

# Infrared reproduction and device dependent process colors

PhD. Ivana Žiljak, PhD. Klaudio Pap,  
PhD. Vilko Žiljak, PhD. Jana Ž. Vujić\*

Faculty of Graphic Arts, Zagreb, Croatia  
*ivana.ziljak@vip.hr*, [klaudio.pap@zg.t-com.hr](mailto:klaudio.pap@zg.t-com.hr)

\* Polytechnic of Informatics and Design, Zagreb, Croatia  
*janazv@tvz.hr*

41st IC Conference Ghent, Belgium

# Introduction

- using the characteristics of natural colors in creating reproductions with diverse appearance of images; firstly in daylight and secondly under infrared (IR) light
- set a double image, two pieces of information created by printing with process color
- process colors are used in our CMYKIR separation with the target to have two images manifested in one on the same print
- the planned image, the image set for infrared light abandons the GCR, UCA and UCR methods that do not know the control of exceptional use of the infrared wavelength area

# Methods

- The image under infrared light depends on the instruments enabling it to be observed - it is primarily an image in the grayscale gradation
- **Infrared reproduction** is prepared for real printing, device dependent in respect to CMYK color space
- reproduction is application in set conditions of the dye in question; the material type onto which the dye is printed and printing technique

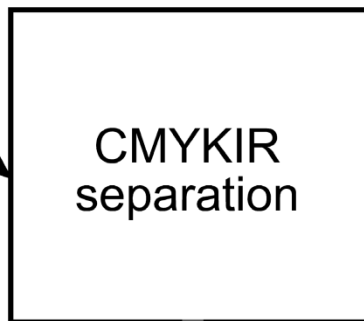
A

input

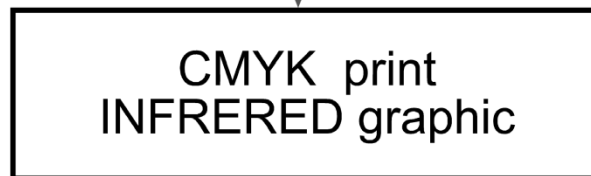
B

RGB pixel image

grayscale, pixel graphic



output



400 nm



700 nm



1000 nm

- color setting system differences with the goal to have successful infrared reproductions
- the great contribution of infrared reproduction is in security printing on securities and packaging material, the design of two pieces of information and in testing the color setting accuracy
- IR reproduction is very sensitive to device dependent printing color space
- Each error is seen in the daylight range

# Results of Infrared reproduction and device dependent process colors

- The new private color setting may be tested through IR reproduction by using the method of hiding the IR image in the broad range of replacing printing CMY dyes with carbon black
- Relations for 2 colors have been set and investigated for offset Fogra27 standard and private color setting for digital print on silk SvilaD (Figure 1, Figure 2)

