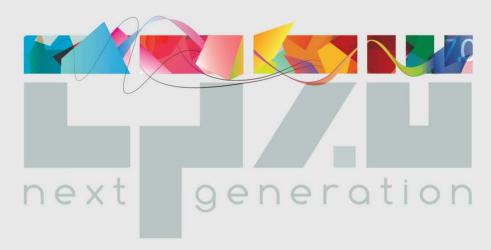


ICC Color Experts Day, Germany



Radovan Slavuj





How CP 7.0 came to be ?



- Today's young researchers are vital to Europe's future. At Marie Curie Actions, we are well aware of that. So we want to make research careers more attractive to young people (ITN – Marie Curie Actions)
- Initial Training Networks (ITN) offer early-stage researchers the opportunity to improve their research skills, join established research teams and enhance their career prospects
- Multi-partner ITN: Well, it takes two to tango but three to network. So, at least three participants join together to propose a coherent programme for an ITN. The participants can be universities, research centres or companies (large or small).

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What is the CP7.0 ?



Colour Printing 7.0: Next Generation Multi-Channel Printing (CP7.0) is a training and research project funded by Marie Curie Initial Training Networks (ITN) CP7.0 N-290154 funding. The project is led by The Norwegian Color Research Laboratory at Gjøvik University College and will be executed in collaboration with 5 full network partners and 6 associated partners from academia and industry throughout Europe. The project addresses a significant need for research, training and innovation in the printing industry. Through this project we plan to do research in the colour printing field by fully exploring the possibilities of using more than the conventional four colorants (CMYK) in printing and focussing particularly on the spectral properties. The goal will be to train a new generation of printing scientists who will be able to assume science and technology leadership in this established technological sector.





Research Goals



Four key scientific areas this project will focus on are:

- Spectral modeling of the printer/paper/ink combination
- Spectral gamut prediction and gamut mapping
- The effect of paper optical and surface properties on the color reproduction of multi-channel devices
- Optimal halftoning algorithms and tonal reproduction characteristics of multi-channel printing.







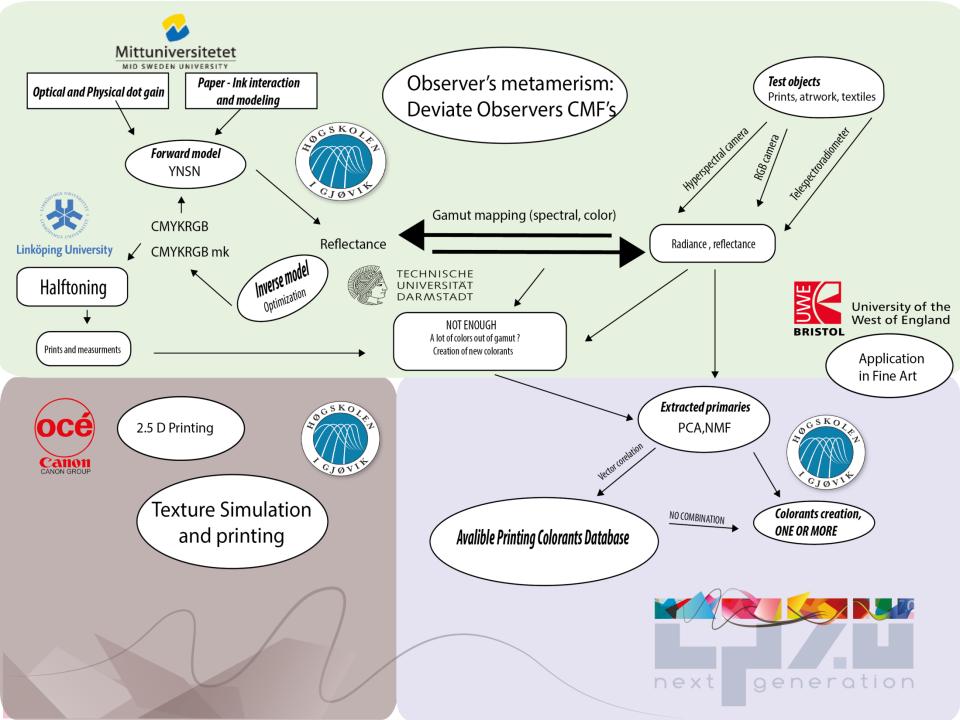


- Aims to match reflectance from originals
- Metameric match under multiple, real world illuminants
- Modeling of paper colorant interaction
- Modeling printer behavior in spectral terms
- Increased spectral and color accuracy (x2 in some applications)

OCE

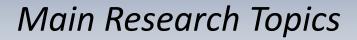














ESR 1 – Spectral Modeling for Multichannel Printers and Displays Researcher: Radovan Slavuj Position at: HIG, Norway Supervisor: Jon Yngve Hardeberg

- Spectral Printer Modeling (paper at IARIGAI, 2013)
- Colorant Selection
- Multi-Primary Displays and Projectors
- Texture Simulation and Reproduction
- Textile Color Reproduction (*paper at AIC, 2013*)















ESR 2 - Spectral gamut prediction and mapping Researcher: Sepideh Samadzadegan Position at: TUD, Germany Supervisor: Philipp Urban

- To improve and extend the paramer mismatch-based spectral gamut mapping method using multi-illuminant XYZ space to remove or minimize its drawbacks, for example the banding artifacts(*paper submitted for CIC,2103*)
- To investigate a spatio-spectral gamut mapping algorithm for the general enhancement of pixel wise approaches for image reproduction.



