

TOPICALITIES

Edited by Markéta Držková

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News & more

An overview of changes in ISO standards for graphic technology

The extent of changes in the standards and specifications under the direct responsibility of the ISO technical committee TC 130 Graphic technology since the regular summary published a year ago is the same as in the previous periods, despite the current limitations. Only the technical report ISO/TR 19300:2015 Graphic technology – Guidelines for the use of standards for print media production is withdrawn. The standards reconfirmed after a review include ISO 11084-2:2006 Graphic technology – Register systems for photographic materials, foils and paper – Part 2: Register pin systems for plate making, ISO 12642-2:2006 Graphic technology – Input data for characterization of 4-colour process printing – Part 2: Expanded data set, and two parts of ISO 15930 Graphic technology – Prepress digital data exchange using PDF – Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a) and Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3), both from 2003. Those confirmed for the first time are two parts of ISO 12647 Graphic technology – Process control for the production of half-tone colour separations, proof and production prints – Part 4: Publication gravure printing (from 2014) and Part 5: Screen printing (2015), ISO 15341:2014 Graphic technology – Method for radius determination of printing cylinders, and ISO 16760:2014 Graphic technology – Prepress data exchange – Preparation and visualization of RGB images to be used in RGB-based graphics arts workflows. New editions and brand new standards are presented below.

ISO 12641-2:2019

Graphic technology – Prepress digital data exchange Part 2: Advanced colour targets for input scanner calibration

The previous ISO 12641 from 1997 changed to a multipart standard, where the new ISO 12641-2 published in December 2019 is intended for the calibration and characterisation of image capturing devices and specifies the requirements for advanced layouts and colorimetric values of targets, together with data reporting. It is based on the exchange format CxF/X-2. The framework can be used for ISO defined as well as custom targets, both reflective and transmissive; the self-emissive ones are covered only if designed to simulate the targets using transmission of light through an optical filter.

ISO 12647-6:2020

Graphic technology – Process control for the production of half-tone colour separations, proofs and production prints Part 6: Flexographic printing

This version released in September 2020 cancels and replaces the second edition from 2012 and incorporates the amendment from 2015. While the focus of the previous editions was on the process control and specific printing condition aims were defined, the present document reflects the versatility of flexographic technology; therefore, it specifies the way of exchanging the colour characterisation data and other information necessary to define the printing characteristics of the desired product for four-colour flexographic printing of packaging and publication materials, including newsprint.

Trends in the publications on printing during the last 20 years

This brief overview is based on the Web of Science by Clarivate. When searching for records containing the word starting with “print” in the title and published from 2000 onwards, it returns almost 60 thousand results. Almost 60 % comprises articles and about 25 % proceedings papers. When considering the countries or regions, almost 25 % come from the USA and 15 % from China, followed by England, South Korea, Germany, Japan and others. Over 11 thousand are open-access publications, more than 75 % of which are articles and 10 % proceedings papers.

The yearly number of these records grows, from about 11 hundred to nearly 7.5 thousand in 2019, with a considerably higher rate approx. since the year 2015, when the average increase changed to about 900. When refining the records to those with open access, the change in slope is even more pronounced due to the average increase about 400 in recent years. Looking at the topics of publications, over 16 thousand deal with 3D (or 4D) printing, almost a quarter of which was published in the year 2019. The yearly number was increasing by about 700 in the last five years, thus representing the fastest growing area of research employing printing.

Among the ten publications most cited (all having over a thousand citations from the Web of Science Core Collection, the newest published in 2014), five deal with a particular application of printed electronics, namely the solar cells, transistors or supercapacitors, and three present the application of inkjet printing to material printing in general. From the open-access publications, the ten most cited ones have between approx. 500 and 800 citations each and mostly deal with 3D printing, which is focused on biomaterials in four cases.

Research at RIT's College of Art and Design

The Image Permanence Institute, a university-based research centre in the College of Art and Design at RIT (Rochester Institute of Technology), has recently received a National Leadership Grant award from the Institute of Museum and Library Services for its three-year research project that aims to identify the most cost-efficient and environmentally responsible methods of preparing paper-based collection objects for transit and display while maintaining preservation standards. The Image Permanence Institute also operates Graphics Atlas, a web-based resource that presents an object-based approach for the identification and characterisation of prints and photographs. The site features the timeline and detailed characteristics of a wide range of processes, not only photographic but also pre-photographic, photomechanical and digital ones, ranging from woodcut relief printing to inkjet or thermal printing. The tools let the user compare the selected print with another one, reproduced by a different process, captured using different lighting angles and magnifications, up to the level revealing substrate fibres, individual raster dots and other features. The key identifying features of each process are explained and documented, including the cross-section images showing the multi-layer structure, for example.

The RIT MAGIC (Media, Arts, Games, Interaction, and Creativity) Center, on the other hand, is dedicated to research and production of digital media, both within sponsored research and independent study projects. Other multidisciplinary collaborations and projects of RIT's College of Art and Design are facilitated thanks to partnerships with companies such as Autodesk and Nikon. Faculty and students also took part in the development of an algorithmic-based platform that can identify the image, audio, and video manipulation in a government-funded project on a topic that is gaining high importance.

ISO/TS 18621-11:2019

Image quality evaluation methods for printed matter Part 11: Colour gamut analysis

This new specification from December 2019 defines procedures to measure and compare the colour gamuts of RGB and CMYK printing processes. Since this summer, its new version is under development.