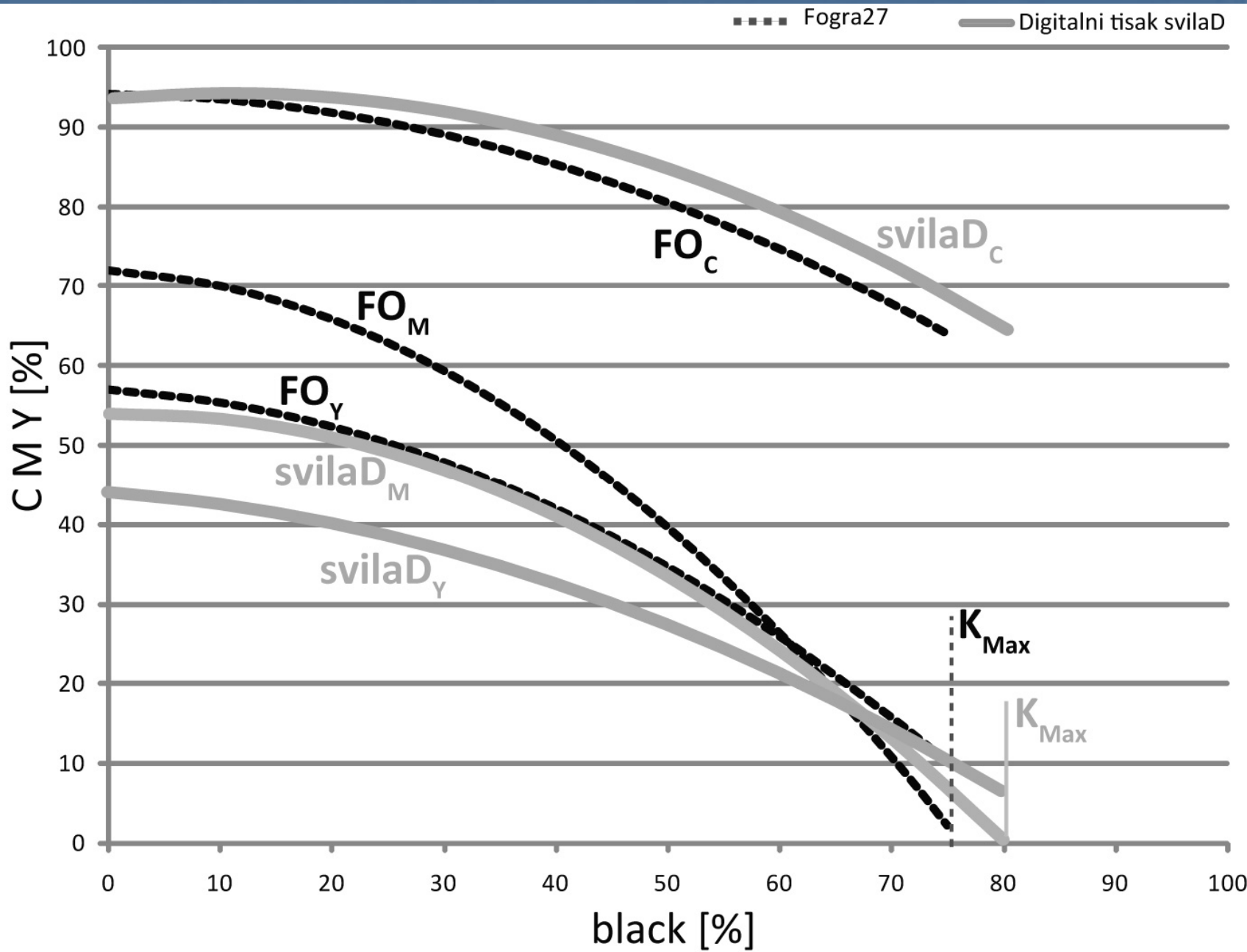


Figure 1

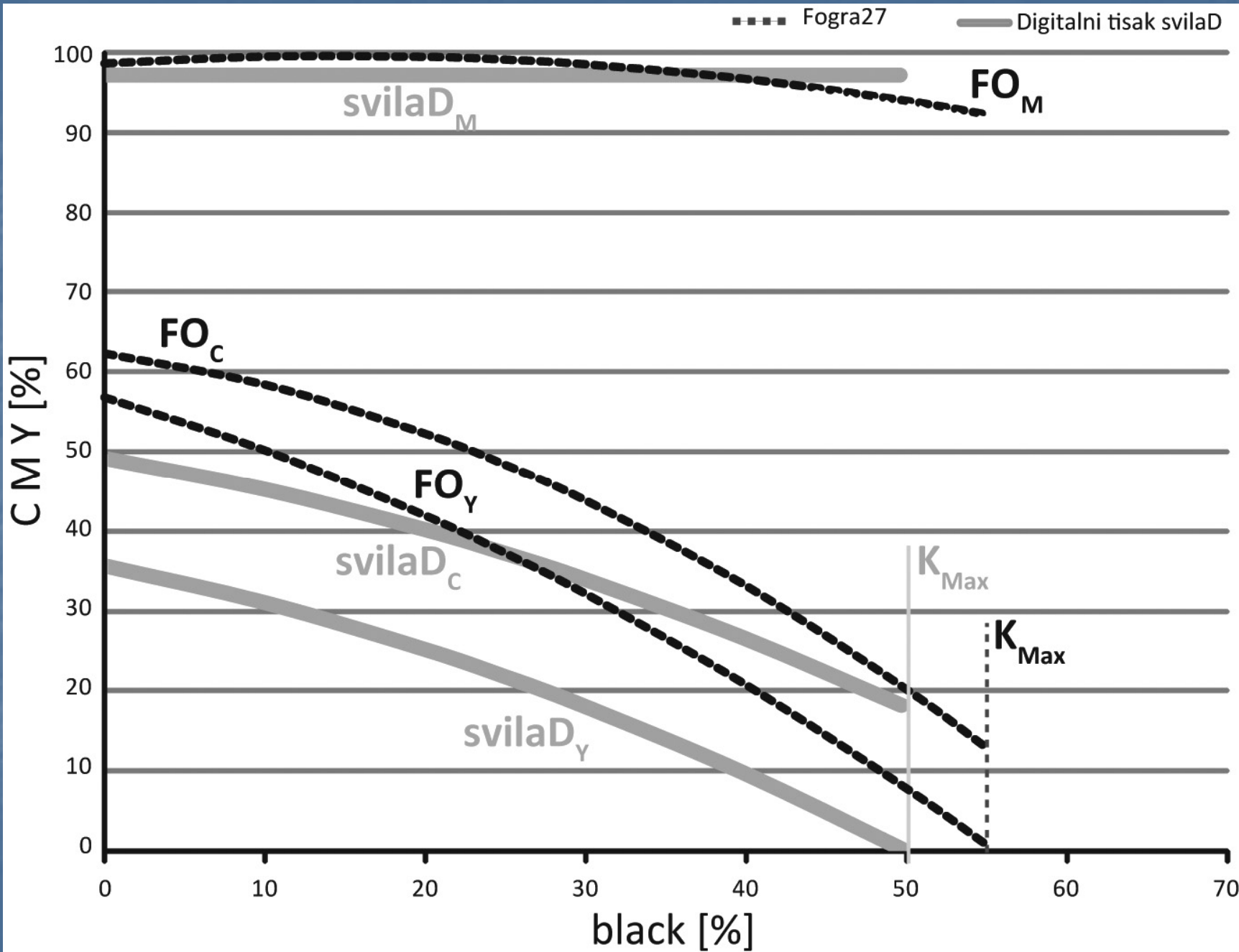


Figure 1



- parameters for C, M and Y relations have been set by the multipolar regression analyses including 18 points
- experimental printing and their interpretations have been performed with infrared light filters from 570 to 1000 nm on Projectina system
- mutual hiding of two or more graphics has been based on the idea that a print should give the same tone in the visual part of the spectrum for various intensities of processing CMYK components

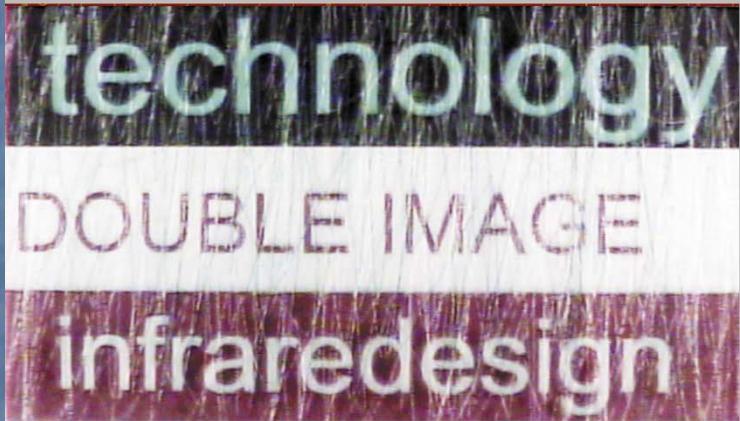


visual spectrum

A2

A3

A4

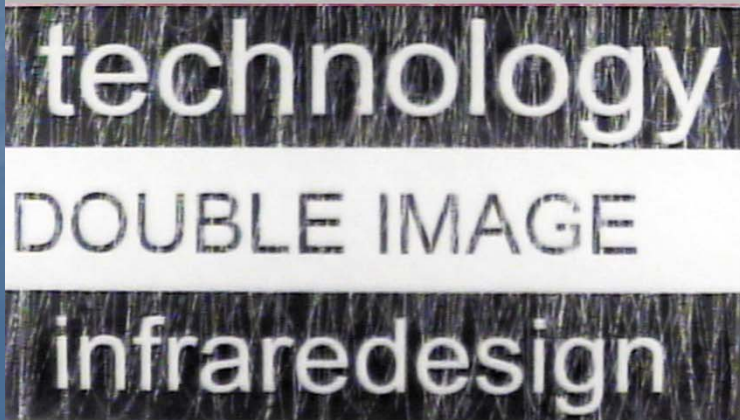


