based on renewable resources as compared to 15 years ago when the original edition was written. Contributed by over 40 experts, the reorganised text in 20 chapters presents historical uses of natural colourants, their sources in different geographical regions and the production and properties of specific types. The remaining ten chapters deal with analytical methods, colouration of wood, textiles and plastics, the role of mordants, natural colourants in printing and packaging, production processes, product standardisation, and environmental, economic, toxicologic and safety aspects of natural dyes and pigments.

Editors: Thomas Bechtold,
Avinash P. Manian, Tung Pham

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2nd ed., July 2023
ISBN: 978-1-119-81171-8
688 pages
Hardcover
Available also as an eBook



Bookshelf

Academic dissertations

Multimaterial 3D/4D Printing by Integrating Digital Light Processing and Direct Ink Writing

This work addresses the challenges of developing a multi-material 3D printing system for high-resolution printing of a wide range of materials with different colours and functional properties at a reasonable price and with time efficiency. The approach is based on integrating digital light processing, which enables creating a matrix with high detail, complex geometry and multi-colour appearance, and direct ink writing as a technique capable of printing various functional materials, including conductive inks, shape memory photopolymers, and liquid crystal elastomers.

First, the dissertation briefly introduces the two 3D printing techniques considered, i.e. digital light processing and direct ink writing, the state of the art regarding multi-material and hybrid 3D printing, including the multicolour and multi-material 3D printing using single or more printing techniques, and the stimuli-responsive materials, namely liquid crystal elastomers (LCE). Next, it describes the design and control of the proposed hybrid 3D printer and printing process, which arbitrarily combines digital light processing and direct ink writing steps. It also discusses the types of inks and printing conditions for achieving the required print quality. Then, the applicability is demonstrated by hybrid printing of different multicolour prototypes, soft robots based on LCE fibres as an active component, and electronic elements. Further, the system was used for 4D printing of freestanding LCE with the ink developed for rapid curing by an in-situ laser-curing module and the utilisation of stretching by the nozzle movement to enhance actuation. The text discusses the influence of printing parameters and presents the printing of the LCE-embedded lattices, active tensegrity structures, actuator with tunable structural stability, and freestanding spatial LCE lattices. Finally, the multicolour 3D printing using single-vat, single-batch grayscale digital light processing without the need of post-processing, based on the Solvent Blue 104 and precisely controlled exposure, is shown with example applications.

Text Comprehension Across Print and Audio: A Person-Centered Mixed Methods Study

The research within this thesis focused on comparing textual information provided as print (in a digital form) or as audio, where the latter is the medium that has recently regained considerable popularity in general and also for academic use. The study systematically combined several methods to collect and analyse quantitative and qualitative data to provide insight into the differences between the two delivery methods and resulting reading and listening comprehension in the case of undergraduate college students. The qualitative data allowed putting the quantitatively identified profiles into context and helped their better understanding.

The introduction of the dissertation defines the objectives and research questions and explains the chosen approach, building on the existing knowledge and identified gaps in terms of learner characteristics, text and test features, and research design and analysis. The literature review provides

Doctoral thesis – Summary

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Mechanical Engineering

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Defended:

18 August 2022, Georgia Institute of Technology, George W. Woodruff School of Mechanical Engineering Atlanta, Georgia, USA

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Further reading:

<http://hdl.handle.net/1853/70102>

Doctoral thesis – Summary

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28 March 2023, University of Maryland, Department of Human Development and Quantitative Methods College Park, Maryland, USA

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Further reading:
 DOI: [10.13016/dspace/maco-ke3d](https://doi.org/10.13016/dspace/maco-ke3d)

Doctoral thesis – Summary

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 14 June 2023, Seoul National
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Further reading:
<https://hdl.handle.net/10371/196361>

the background on comprehension, delivery of textual content by print and audio media, the related neuroscience research, reading on paper or on screen, and the relationship of comprehension with learner characteristics, including age, prior knowledge of the topic, self-efficacy, reading and listening habits, as well as text and test processing behaviours. The main part details the extent and conditions of the study and measures investigated in both phases, from demographics questionnaire to self-reported task experience and cued retrospective interviews, and presents the results together with their in-depth discussion. Three reader profiles and three listener profiles were identified and validated. In both cases, the depth of text processing differed among the groups. In addition, reader profile groups differed on digital reading strategies and listener profile groups on attention regulation and preferences. One of the key findings concerns the role of printed content in education. While similar performance levels of recall and inference were achieved when reading print and listening to audio, print showed an advantage over audio for understanding the main idea and incidental vocabulary learning.