ISO 19301:2020

Graphic technology – Guidelines for schema writers – Template for colour quality management

Published in March 2020, this new standard specifies the requirements for certification schemes to facilitate comparable attestations or certifications worldwide. It assumes the quality management based on ISO 9001, with the relevant print-specific ISO standard referenced in the certification scheme.

ISO/TS 19303-1:2020

Graphic technology – Guidelines for schema writers Part 1: Packaging printing

This new specification available since September 2020 provides the guidelines for globally comparable technical and conformity assessment of colour reproduction capability in typical packaging printing workflow, either using CMYK, spot colours, their combination or multi-colour printing. It refers to the related best practices and international standards.

ISO 20616-2:2020

Graphic technology – File format for quality control and metadata Part 2: Print quality eXchange (PX)

This new standard from March 2020 defines an extensible file format for the exchange of print quality data and metadata for colour measurement (both spectral and non-spectral), process control, quality management, etc.

ISO/TS 23031:2020

Graphic technology – Assessment and validation of the performance of spectrophotometers and spectrodensitometers

This new specification released in August 2020 is intended for optical spectrometers capturing the spectral reflectance or radiance factor of printed areas comprised of non-fluorescent or fluorescent materials, respectively.

ISO 23498:2020

Graphic technology – Visual opacity of printed white ink

This brief new standard from September 2020 specifies a method of measuring the visual opacity of opaque white ink as printed, including the range of suitable substrates and standard conditions.

ISO/TS 23564:2020

Image technology colour management – Evaluating colour transform accuracy in ICC profiles

Available since January 2020, this new short specification defines the procedures for evaluation of the accuracy of colorimetric rendering intents in v4 ICC profiles conforming to ISO 15076-1.

Bookshelf

Handbook of Image Processing and Computer Vision

Volume 1: From Energy to Image

Volume 2: From Image to Pattern

Volume 3: From Pattern to Object

Three volumes of this new handbook in the field of artificial vision provide a systematic and comprehensive review of the individual steps from the formation of an image up to the 3D reconstruction of a scene while explaining the related concepts and processes.

Volume 1 begins with four chapters presenting the image formation process, radiometric model, colour and optical system. The authors provide the background on energy, electromagnetic waves, photons, light and light–matter interaction, the spectrum of electromagnetic radiation, light sources, the bidirectional reflectance distribution function, theory of colour perception, human visual system and visual phenomena, colour constancy, colorimetry and colour spaces, colour reproduction technologies, reflection and refraction of light on spherical elements, thin lens, optical magnification and optical aberrations. The fifth chapter describes the image acquisition systems, digitisation and display. The next four chapters outline the properties of the digital image, data organisation, structure and encoding, representation of objects and description of forms, and image enhancement techniques, such as histogram modifications and various filters.

Volume 2 first details the local operators and filtering techniques for the boundary extraction and the fundamental linear and geometric transformations, including various discrete and wavelet transforms, the transform based on the eigenvectors and eigenvalues, geometric operators, affine transformations, nonlinear geometric transformations, and different interpolation approaches. Further, it deals with the methods for the reconstruction of degraded images and image segmentation, as well as with the commonly used algorithms detecting the points of interest and describing the surrounding area in terms of radiometric spatial invariance attributes.

Volume 3 then presents a number of the object recognition methods and algorithms, introduces the significant types of neural networks – the radial basis function networks, self-organising map networks, Hopfield networks and deep neural networks – and the analysis of texture with statistical, syntactic, spatial, spectral, structural and model-based texture description methods. It also reviews the 3D vision, Marr's paradigm, stereo vision, the approaches to the reconstruction of a 3D scene from shading, texture, structured light, focus or defocus, as well as the motion analysis algorithms estimating the 3D motion from sequences of 2D images including the methods applied for motion in complex scenes. Finally, the last chapter deals with the calibration of the image acquisition system, which is important for detecting the size and pose of objects in the scene to enable the 3D reconstruction.



Authors: Arcangelo Distanto, Cosimo Distanto

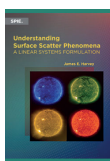
Publisher: Springer, 1st ed., July 2020
 ISBN: 978-3-030-38147-9 &
 978-3-030-42373-5 & 978-3-030-42377-3
 491 & 432 & 676 pages,
 309 & 272 & 271 images
 Hardcover
 Available also as an eBook



Understanding Surface Scatter Phenomena A Linear Systems Formulation

Author: James E. Harvey

Publisher: SPIE Press
1st ed., July 2019
ISBN: 978-1510627871
252 pages
Softcover
Also as an eBook



This book presents the generalised Harvey–Shack surface scatter theory that integrates the radiometric principles with scalar diffraction theory and enables a detailed analysis of scattering behaviour of rough surfaces illuminated at arbitrary incident angles, which should help in solving the problems caused by scattered light, such as the image quality degradation.