665 nm

A2

A3

A4



850 nm

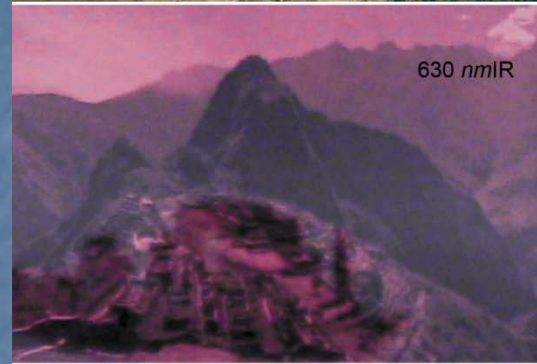
A2

A3

A4



VS



630 nmIR



715 nmIR



830 nm IR

## Conclusion

- “infrared objective” is not developed in methods of GCR, UCR and UCA quality evaluation
- IR reproduction uses continuous space defined with given “IR goal” replacement with standard printing dyes
- it is a test for the nature of dyes, their characteristics
- it is also a proposal on the way to set parameter alternating between two different color settings for different dyes

**Thank you for your attention!**

PhD. Klaudio Pap  
Faculty of Graphic Arts

*[klaudio.pap@zg.t-com.hr](mailto:klaudio.pap@zg.t-com.hr)*