A Study on Electrically Driven Hydrogel-Based Soft Robots: Turgor Actuator and 3D-Printed Modular Robot

This thesis contributed to the development of electrical soft actuators. The approaches were based on hydrogels. In particular, the work focused on two functional principles that complement each other in terms of their benefits and limitations. Actuators made from electroactive hydrogels utilise electroosmotic swelling and operate at low voltages. Meanwhile, dielectric elastomer actuators, which compress the elastomer using hydrogel stretchable electrodes, operate with high forces and speed. The research addressed the low actuation force and speed of the former and the fabrication complexity of the latter for more efficient production of configurable soft robotic systems.

After a brief introduction, the main content is organised into three chapters. One deals with modifying 3D-printable electroactive hydrogels to enhance their mechanical properties in terms of stretchability and toughness while preserving their electroactivity. It was achieved by using glycidyl methacrylated hyaluronic acid as a long-chain crosslinker for poly(3-sulfopropyl acrylate, potassium salt) hydrogels. Fabricated hydrogels were characterised regarding their mechanical properties and electroactivity and then two different models were successfully 3D-printed and electroactuated. The next chapter presents a turgor actuator inspired by plant cells that make use of a strong turgor (hydrostatic) pressure by utilising high osmotic pressure of hydrogel. The swelling accelerated by electroosmosis enables fast and strong actuations to be achieved. The text describes the fabrication of turgor actuators with hydrogels enclosed within selectively permeable membranes, measurement of osmotic pressure of hydrogel and analysis of electroosmosis, blocking stress and compression testing of turgor actuators. The resulting actuators could generate MPa driving stresses at high speeds. Their functionality was demonstrated by breaking solid bricks and constructing underwater structures. Finally, one chapter is dedicated to the design of agile, modular robots based on dielectric elastomer actuators. Different modules, including body modules, foot modules for diverse terrains and head modules for communication, were fabricated using multi-material 3D printing, analysed and assembled into various on-demand soft robotic devices. The dissertation demonstrates robotic locomotion on smooth or rough solid surfaces and water, emitting or detecting light, as well as extending the speed and force of robots or changing their moving direction by combining multiple bodies.

Events

Electronic Imaging 2024

Burlingame, California, USA
21–25 January 2024



The programme of this symposium is rich as usual. It offers 18 conferences and almost the same number of short courses, of which six are new. The keynote speakers include Norman Koren introducing image information metrics evaluated from slanted edges, Gordon Wetzstein presenting the capabilities of neural radiance fields and scene representation networks for a photorealistic output, Aaron Parry discussing next steps towards immersion entertainment, Thomas Wischgoll providing practical insight into immersive technologies for interactive visualisation, Grace Kuo dealing with holographic displays, Robin Atkins reviewing the state of the art in HDR imaging, Mohamed Wahib identifying the routes to next-generation high-performance imaging, Anjul Patney highlighting the relationship between vision science principles and advances in graphics algorithms based on artificial intelligence, Vivek K. Goyal demonstrating quantitative secondary electron yield mapping in ion-beam microscopy, Youzo Lin addressing the applicability and challenges of computational wave imaging, Patrick Le Callet explaining the concept of Quality of Experience, and Márton Orosz exploring the approaches of György Kepes to bridge aesthetics and engineering.

SPiE Events

Photonics West 2024

SPiE. PHOTONICS WEST San Francisco, California, USA
27 January – 1 February 2024

For this edition, the contributions related to printing deal e.g. with advanced digital light processing and femtosecond laser stereolithography for multi-material printing, photoinitiator depletion to expand printing capability of single-photon 3D printing, 3D printing through highly scattering media using upconversion nanoparticles, holographic beam shaping for volumetric 3D printing, in-situ shape monitoring during multi-photon 3D laser printing, dry printing multi-material electronic and functional devices, and 4D printing of optics and photonics using hybrid polymers and nanomaterials.

Smart Structures / Nondestructive Evaluation 2024

SPiE. SMART STRUCTURES+ NONDESTRUCTIVE EVALUATION Long Beach, California, USA
25–28 March 2024

The programme of this event also offers many applications of printing, such as fully inkjet-printed dielectric elastomer actuators, multi-material 4D printing for two-stage morphing in self-actuating structures, in-space manufacturing of morphing electronics, and all-printed multifunctional sensors for structural health monitoring of inflatable habitats.