Advanced Graphic Communication, Printing and Packaging Technology

Editors: Pengfei Zhao, Zhuangzhi Ye, Min Xu, Li Yang

Publisher: Springer
1st ed., April 2020
ISBN: 978-9811518638
883 pages, 571 images
Hardcover
Also as an eBook

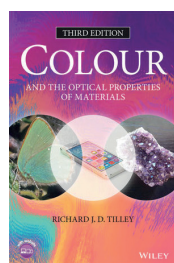


The Proceedings of the 10th China Academic Conference on Printing and Packaging held in November 2019 in Xi'an include over a hundred papers dealing with the technology related to colour science, image processing, digital media, printing and packaging engineering, information engineering and artificial intelligence, printing materials, films and novel functional materials. The topics include, for example, the improved spectral reflectance reconstruction algorithm, applications of augmented reality, screen-printed electrochromic devices, capacitive flexible pressure sensors, digital watermarking technology, moisture-proof coating for corrugated boards and boxes, advanced ink formulations, and super-hydrophobic surfaces.

Colour and the Optical Properties of Materials

The updated and extended third edition of this textbook provides the essential background on the subject, explaining the fundamental principles, and also covers the modern applications such as fibre optics, flat lenses, special coatings, multilayer stacks, liquid crystals, photonic crystals, holograms, lasers, optical amplifiers, super-resolution imaging, light-emitting diodes, including the organic and quantum dot based ones, different types of colour displays, electrochromic films, photovoltaics and plasmonic crystals, among others. The new edition keeps the proven structure. Six chapters are dedicated to light and colour, refraction and dispersion, reflection, polarised light and crystals, scattering and diffraction. The next three chapters deal with the interaction of light with atoms, ions and molecules, including the mechanisms of luminescence. The last chapter is focused on colour in insulators, semiconductors and metals.

Besides the recommended literature, the text is complemented by quizzes, calculations and questions at the end of chapters, with the answers and solutions available at the instructor companion site. The appendices contain information on definitions, units, conversion factors, the colour of a thin film in white light, the formation of a hologram, atomic electron configurations and energy levels.



Author: Richard J. D. Tilley

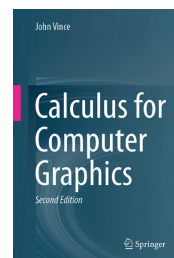
Publisher: Wiley
3rd ed., March 2019
ISBN: 978-1-119-55469-1
608 pages
Hardcover
Available also as an eBook

Calculus for Computer Graphics

This concise book is intended to provide the understanding of calculus applied in computer graphics, games and animation to the readers who are already acquainted with algebra, trigonometry, vectors and determinants. The chapters go through functions, limits and derivatives, antiderivatives, higher and partial derivatives, integral calculus, the area under a graph, arc length and parameterisation of curves, surface area, volume, vector-valued functions, tangent and normal vectors, continuity and curvature; the last three, useful for shading algorithms, physically-based animation and Bézier curves, are new in the second edition, together with the part on curve parameterisation in the ninth chapter. The understanding of the topic is facilitated by numerous worked examples and illustrations.

Author: John Vince

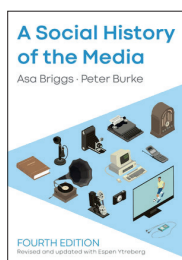
Publisher: Springer
2nd ed., March 2020
ISBN: 978-3-030-11375-9
303 pages, 179 images
Softcover
Available also as an eBook



A Social History of the Media

This overview of communication media, rather broad than detailed, helps to understand the present media industry and its fast changes. The authors focus on the context and impact of media communication, aiming to show the relevance of the past to the present. Just like not everyone today praises the social media, this was the case also with printing and every new mode of communication that came over time with the technological progress. The book also documents the mutual relationship between the development of the media and the politics, religion, economics and culture.

This new edition, appearing ten years after the third edition of the text originally published in 2002, is revised to make the book more reader-friendly, with a more clear structure, updated chronology and recommended further reading replacing the bibliography. Besides a thorough revision of the introduction, the last chapter by Asa Briggs, who has passed away, is newly written by Espen Ytreberg, covering the media developments in the 21st century.



Authors: Asa Briggs, Peter Burke, Espen Ytreberg

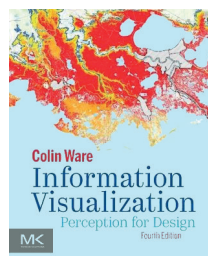
Publisher: Polity
4th ed., June 2020
ISBN: 978-1-509-53371-8
360 pages
Hardcover
Available also as an eBook

Information Visualization Perception for Design

The author of this book provides the relevant background on perception, based on the extensive research literature in the field, and derives the design principles helping to display information effectively, avoiding incomprehensibility and ambiguity. The text reviews the foundations, such as the perceptual data processing, types of data and differences between the approaches based on design and the science of perception, effects of the environment, optics, resolution and the display, concepts of lightness, brightness, contrast and constancy, the science of colour vision, the visual salience, patterns, both static and moving, the perception of space, the recognition and display of objects, the visual and verbal presentation, the interaction with visualisations, the visual thinking process, and the design of cognitively efficient visualisations. As in the case of previous editions, also the current one is revised and updated according to the recent findings – especially the one that the neural mechanisms for predicting the future and remembering the past are the same, reflected in the last three chapters.

