

DEJAVNIKI KAKOVOSTI V TISKU

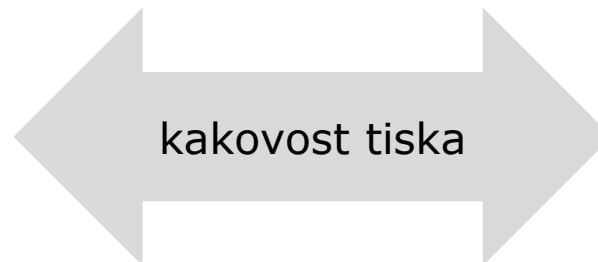
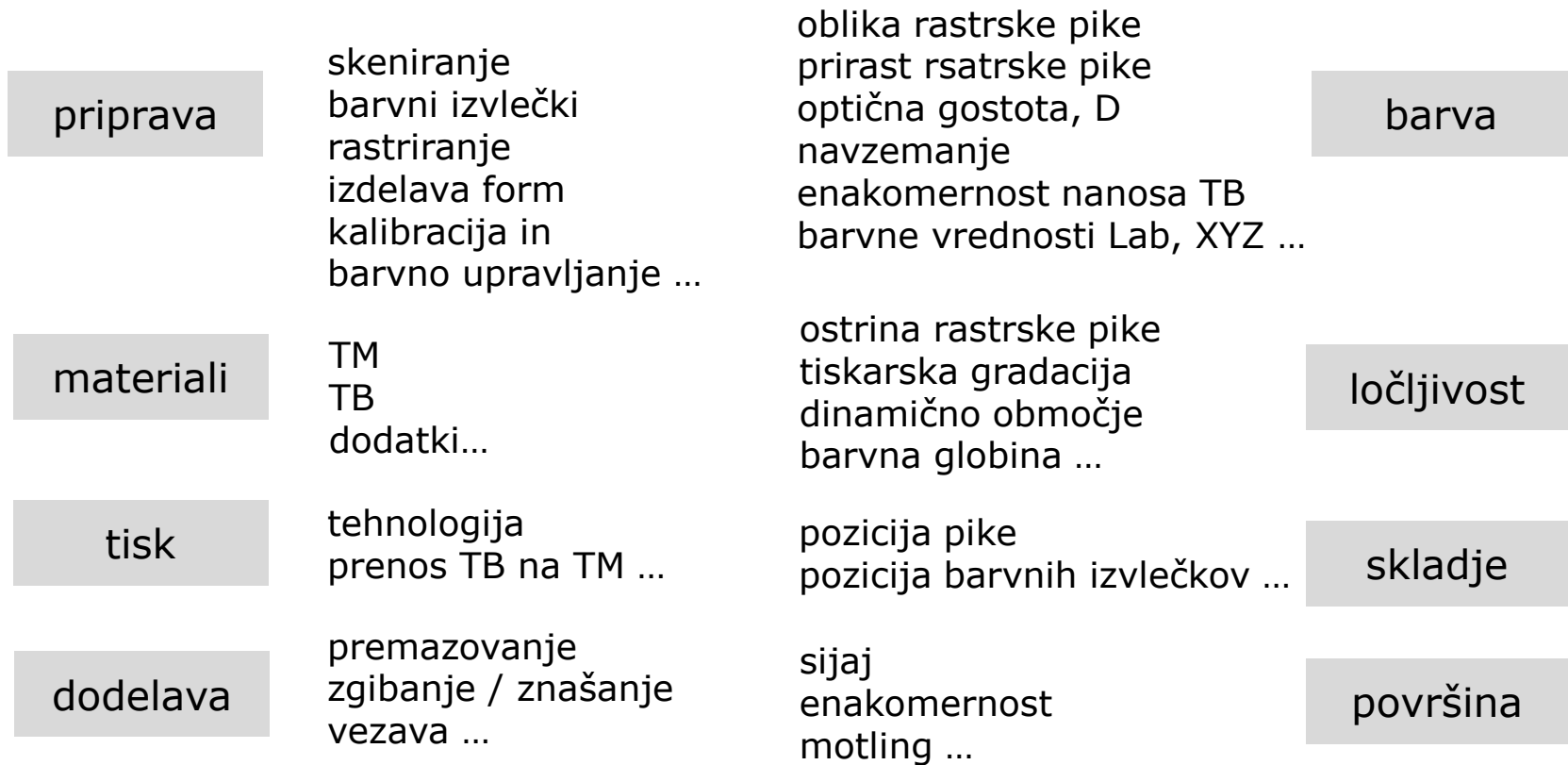
UVOD

Deja Muck

7. 10 . 2020	PREDAVANJA (uvod)
14. 10. 2020	PREDAVANJA (tiskana elektronika)
21. 10. 2020	PREDAVANJA (tiskana elektronika)
28. 10. 2020	ODPADE
4. 11. 2020	VAJE (tiskana elektronika)
11. 11. 2020	VAJE (tiskana elektronika)
18. 11. 2020	PREDAVANJA (rastriranje, odstranjevanje šuma, ovrednotenje kakovosti z objektivnimi metodami)
25. 11. 2020	PREDAVANJA (rastriranje, odstranjevanje šuma, ovrednotenje kakovosti z objektivnimi metodami)
2. 12. 2020	PREDAVANJA (rastriranje, odstranjevanje šuma, ovrednotenje kakovosti z objektivnimi metodami)
9. 12. 2020	VAJE (rastriranje)
16. 12. 2020	VAJE (rastriranje)
23. 12. 2020	PREDAVANJE (3D, 4D-tisk)
30. 12. 2020	ODPADE
6. 1. 2021	VAJE (3D, 4D-tisk)
13. 1. 2021	VAJE (3D, 4D-tisk)

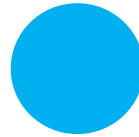
UVOD

Dejavniki kakovosti v tisku – kompleksna vzajemna odvisnost.