Advanced Inkjet Technology 2024

Fribourg, Switzerland
29–31 January 2024



This event is held by the iPrint Institute of the University of Applied Sciences and Arts Western Switzerland and IS&T. It builds on one of the IS&T 2022 Advances in Printing Technology series sessions. The programme begins with a keynote, 'A Helicopter View of Ink Jet Printing' by Stephen Temple. The sessions cover droplet generation and visualisation, new application domains of inkjet-based processes, novel printing and micro-manufacturing technologies, inkjet printheads, closed-loop control based on piezo self-sensing, and key aspects of inks and substrates. In addition, the one-day Advanced Inkjet Workshop is offered on 1 February.

C!print

Lyon, France
6–8 February 2024



The 11th edition of this tradeshow introduces the C!Factory, a demonstration space covering a complete production chain. It complements the Software Village introduced in 2022 to present solutions for web-to-print, automation, personalisation, etc.

9th Colour Management Symposium

 Munich, Germany
21–22 February 2024

The topics of this edition include colour management approaches in various modern workflows to meet customer and standard requirements, contract proofing, the trends in using artificial intelligence, and more.

VISIGRAPP 2024

19th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications

Rome, Italy
27–29 February 2024

In 2024, the participants of this event that traditionally



joins four international conferences can also attend the co-located 4th International Conference on Robotics, Computer Vision and Intelligent Systems (25–27 February) and 10th International Conference on Information Systems Security and Privacy (26–28 February), as non-speakers without the additional fee.

The keynote speakers include Fahad Khan on deep-learning visual recognition networks and models with limited human supervision, Mel Slater on virtual reality in mental health, Gerhard Rigoll on multi-modal human-machine interaction, and Alvitta Ottley on the parallels between human reasoning and artificial intelligence models, substantial for facilitating effective human-AI interaction.

44th CIP4 InterOp Meeting

Munich, Germany
11–15 March 2024

This is the last in-person meeting before the upcoming drupa fair, dedicated to testing and discussing the next steps in developing JDF, XJDF and PrintTalk specifications.

The London Book Fair 2024

London, UK
12–14 March 2024



This edition includes e.g. the Research and Scholarly

Publishing Forum on the last day, focused on the influence of artificial intelligence on scientific authorship and research, transformation towards open access and other strategies or trends in academic publishing.

innoLAE 2024

Innovations in Large-Area Electronics

Cambridge, UK
20–22 February 2024



innoLAE

For the 10th annual conference, which is dedicated to innovations in printed, flexible, hybrid, plastic, organic and bioelectronics, the number of half-day courses offered on the first day was increased to four. The main programme for the next two days features the keynotes of Alberto Salleo, providing an insight into the possibilities to modulate the charge density in electrochemically active polymers over a wide range by ion insertion and the development towards so-called iontronics based on the modulation of electronic properties via electrolytes, Jonathan Rivnay, presenting new classes of organic mixed ionic/electronic conductors for bioelectronics, Ana C. Arias, discussing the options of distributing printed sensors over large areas to create a distributed network of nitrate sensors in soil, and Carl Naylor, focusing on 2D materials, such as transition metal dichalcogenides at angstrom thicknesses, and their possible role as next-generation materials in future electronic devices. The conference sessions deal with manufacturing methods, high-performance materials, novel devices, systems and applications, bioelectronics, sustainability and energy efficiency. Traditionally, the oral presentations are complemented by a poster display and exhibition of the industry partners.

LOPEC 2024



LOPEC
DRIVING THE FUTURE
OF PRINTED ELECTRONICS

Munich, Germany
5–7 March 2024

The Large-area, Organic & Printed Electronics Convention keeps the proven format for 2024. The conference schedule includes presentations in up to five parallel tracks. In plenary sessions, the invited lectures focus on steps taken towards sustainability thanks to printed electronics in general and smart and circular medical products in particular, the development of printed electronics solutions, flexible and printed electronics manufacturing in China from the perspectives of leading researchers, the role printed sensors can play in orthopaedic rehabilitation, transferring the experiences from silicon semiconductor industry to scale up the production of flexible integrated circuits, business development for next-generation telecommunications, and accelerating emerging photovoltaic technologies.

PRINTING United Technical Event Series



PRINTING UNITED
TECHNICAL EVENT SERIES

Dallas, Texas, USA
12–14 March 2024

In 2024, PRINTING United Alliance combines the COLOR and TAGA Conferences into a new series of technical events, bringing the former two months later than was its usual schedule. The announced programme features three keynote speakers – Peggy Van Allen, highlighting the power of colour and suggesting how to predict future trends for a longer period reliably; Don Hutcheson, presenting G7+ calibration; and Craig Bushman, sharing practical examples of packaging innovations improving recycling compatibility, lowering greenhouse gas emissions, and supporting reuse applications.