Author: Colin Ware

Publisher: Morgan Kaufmann
4th ed., March 2020
ISBN: 978-0-12-812875-6
560 pages
Softcover
Available also as an eBook



Practical Web Inclusion and Accessibility A Comprehensive Guide to Access Needs

Author: Ashley Firth



Publisher: Apress
1st ed., May 2020
ISBN: 978-1484254516
470 pages, 128 images
Softcover
Also as an eBook

This guide on web accessibility is aimed at everyone involved, no matter the discipline and level of expertise, and provides numerous practical examples. After the introduction, the text in six chapters presents different disabilities and access needs, dealing with blindness, low vision and colour blindness, motor disabilities, deafness and hard of hearing, cognitive impairments, and mental health. The following part then discusses the ways how to improve the accessibility of images, videos and other graphic elements, as well as of the communication beyond a website. One chapter then presents the possibilities arising thanks to the emerging technologies. Finally, the author shows how to ensure that accessibility is considered during the whole development process, approaches to auditing an existing site, and tools for testing and improving a site.

Generative Design Visualize, Program, and Create with JavaScript in p5.js

Authors: Benedikt Gross, Hartmut Bohnacker, Julia Laub, Claudius Lazzaroni



Publisher: Princeton Architectural Press
2nd ed., October 2018
ISBN: 978-1616897581
256 pages, 500 images
Softcover

This richly illustrated volume with step-by-step tutorials demonstrates the coding strategies to generate artwork, infographics, 3D models and animations using simple languages.

Low Temperature Chemical Nanofabrication Recent Progress, Challenges and Emerging Technologies

Authors: Omer Nur, Magnus Willander

Publisher:
William Andrew
1st ed., January 2020
ISBN: 978-0128133453
252 pages, Softcover
Also as an eBook



The authors of this new book first provide the theoretical background to nanoscale phenomena and explain the differences between nanomaterials and the bulk, presenting the electronic band structure of nanomaterials, their optical properties, nanodielectric effects and other effects related to the nanostructure morphology. The following part deals with the nanofabrication methods, covering both the top-down and bottom-up processes. One chapter describes the conventional methods, another one the emerging ones, including the inkjet printing as a tool for nanofabrication, and the next one is focused on the low-temperature chemical nanofabrication methods. The last chapter covers the emerging applications in sensors, sustainable energy sources and photocatalysis.

The Effect of UV Light and Weather on Plastics and Elastomers

Author: Laurence McKen

Publisher:
William Andrew
4th ed., March 2019
ISBN: 978-0128164570
464 pages, Hardcover
Also as an eBook



For individual polymer classes, this revised and expanded edition summarises the latest data on the effects of UV radiation and weathering, important for their use in outdoor applications; the book also covers the newly available materials, including the bio-based polymers and plastics for 3D printing.

Mechanically Responsive Materials for Soft Robotics

This volume brings a timely overview of the progress in the multidisciplinary field of soft robotics and the development of materials that mechanically respond to external stimuli. Part I reviews about a decade of basic research on the mechanically responsive crystals that exhibit a wide range of properties. Its six chapters describe photomechanical behaviour of photochromic crystals based on diarylethene, anthracene derivatives and other organic compounds, crystals with heat-induced mechanical motion, such as inchworm-like walking, fast-rolling locomotion or step-wise bending, crawling motion of crystals on solid surfaces by the photo-induced reversible crystal-to-melt phase transition, crystals that exhibit bending, jumping and self-healing, and shape memory molecular crystals showing superelasticity. Part II deals with the mechanically responsive polymers and composites together with their applications. It presents mechanical polymeric materials based on cyclodextrins as artificial muscles, cross-linked liquid-crystalline polymers as photomobile materials, photomechanical liquid crystal polymers and bioinspired soft actuators, organic-inorganic hybrid materials with photomechanical functions, multi-responsive polymer actuators by thermo-reversible chemistry and their outlook in 3D printing, and mechanochromic polymers as stress-sensing soft materials. Part III then presents soft microrobots based on photoresponsive materials, 4D printing as an enabling technology for soft robotics, the self-growing adaptable soft robots, and the biohybrid robot powered by muscle tissues.

Editor: Hideko Koshima

Publisher: Wiley-VCH
1st ed., February 2020
ISBN: 978-3-527-34620-2
448 pages
Hardcover
Available also as an eBook

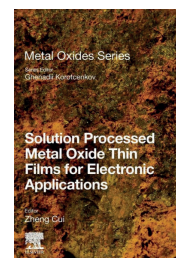


Solution Processed Metal Oxide Thin Films for Electronic Applications

This volume is a part of the series on metal oxides. After a brief outline of the solution-processed electronics and metal oxides in solution, it presents the metal-oxide conductors, semiconductors and dielectrics relevant for various electronic applications. Next, it deals with the sol-gel precursor inks and films and inks based on nanoparticles, along with their processing by coating or printing and thermal annealing. Finally, the text presents the selected applications of metal oxides in photovoltaics and electroluminescence devices, namely in organic and quantum dot light-emitting diodes.