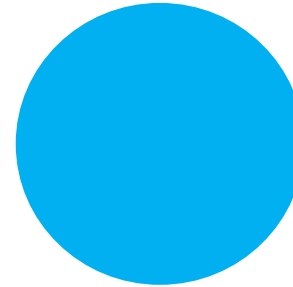


UVOD

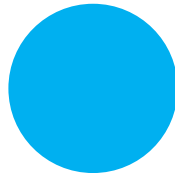
konvencionalni / digitalni / 2D tisk /



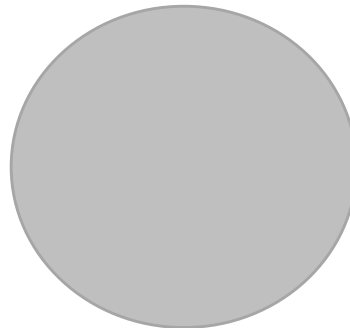
funkcionalni / industrijski / tisk elektronike



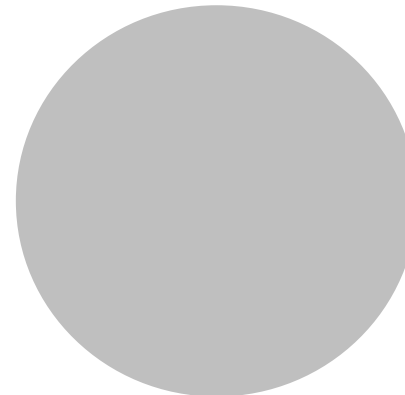
3D tisk



3D tiskana elektronika



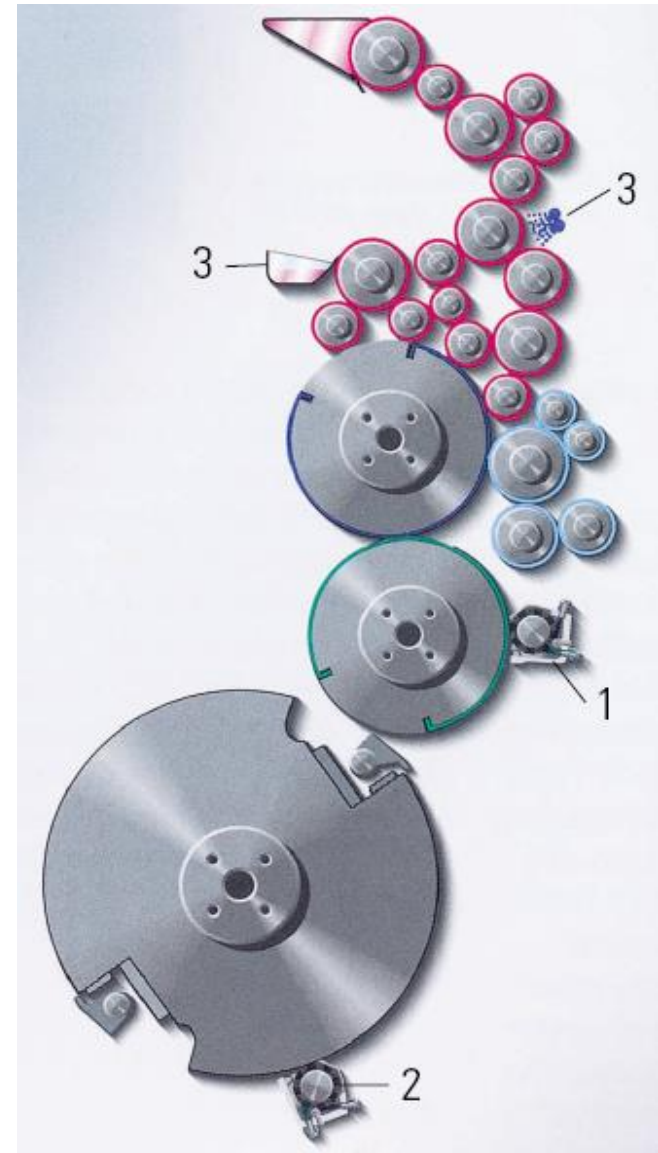
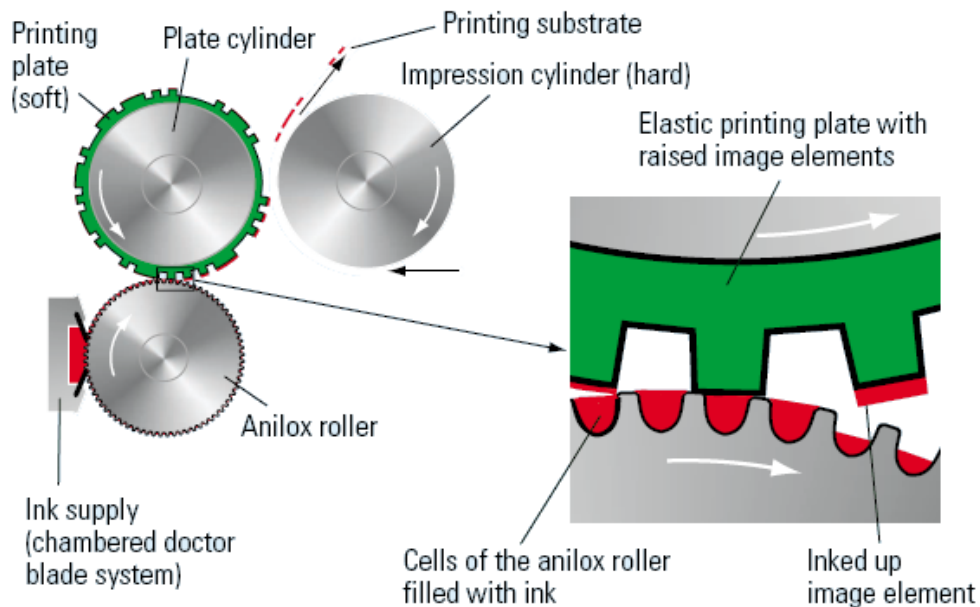
4D tisk in pametni sistemi