University of the West of England







PHD 3 - Paper optics and surface propertiesResearcher: G M Atiqur RahamanPosition at: VV, SwedenSupervisor: Ole Norberg

- The objective of this project is to model the spectral behavior of print media interactions i.e., modeling the interactions between light, paper and ink. (*paper at AIC*, 2013)
- The main aim is to develop methods for predicting the reflectance of color print to reproduce accurate colours in a spectral printing system using optical simulation tools like DORT2002 and Monte Carlo.

















ESR 4 - Applications in Fine Arts Researcher: Melissa Olen Position at: UWE, Bristol, UK Supervisor: Carinna Parraman

- Multi-channel inkjet printing methods that incorporate artist colour mixing principles relevant to traditional print processes through direct n-channel printing.
- How modifications to the print workflow can influence the reproducible colour gamut for artist prints through the development of bespoke inkjet printing methods (*paper at AIC*, 2013)

















ESR 5 - Halftoning and tonal reproduction Researcher: Paula Žitinski Elías Position at: LiU, Sweden Supervisor: Daniel Nyström

- Application of AM halftoning for multichannel printing question of how to include more than four channels (e.g. elliptical dots) (*paper at AIC,2013*)
- Dependent iteration based FM halftoning taking into account individual separations for dot placement









ESR 6 - Optimization of Print Quality Researcher: Teun Baar Position at: Oce, France Supervisor: Maria V. Segovia Ortiz

- Optimization of Print Quality
- Measuring BRDF
- Application of the 2.5 D printing (paper at AIC, 2013)





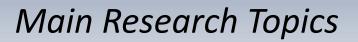














ESR 7 - Design and development of spectral color management workflows Researcher: Srikrishna Nudurumati Position at: HIG, Norway Supervisor: Jon Yngve Hardeberg

- This research aims at addressing the color appearance matching in practical applications for observers whose CMFs vary from each other (inter-observer variability) and within a given observer (intra-observer variability).
- A Spectral Visualization and Management System would be developed to serve the purpose of handling various spectral transforms















ER 1: Spectral Image Quality Researcher: Steven Le Moan Position at: TUD, Germany Supervisor: Philipp Urban

- How to compare two images with dozens of channels in terms of perception? To which extent can we apply traditional (color) image difference measures and pool the results over a variety of renderings corresponding to different viewing conditions? (*paper at ICIP, 2013*)
- How much, and which aspects of the perceptual difference between two images remain unchanged from one set of VC to another (e.g. from daylight to incandescent light)?

















ER 2: Interaction of light with printed papers

Researcher: Ludovic Gustafsson Coppel Position at: HIG, Norway Supervisor: Jon Yngve Hardeberg

- Implementation strategies for models developed in the CP7.0
- Simulation models that predicts the appearance of materials in different visual environments from the material structure and composition (*CVCS, Gjovik, 2013*)









Applications of Spectral Printing



- Highly accurate industrial color communication
- Proofing
- Fine art
- Catalogues (Textiles , Paint)
- Security





Conclusions



Challenges

VS

0	pportunities needed for each application	Manufacturing of multiple ink sets that can be changeable within printer
	Original material a lot different than printing substrate	Developing specific printing substrates, modeling surface properties (e.g. gloss)
	Texture of the original material different from printing substrate	Simulation of the Texture, halftoning, 2.5 D
	Illuminants at original's environment (Art Gallery)	Specific light sources used with reproduction
	Controlling and interchange of individual channel in multichannel printing	Addition to functionality and diversity of the printers
	Building spectral reproduction workflows	Extension of the ICC workflows, individual vendor workflows















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art Bonnier Carinna parraman Coloriab colour management CP7.0 darmstadt ER gamut mapping Gjøvik G M Atiqur Rahaman halftoning Hardeberg IARIGAI ICIP Linköping Ludovic Coppel Marius Pedersen melissa olen norberg Oce optical paper Paula Žitinski Elías Peter

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CP 7.0 Training Event 3, LiU Sweden



The third training event of the project was organised at the network partner Linköpings Universitet, Campus Norrköping, Sweden on May 27 – 31, 2013. The event was attended by all the ESRs as part of training program in the CP7.0 project.

This training event covered the fundamental knowledge about halftoning concepts and methodologies, as well as models predicting the spectral outcome of halftone prints. For more details click here.

31. May 2013 by Aditya Sole

Categories: Training Events | Tags: cp7.0, G M Atiqur Rahaman, halftoning, Linköping, Ludovic Coppel, melissa olen, Paula Žitinski Elías, Radovan Slavuj, Sepideh Samadzadegan, Srikrishna Nudurumati, Teun Robert Baar, training | Leave a comment

Paper accepted at ICIP 2013

NEXT GENERATION MULTI-CHANNEL PRINTING

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