Editor: Zheng Cui

Publisher: Elsevier
1st ed., June 2020
ISBN: 978-0-12-814930-0
180 pages
Softcover
Available also as an eBook



Bookshelf

Academic dissertations

A Robotic Multiaxis Additive Manufacturing System for Nonplanar and Dynamic Orientation Printing

With a vision of a future automatic robot fabrication system producing small, customised and fully integrated robots for specific tasks, this thesis addresses the limitations of the current additive manufacturing systems in terms of anisotropic mechanical properties, the stepwise approximation of curves, need for support structures and embedding of components. The approach is based on varying build orientation allowed by the use of industrial robot arms. The dissertation reviews the literature on direct digital manufacturing, integrated robot fabrication and multiaxis additive manufacturing and presents the steps taken to develop a system capable of printing curved and non-parallel layers along with embedding pre-existing components. First, it details the design and development of the additive robot manufacturing system and its key aspects – four robotic arms (for the camera, gripper, extruder and build plate) with six axes each, materials and equipment for fused filament fabrication, software for the design and processing of 3D models and system control, as well as the kinematic model for the system with 12 degrees of freedom enabling to position the nozzle relative to the build plate. System validation involved visual inspection of conventionally 3D-printed items and testing of their tensile strength, dimensional accuracy and surface roughness. The resulting quality was at least comparable with other fused filament fabrication machines. Further experiments proved that printer orientations other than vertical have no adverse effects to the surfaces and that overhangs of arbitrary size and angle can be printed without any support structures thanks to dynamic build orientation during additive manufacturing. The possibility to increase strength was verified by printing the arch with nonplanar layers onto a smooth support structure. Finally, a model plane with an embedded DC motor was printed to demonstrate the ability to automatically embed functional components.

Doctoral thesis – Summary

Author:

Nicholas Richard Fry

Speciality field:

Engineering Systems and Design

Supervisors:

Robert Richardson

Jordan Boyle

Degree conferral:

*11 June 2018, University of Leeds,
School of Mechanical Engineering
Leeds, United Kingdom*

Contact:

N.Fry@leeds.ac.uk

Copper Nanocrystals-Based Conductive Inks for Printed Electronics

This thesis contributes to the research on nanoparticle-based copper inks as a cost-efficient alternative to conductive inks containing silver. After introducing the background and outline of the thesis, the work reviews the known methods for copper nanoparticles synthesis. These comprise the methods employing the chemical and biological bottom-up processes and the physical methods, typically based on a top-down approach. The methods are assessed in terms of their cost, productivity and environmental impact, and also the ability to control the size of particles. Because copper has the inherent oxidation tendency and the oxidation rate is accelerated to a great extent in the case of nanoscale particles, the review also presents the strategies to preserve the electrical properties of the nanoparticles, i.e. to prevent oxidation. The colloids can be protected by a shell based on carbon, noble metal or silica; also, long-chain organic ligands and polymer stabilisers improve the oxidation resistance of colloids. When comparing these approaches, a drawback is the increased resistivity of the printed patterns in the case of the carbon or silica shells and high cost in the case of the noble metal shells; therefore, the ligand or polymer-capped nanoparticles

Doctoral thesis – Summary

Author:

Arnau Oliva Puigdomènech

Speciality field:

Chemistry

Supervisors:

Zeger Hens

Christophe Detavernier

Defended:

*10 January 2020,
Ghent University, Faculty of Sciences,
Department of Chemistry
Ghent, Belgium*

Contact:

arnauolivapuigdomenech@gmail.com

together with the appropriate sintering conditions are seen as a cost-effective solution to obtain highly conductive films. The experimental work building on this basis is described in four chapters. The first one presents the synthesis of metallic copper nanocrystals based on the low-temperature decomposition of copper formate, with oleylamine used as the surfactant. It was demonstrated that a self-cleaning effect suppressing oxidation is achieved with high precursor concentration. This economic approach does not need an additional reducing agent nor a protective atmosphere while producing a high amount of nanoparticles per volume of reaction. Moreover, by adjusting precursor and ligand concentrations and ratio, the size of the nanoparticles can be tuned from 10 nm to 200 nm. Next, the comprehensive study of the surface chemistry of copper nanocrystals helped to understand how amines and carboxylic acids bind and pack on the surface, creating a tightly-bound ligand shell. The further work was focused on the sintering of copper nanocrystals capped with different carboxylic acid ligands; also, the influence of particle sizes, atmosphere and temperature was studied. It was proved that oxidation can be reversed by thermal annealing in an N₂ atmosphere. Finally, the dissertation presents the upscaled synthesis and formulation of a copper-nanocrystal-based conductive ink with optimised adhesion and resistivity. The resulting screen-printing ink was used to produce conductive RFID antennas.

Doctoral thesis – Summary

Author:

Eli Nadia Abdul Latip

Speciality field:

Microfluidics and Microengineering

Supervisors:

Loic Coudron

Mark Tracey

Degree conferral:

5 February 2020,

*University of Hertfordshire, School
of Engineering and Technology
Hertfordshire, United Kingdom*

Contact:

elinadia@uitm.edu.my

Development of a Digital Microfluidic Toolkit: Alternative Fabrication Technologies for Chemical and Biological Assay Platforms