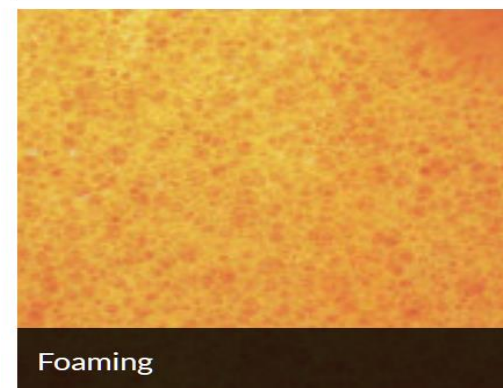
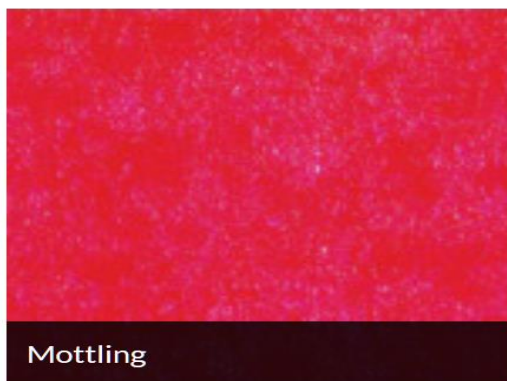
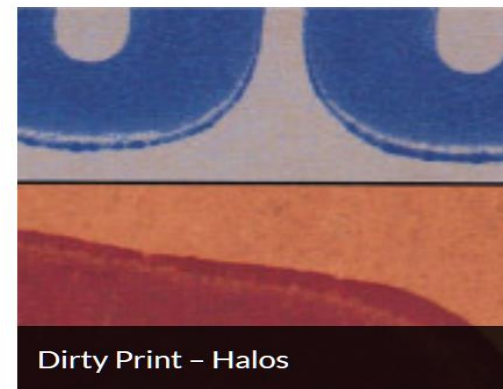
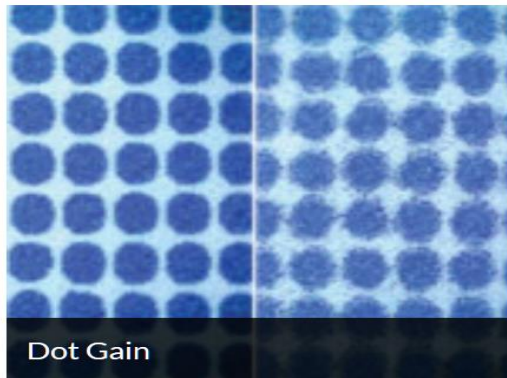
UVOD

Konvencionalni tisk

- ploščni (PV) / posredni valj (GV)
(kemijske, fizikalne in mehanske lastnosti),
- tiskarska barva (TB),
- tiskovni material (TM)
- kakovost odtisa;
interakcija TB:TM)



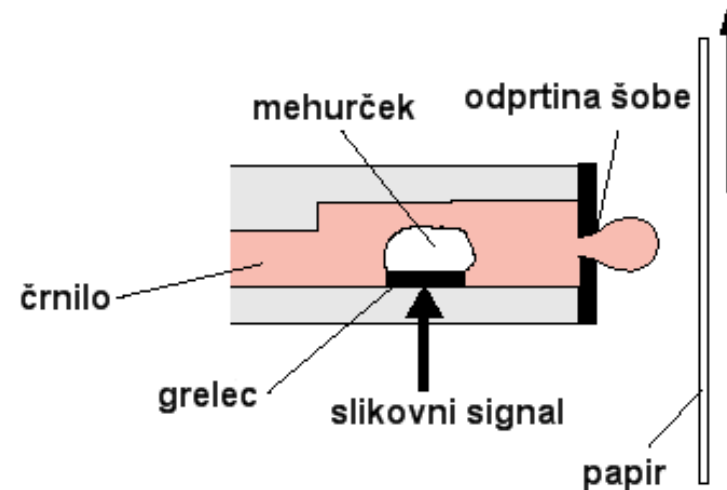
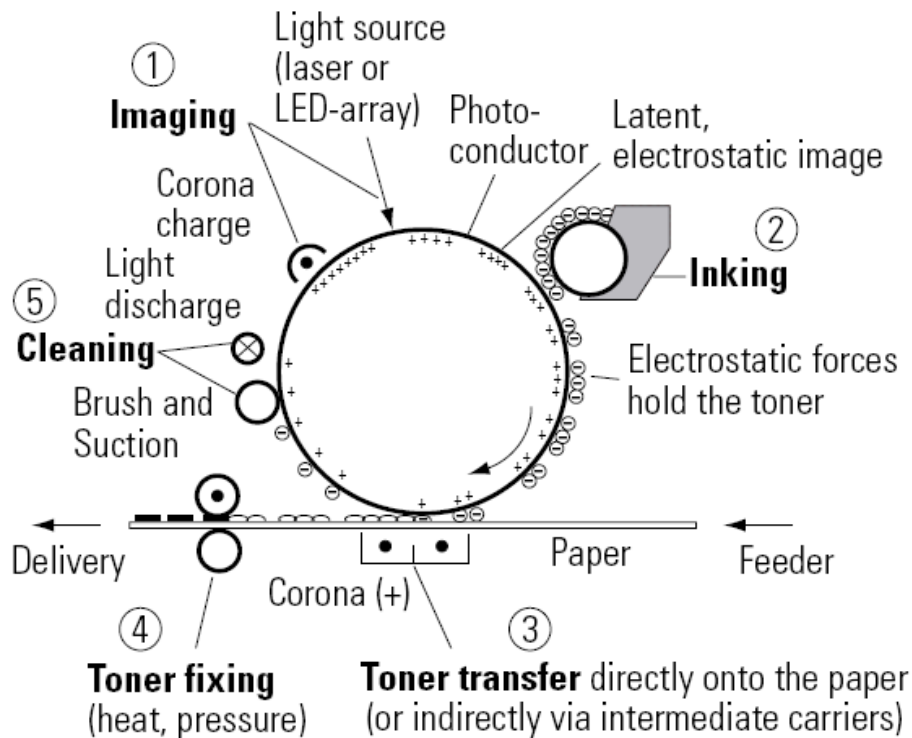
UVOD