The aim of this thesis was to use more affordable fabrication methods and materials to produce low-cost digital microfluidics and to increase the robustness of the device with respect to surface contamination by biomolecules. The work provides the background on actuating mechanisms in digital microfluidics with the focus on electrowetting-on-dielectric, the most commonly applied one, and reviews the requirements on the dielectric layer and actuating surface in the device, as well as the methods for its fabrication. The experiments first tested the possibility of electrode patterning by inkjet printing using a suitable combination of conductive ink and substrate. It was found that the most reliable droplet actuation performance of the device is achieved using poly(3,4-ethylenedioxythiophene) poly(styrene-sulfonate) (PEDOT:PSS) ink and polyethylene terephthalate substrate, with a velocity comparable to the standard chrome-on-glass device. Comparing a low-cost HP Deskjet 1000 J110 and a specialised Fujifilm Dimatix DMP-2850 printers, the desktop inkjet printer produced satisfactory electrode spacing and track width resolutions, but the printing reliability had to be improved by plasma treatment of the substrate, ink additives, filtering, and immediate cleaning of the cartridge. The inkjet printing using the laboratory printer proved to be a robust and reliable process with the potential to be widely applied in the fabrication of the electrowetting-on-dielectric devices. According to the preliminary testing of the off-the-shelf products in the search for alternative materials, the polyurethane finish from Rust-Oleum for the dielectric layer and the superhydrophobic top coating from NeverWet for the actuating surface performed the best in terms of electrowetting reversibility and the latter also in droplet actuation. Utilising the findings, three types of more complex electrowetting-on-dielectric devices were fabricated – the 3D 4 × 4 electrode array device allowing for future construction of multi-level digital microfluidic devices with the large functional area, a magnetic micro-immunoassay device (both inkjet-printed with conventional dielectric and hydrophobic materials) and a superhydrophobic anti-biofouling device with the NeverWet top coating and chrome-on-glass electrodes.

Events

Virtual Fall Conference 2020

<https://www.flexography.org>
5–7 October 2020



The 2020 edition of the Flexographic Technical Association's Fall Conference is designed for an online environment and complemented by the Virtual Exhibit with new package printing and converting technologies, open since 5 October for ten days. Among six conference sessions, the first one presents a systematic approach to producing flexographic printing plates and covers calibration and optimisation, process and quality control, solving the common plate-related problems, and approaches to implementing new technologies while reducing the risk. The next one shows how to face the ongoing pandemic with the help of virtual interviews, web-based training, and remote press approvals. The second day is dedicated to proper file preparation for both flexographic and digital presses to produce matching products and colour management for spot as well as process colours, discussing also practical application of the ISO 12647-6 standard, the concept of neutral print density curves, G7 acceptance criteria, and spectral data. Finally, the last two sessions explore the print quality scoring and the process of package development.

Printing for Fabrication 2020

<https://www.imaging.org>
19–21 October 2020



The main programme of this online event is preceded by a week of live short courses starting on 12 October, with online discussions after each class and the recordings available for later or repeated viewing by the participants until 15 February 2021. Four courses focus on inkjet fluid dynamics and fundamentals, inkjet ink manufacturing and its practical characterisation. Another topic is adhesion and its optimising by improved surface properties, formulation or process. Two courses deal with textile printing. The last four courses present the fundamentals of digital fabrication along with two specific applications, namely direct-to-object printing and on-skin electronics by printing.

The topics of the 2020 keynotes include the hybrid supply chain models where 3D printing could be used to complement injection moulding (presented by Edward D. Davis), multi-disciplinary research undertaken at the Centre for Fine Print Research at UWE Bristol (by Carinna Parraman), and fundamental fluid dynamics challenges in inkjet printing (by Herman Wijshoff). The focal talks deal with the fabrication of magnetic polymer nanocomposites, the effect of the amount of filament on readability when recording the rewritable information by 3D printing inside an object, dynamic imaging by Kodak, 3D surface structures and 3D halftoning, probabilistic motion inference for fused filament fabrication, and aqueous inks for printed electronics based on two-dimensional materials, namely MXenes.

Further events cancelled for 2020 due to pandemic

While many events still take place online due to the ongoing pandemic, some are fully cancelled for this year.

The 52nd Annual Conference of the International Circle of Educational Institutes for Graphic Arts Technology and Management should take place in September 2021 in Athens, Greece as a joint event with the 47th International Iarigai Conference. The 6th edition of CIDAG, the biannual International Conference in Design and Graphic Arts, has been postponed to 20–22 October 2021. The new date for the 7th European edition of The Inkjet Conference, TheIJC, is set to November 2021. Similarly, the ERA Packaging & Decorative Conference is rescheduled to November 2021.

Among the trade shows, the Latin American exhibition FuturePrint has been postponed again, now planned to 21–24 July 2021. The IDTechEx Show! 2020 in Santa Clara, California, USA and the 3rd International Exhibition of Print Technology for Industrial Manufacturing in Italy, InPrint Milan 2020, also have been cancelled, with new dates yet to be announced. InPrint Munich takes place on 9–11 March 2021. The next edition of PACK EXPO International that should take place this year in Chicago, Illinois, USA has been rescheduled to 23–26 October 2022. In 2021, the American edition of PACK EXPO takes place in Las Vegas, Nevada (27–29 September). A virtual event PACK EXPO Connects, with hundreds of exhibitors and over 2 600 live demonstrations, is held in a week of 9–13 November 2020, including a panel discussion on digital printing and finishing of packaging materials. Likewise, while the physical event SEMICON Europa 2020 has been cancelled and the next edition is planned to 16–19 November 2021, a differentiated digital forum is being prepared.