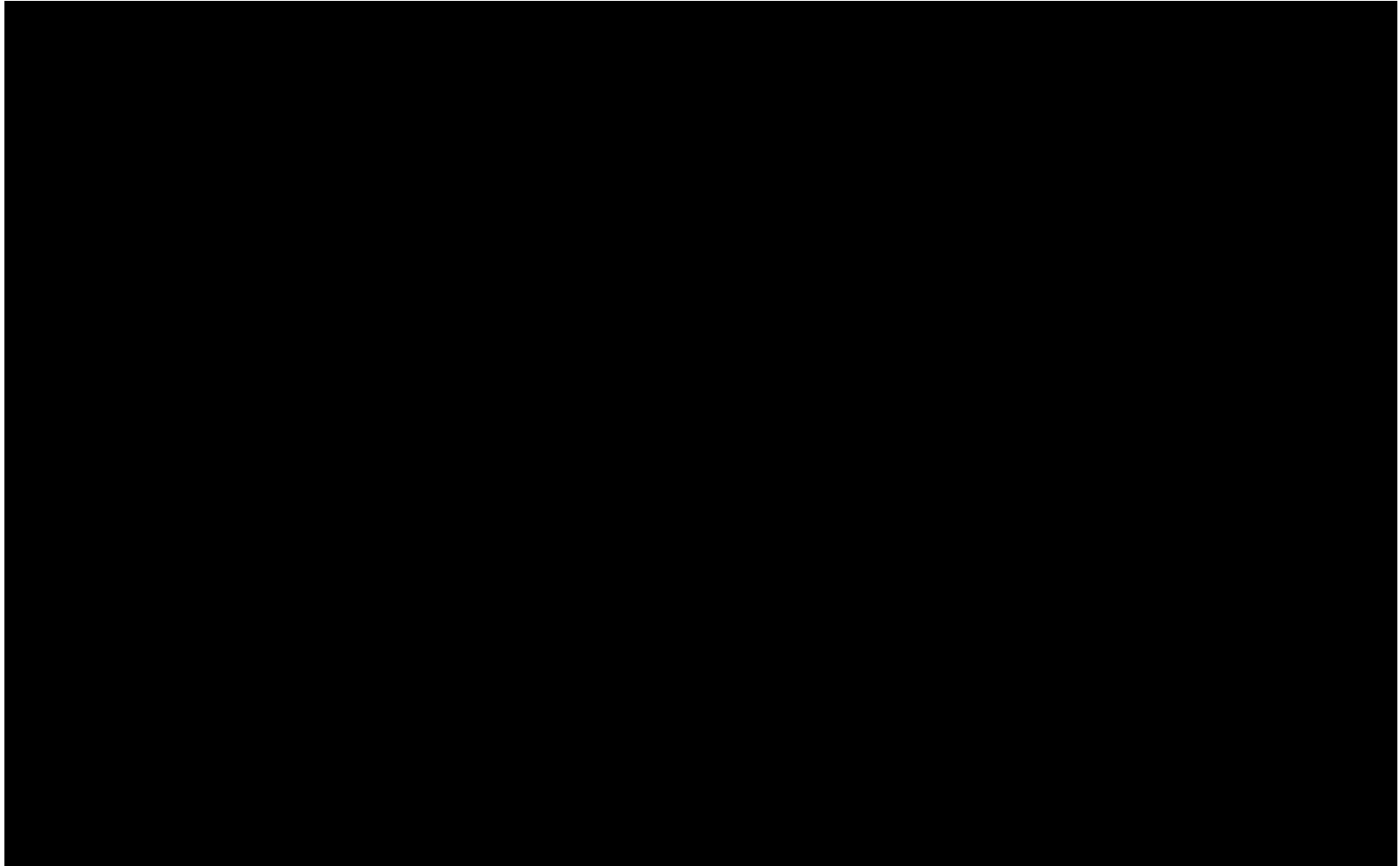
UVOD

Digitalni tisk

- ❑ upodobitveni valj, prenosni trak (EF), tiskalna glava (IJ) (kemijske, fizikalne in mehanske lastnosti),
- ❑ tiskarska barva (TB),
- ❑ tiskovni material (TM),
- ❑ kakovost odtisa; interakcija TB:TM)



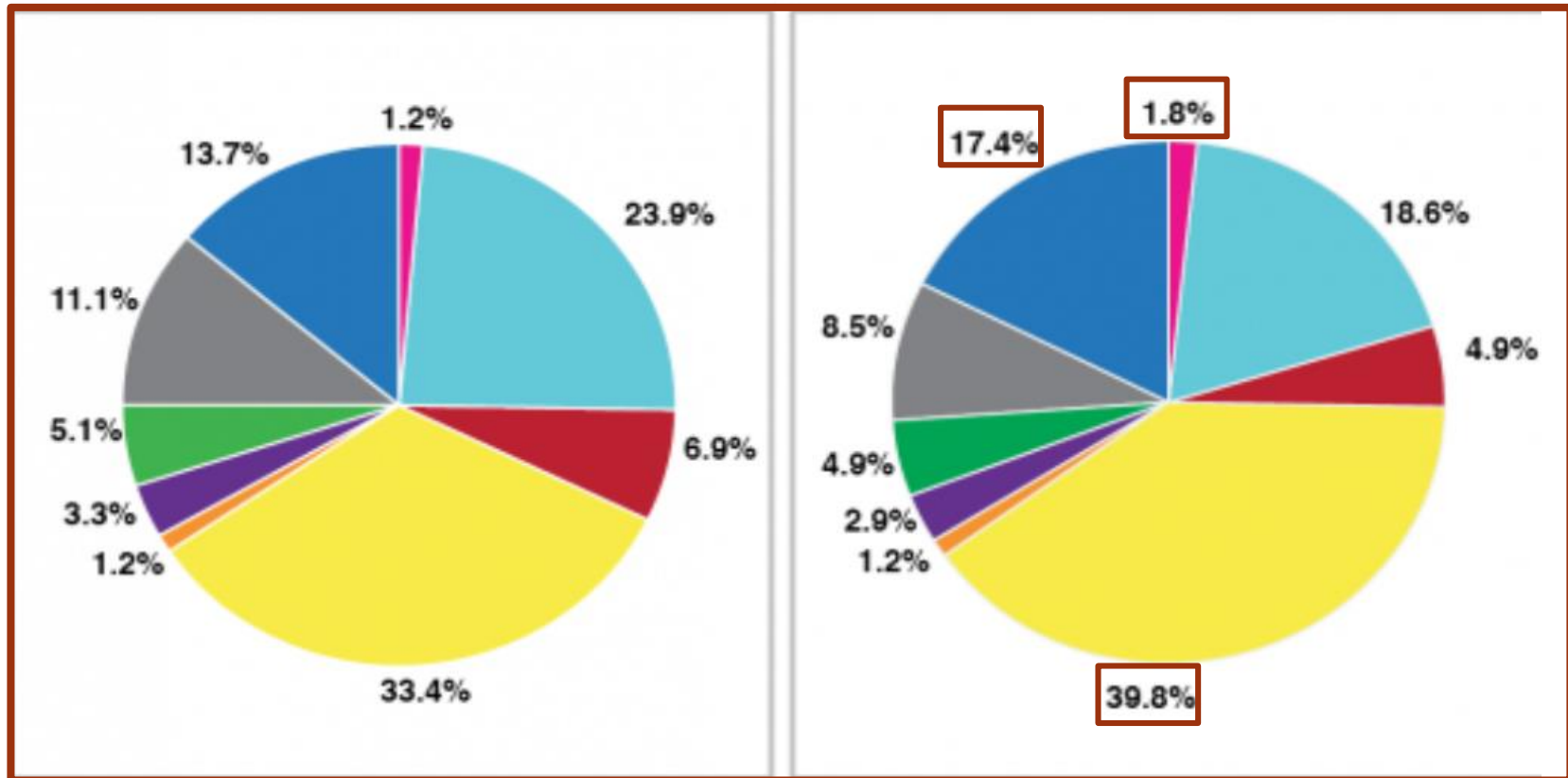
UVOD



UVOD FUNKCIONALNI IN INDUSTRIJSKI TISK

2015

2020



● Décor and laminate
● Ceramics
● Electronics

● Glass
● Automotive
● Biomedical

● Promotional/misc.
● 3-D printing
● Digital textile printing

UVOD FUNKCIONALNI IN INDUSTRIJSKI TISK



HOME TEXTILES



MEMBRANE SWITCHES



DIRECT-TO-SHAPE



HAPTIC PROOFS



3D

ESMA MEMBERS AND PARTNERS PROVIDE EXAMPLES OF THEIR STATE-OF-THE-ART SOLUTIONS FOR SPECIALIST, INDUSTRIAL AND FUNCTIONAL PRINTING APPLICATIONS. COME, HAVE A LOOK AND LEARN ABOUT THE PROCESS!