WAN-IFRA Events



The calendar of events for the end of the year includes the 2020 virtual editions of Digital Media for three regions – Asia (13–15 October), Europe (10–12 November) and Latin America (17–19 November); this last one with the 2020 LATAM Digital Media Awards on the first day. Other 2020 events are also virtual. The Newsroom Summit (20–21 October) this year explores e.g. how to lead and manage a remote team. The topics of the World Printers Summit (27–29 October) include newsprint procurement, the global campaign “I love Paper”, optimisation of the paper supply chain and plate production, sustainable approaches, distribution of newspapers during the pandemic, new possibilities for layout and page assembly with artificial intelligence, and more. The 2020 Print Innovation Awards take place on the last day.

Practical utilisation of artificial intelligence also belongs to the topics of the Middle Eastern Media Leaders eSummit (3–5 November). The Global Summit with a theme of ‘Science in the Newsroom’ (23–24 November) is focused on journalism in the age of global health emergencies, showcasing best practice journalism that has emerged in 2020.

In October 2020 also starts the online Cultural Change Ignition Program for Latin American News Publishers organised jointly with The Facebook Journalism Project. It is running until January 2021, with eight sessions aimed at rising media leaders in the region. The online training programme ‘Managing Revenue Growth in Pandemic Times’ is offered on 26–27 October.

AIPIA Smart Packaging Virtual Exhibition

<https://www.aipia.info>
7 October 2020



This event of the Active & Intelligent Packaging Industry Association can be attended online for free.

Ink Week 2020



This event dedicated to the developments in ink technology for graphic arts and printing is organised by the National Association of Printing Ink Manufacturers (NAPIM), along with the Ink World and Printed Electronics Now magazines. Ink Week features two online conferences with one registration fee providing access to both, including the recordings of all sessions shared after the event.

NAPIM Fall Technical Conference 2020

<https://www.napim.org>
12–14 October 2020



With a topic for this edition defined as ‘Formulating for a Circular Economy’, the agenda includes a lecture discussing the concept of circularity and its practical applicability to the printing industry, along with a panel discussion of raw material suppliers, ink manufacturers and printers to learn about their view on the current status and possible developments in graphic arts sustainability. There are also contributions dealing with the current Sustainability Report of the American Coatings Association, sustainability in the chemical supply chain, the presence of polychlorinated biphenyls, in particular PCB 11, in pigments, printing inks and environment, and compostability testing for packaging. Further, the schedule offers a lecture on the challenges and opportunities of supplier partnerships, the NAPIM State of the Industry report, the National Printing Ink Research Institute lecture, and several regulatory updates relevant to the ink industry, such as the stormwater monitoring requirements, regulation of printing inks in food packaging in Europe, policy activity on per- and polyfluoroalkyl substances, and amendments to the Toxic Substances Control Act.

Electronic and Conductive Ink Conference 2020



<http://www.printedelectronicink.com>
15–16 October 2020

The topics announced for the 3rd edition of this conference cover the developments in conductive inks, such as the particle-free silver inks with low sintering temperature, inks based on silver nanowires and metal gel compositions, processes for their application, including the direct-to-fabric printing, their utilisation in the production of various sensors and other electronic devices, as well as the characterisation and testing methods for printed and flexible electronics.

PRINTING United Digital Experience



<https://www.printingunited.com>
26 October – 12 November 2020

This year’s digital edition of the PRINTING United event is scheduled for three weeks combining exhibitor showcases, product launches, educational sessions, equipment demonstrations, and more. The PRINTING United Insight Days encompass different market sectors and printing technologies. These include the hardware, consumables, finishing and workflow solutions

for wide-format sign and graphic printing, apparel decoration, including direct-to-garment printing and colour management in the digital textile segment, adoption of high-speed and cut-sheet production inkjet printing for commercial printing production, the possible combination of electrophotography and inkjet technology in this sector, as well as the advanced automation in offset commercial printing. Two days track the trends and opportunities in individual packaging sectors, i.e. labels, flexible packaging, folding carton and corrugated packaging, including digital printing, sustainability, e-commerce, and luxury brands. The workflow efficiency and innovative applications with wide-format printing in the in-plant segment, the current trends in industrial printing and direct mail, workflow automation systems and other software solutions are also included in the programme.

CIC28 – 28th Color and Imaging Conference



<https://www.imaging.org>
16–18 November 2020

As in the case of other traditional events sponsored by IS&T, the Society for Imaging Science and Technology, and transformed into the online mode, the live short courses lasting for 2–8 hours each are scheduled before the technical sessions of the conference, starting on 4 November). The day after, 19 November, is reserved for a workshop programme, which has not been specified yet. To further facilitate remote participation, the recordings of individual courses and technical presentations, including the online discussions, can be accessed later and as often as needed until 15 March 2021.

The short courses on colour theory and modelling range from the 4-hour introductory course on advanced colorimetry and colour appearance, to fundamentals of psychophysics and surface appearance characterisation on the intermediate level, up to the advanced course on individual differences in colour matching and appearance. The group of courses dealing with colour imaging consists of two introductory courses – the 8-hour course presenting the basic concepts of colour and imaging and the course on fundamentals of spectral measurements for colour science, together with three intermediate courses on the evolution of high dynamic range imaging, colour imaging challenges with compact camera optics, and colour-related aspects of the camera imaging pipeline. Two courses are focused on colour display – the introductory one presenting high dynamic range display concepts and technologies and the intermediate one providing colour essentials in LED lighting systems. The last group of courses is aimed at colour processing at the intermediate level. These include the 4-hour one on theory and practice of camera colour characterisation, using the iccMAX architecture for colour management and its practical applications, solving colour problems using vector space arithmetic, and spatial colour perception and image processing.