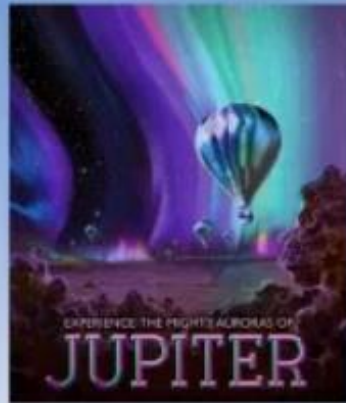
VISIT THE INDUSTRIAL PRINT SHOWCASE
AT ESMA PAVILION IN HALL 4, C63



CORRUGATED BOARD



GLASS



SPECIAL EFFECTS



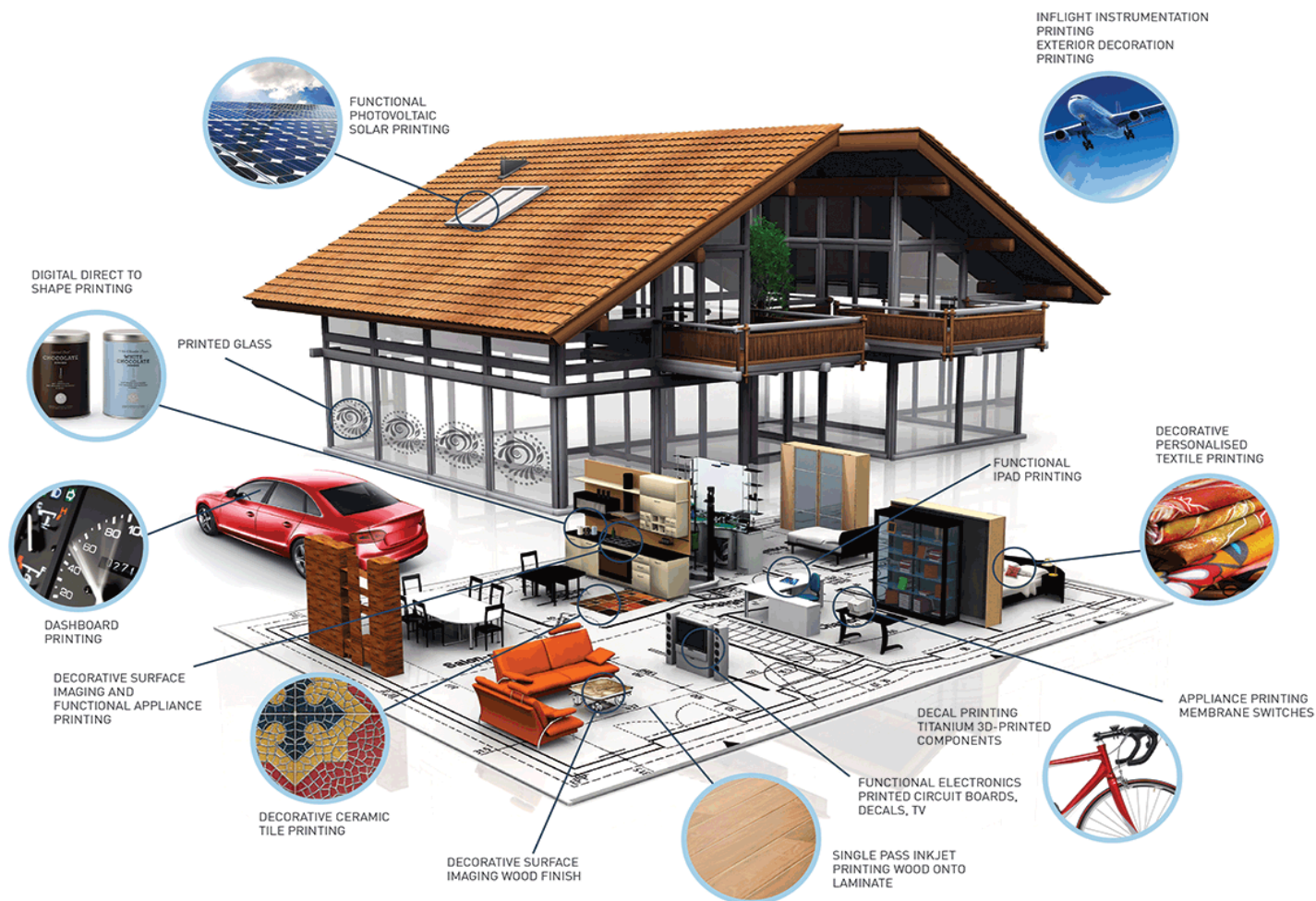
FLOCK



CARPETS

UVOD FUNKCIONALNI IN INDUSTRIJSKI TISK

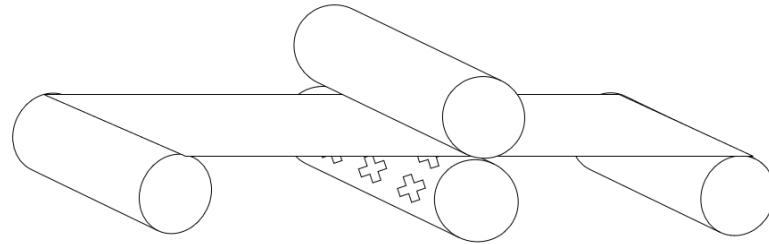
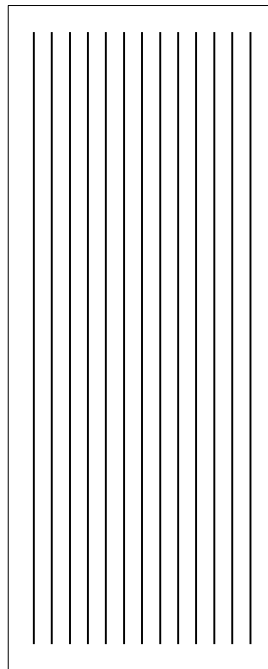
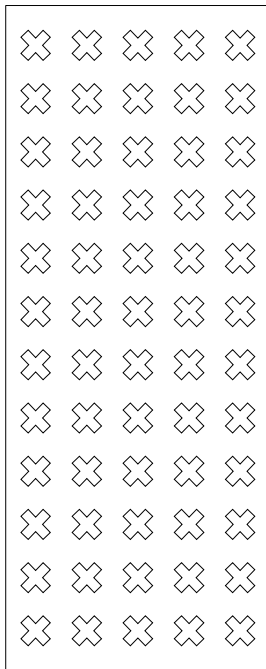
Uporaba tehnologij tiska znotraj proizvodnega procesa. Gre za uporabo funkcionalnih TB in materialov z namenom povečanja funkcionalnosti ali dekorativnosti izdelkov.



UVOD FUNKCIONALNI IN INDUSTRIJSKI TISK

patentna prijava – maj 2014

TISKAN FREKVENČNO SELEKTIVNI ZASLON



Oblikovanje meta-celic in prenos le teh s tiskom na fleksibilne tiskovne materiale. S tiskom meta-celic ustvarimo meta-papirje. Ti delujejo kot frekvenčno selektivni zaslони - filtri za različna frekvenčna območja EM valovanja.

Prednosti organske elektronike

- ❑ nizko cenovni materiali
- ❑ grafične tehnologije tiska visoke hitrosti
- ❑ fleksibilna elektronika
 - nizki proizvodni stroški
 - tanka, lahka