From the three days of the rich technical programme, Monday is focused on colour vision and perception, with the keynote on 'Colour appearance and spatio-chromatic vision' by Sophie Wuerger. Tuesday topic is computational colour, opened with the keynote by Derya Akkaynak asking 'Why are there colors in the ocean?'. Colour applications sessions on Wednesday begin with the keynote 'Rethinking Color Measurement' by Ayan Chakrabarti. Each day, the schedule offers both oral and poster presentations, in part within the interactive sessions.

ESMA Events



The European Association of Specialist Printing Manufacturers offers

two ESMA Academy courses. Digital Printing on Textiles in Denkendorf, Germany (6–9 October 2020) is intended for participants from companies considering or preparing the implementation of a digital inkjet printing process in the production of textiles. The second one, Industrieller Digitaldruck for the German-speaking participants interested in industrial digital printing, takes place in Stuttgart, Germany on 16–19 November 2020.

Decorative Surfaces Conference 2020



Vienna, Austria
19–21 October 2020

This event held by TCM (Technical Conference Management) originally should take place in March. It combines two days of the conference with digital printing solutions among the topics and a workshop on the third day, Inkjet Technology for Décor Printing, presented in cooperation with IMI Europe.

Paper & Plastics Recycling Conference International

<http://www.recyclingtodayevents.com>
20–22 October 2020



For this year, the American and European

editions of this established conference had to merge into a global broadcast and online networking event.

Inkjet Age of Materials Conference 2020–2021



The sessions of this new bi-monthly digital online conference designed by IMI

to address the current and needed developments in inkjet materials start on 18 November 2020, with the last one scheduled for 15 September 2021.

Smithers Events for Printing and Packaging



The events organised by Smithers also had to be postponed or transformed into the virtual format. Those to be held at the end of this year include the 2020 editions of Digital Print for Packaging, the US conference on 12–14 October and the European one on 7–8 December. The American event is directly followed by Digital Textile Printing US on 15–16 October. The annual WEAR Conference for the smart fabrics, e-textiles, and wearable technology markets takes place the same week, 13–15 October 2020. The following weeks offer Specialty Papers Europe 2020 (19–21 October) and three packaging conferences, namely SmartPack US 2020 focused on collaboration and innovation to accelerate the commercial adoption of intelligent packaging on 26 October, the 3rd US edition of E-PACK for the e-commerce packaging supply chain on 27–28 October 2020, and Sustainability in Packaging Europe 2020 on 2–5 November.

GRID 2020

10th International Symposium on Graphic Engineering and Design

Novi Sad, Serbia
12–14 November 2020

For its 10th edition, this bi-annual event hosted by the University of Novi Sad and organised by the Department of Graphic Engineering and Design becomes either a hybrid or fully online event, depending on the situation on the symposium days.



The Holography Conference

<https://holographyconference.com>
8–9 December 2020

This traditional event held since 1990 is also going online, with a minimum of four sessions planned for two days of the conference.



Awayzgoose Conference



<https://woodtype.org>
5–8 November 2020

The Hamilton Wood Type & Printing Museum presents the 12th volume of its annual Wayzgoose Conference for type, design and letterpress printing as the 2020 Awayzgoose, an online event in partnership with the American Printing History Association. All workshops and presentations are thus this year easily accessible to designers, printers, typographers and educators from across the globe.

The online pre-conference workshops start on 26 October. The participants of the one-day workshops can learn how to design letterpress compositions for both digital and analogue output using the Adobe Creative Cloud software, try reduction block printing and calligraphy with Koch's textura, and take part in the Modus type project. The following four-day workshop covers all steps of wood engraving.

Besides the presentations, panel discussions, networking opportunities and demonstration of wood type cutting, the conference schedule features four keynotes – with Paula Scher on her new book about 25 years of working for the Public Theater in New York, Susan Skarsgard with presentation details yet to come, Erik Spiekermann, discussing the 21st-century methods of letterpress using tools from the 18th and 19th century, and Richard Kegler interviewing Bruce Licher about his career as a designer and printer, now documented in the extensive monograph on work of Independent Project Records & Press.

ICC DevCon 2020

<http://www.color.org>
November 2020 and January 2021



The upcoming International Color Consortium Developers Conference is held online with the theme 'The future of colour management'.

The webinars scheduled to Mondays in the second half of November explore three topical areas. On 16 November, the focus is on the emerging needs in colour management of colorimetric and spectral data, with presentations contrasting the situation in graphic and other industries and discussing how to incorporate spectral reproduction workflows into colour management. On 23 November, the papers deal with colour and material appearance, presenting the selected new developments in colour appearance modelling, fabrication of objects with spatially varying colour and translucency using multi-material 3D printing, implementation of bidirectional reflectance distribution function in an ICC profile, and total appearance capture and reproduction. Finally, on 30 November, the lectures cover colour management for display and print, with one discussing colour on the web and broadcast, while the other two deal with practical aspects of n-colour reproduction. Another three webinars planned to January 2021 comprise an extended hands-on workshop on using iccMAX, from the introduction of iccMAX features and example implementation to working with ReflccMAX, using iccXML and calculator element programming, up to the Interoperability Conformance Specifications and their use.