KONVENCIONALNI TISK – PROCESNE BARVE



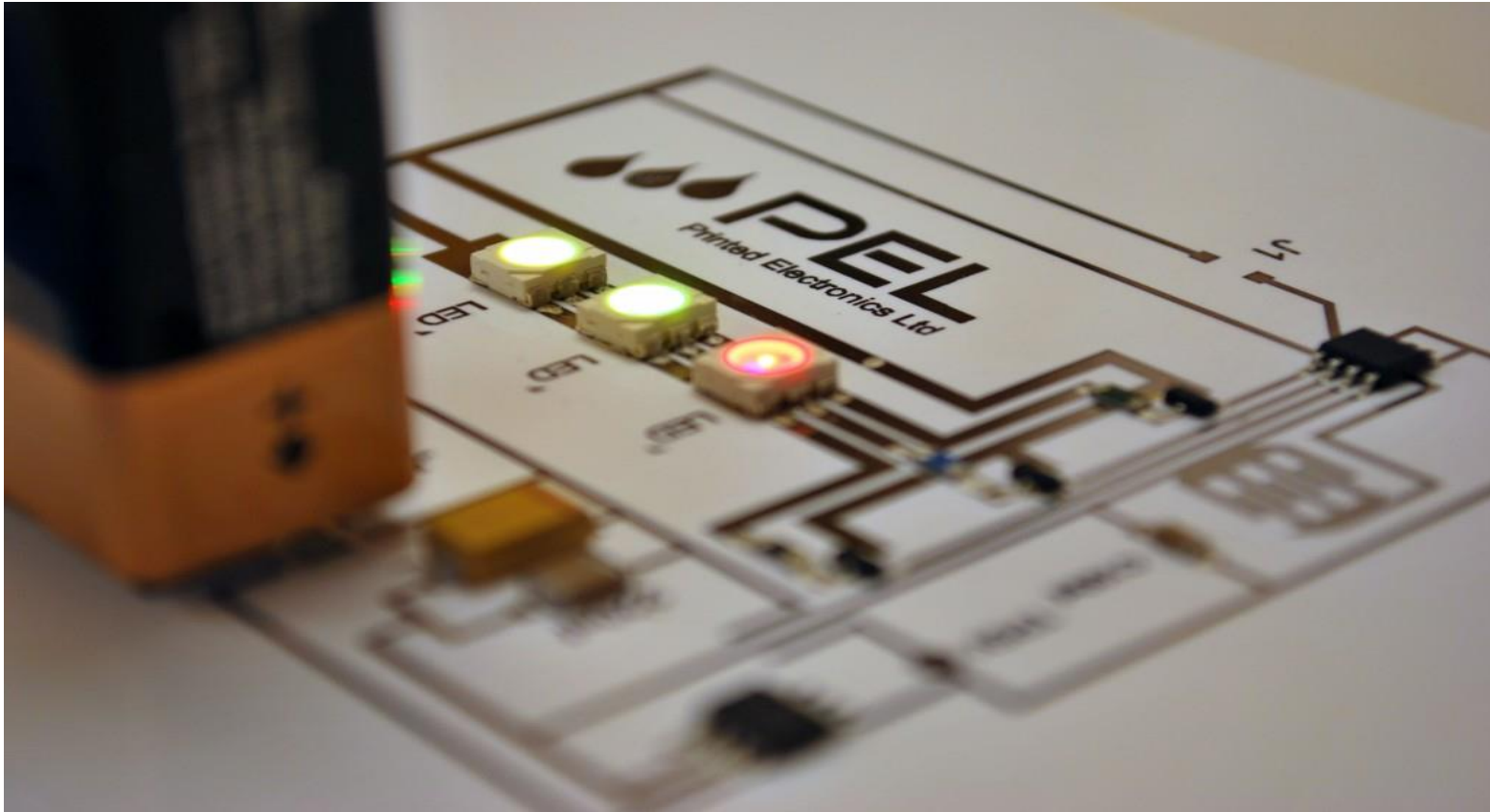
TISK ELEKTRONIKE – FUNKCIONALNE BARVE



INTERAKCIJE

- TB – podobne lastnosti
- TB + lak

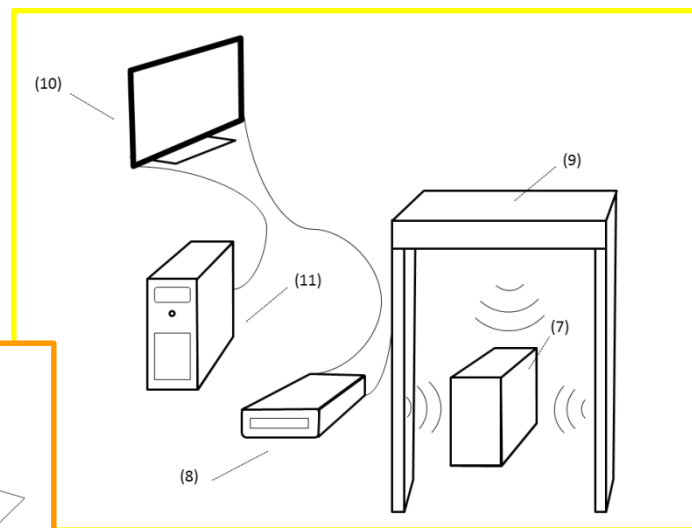
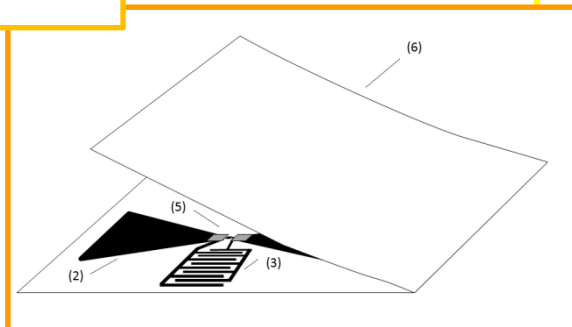
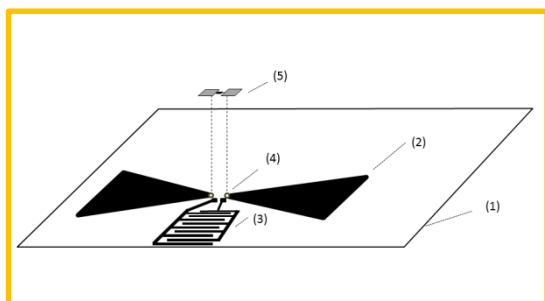
- TB – različne lastnosti
- različne tehnologije



Problem integracije – hibridna elektronika.

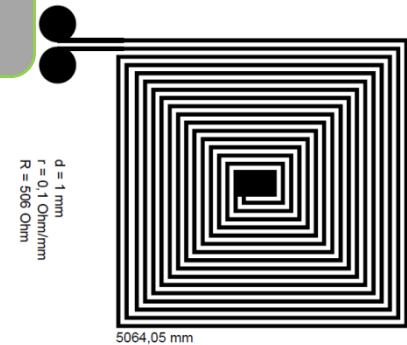
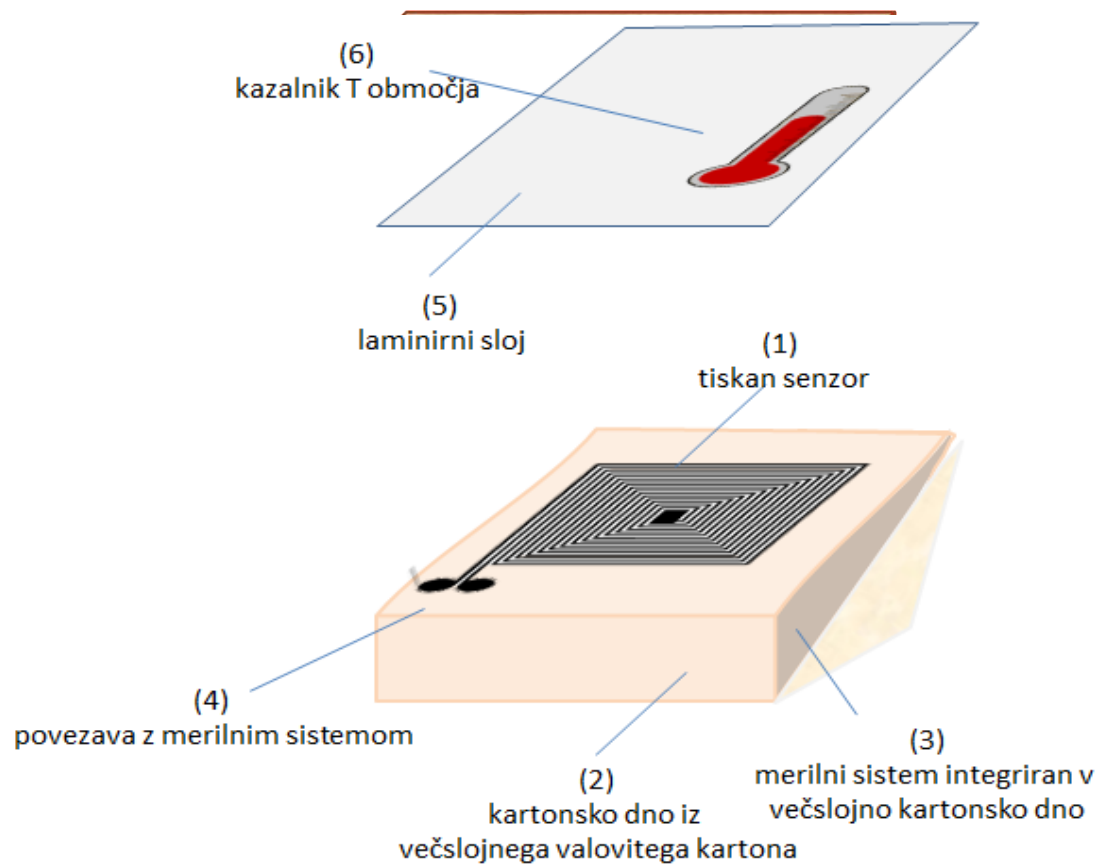
patentna prijava (januar 2013)

EMBALAŽA IZ KARTONA Z VGRAJENO PAMETNO ZNAČKO
ZA RADIOFREKVENČNO IDENTIFIKACIJO Z MOŽNOSTJO
BELEŽENJA RAZLIČNIH PARAMETROV



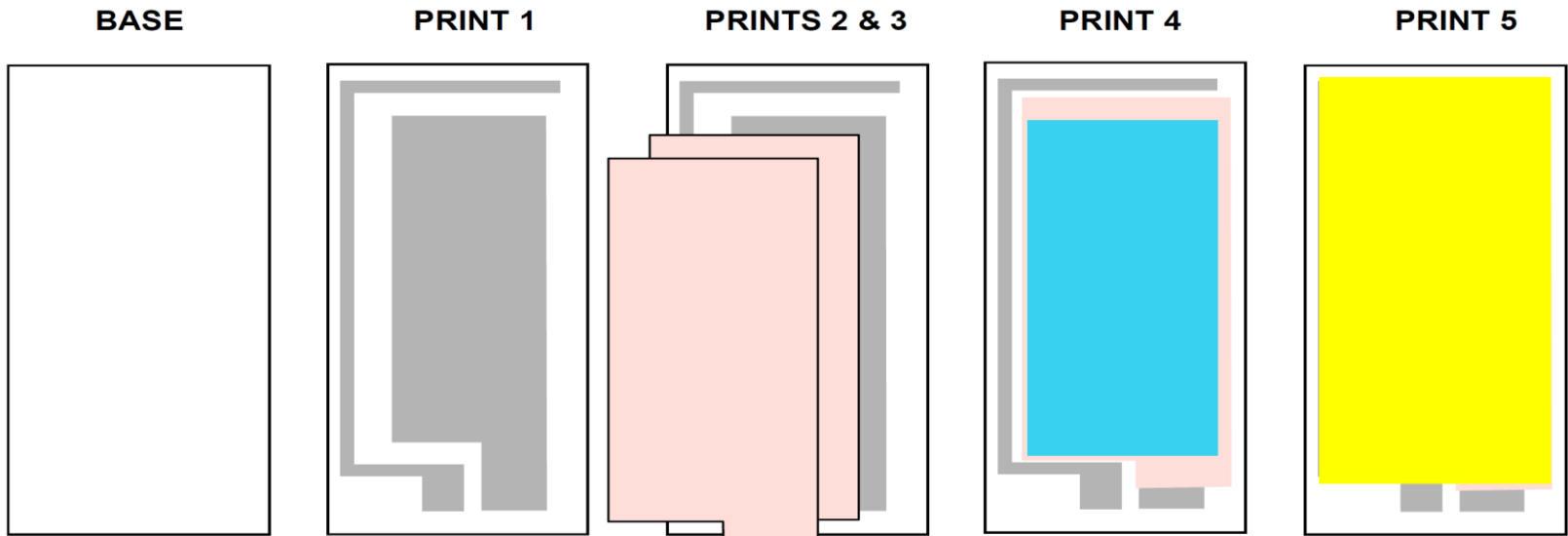
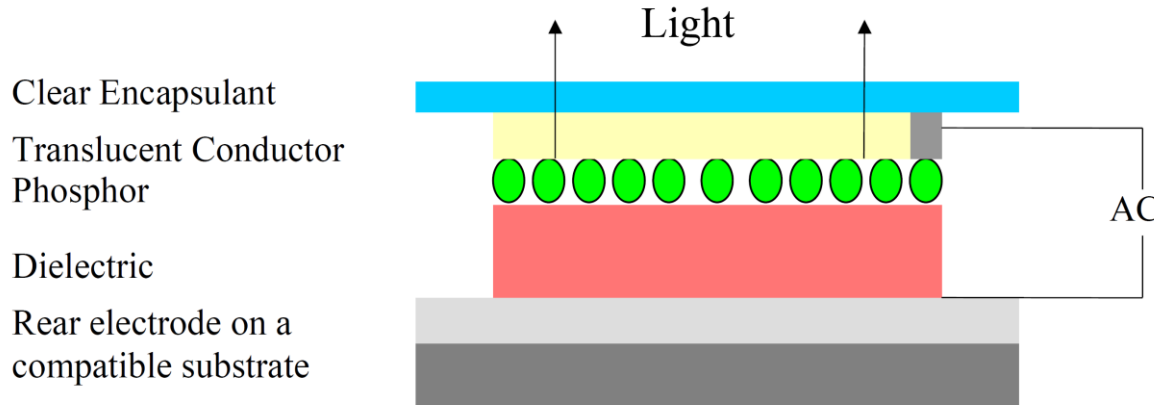
patentna prijava (september 2013)

TISKAN TEMPERATURNI SENZOR V ELEKTRONSKEM MERILNEM SISTEMU ZA NAMEN UPORABE V PAMETNI EMBALAŽI



UVOD

TISKANA ELEKTRONIKA



Base Substrate

- Various e.g. polyester, FR4 Printed Circuit Board

Rear Electrode & Front Busbar

- 5000 Silver
- 7102 Carbon

2 - 3 Dielectric Layers

- 7153E

Phosphor

- 7151J GreenBlue
- 7154J YellowGreen
- 7138J White

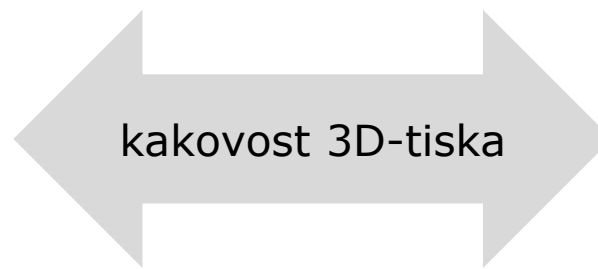
Translucent Front Conductor

- 7164

UVOD

Dejavniki kakovosti v tisku – kompleksna vzajemna odvisnost.

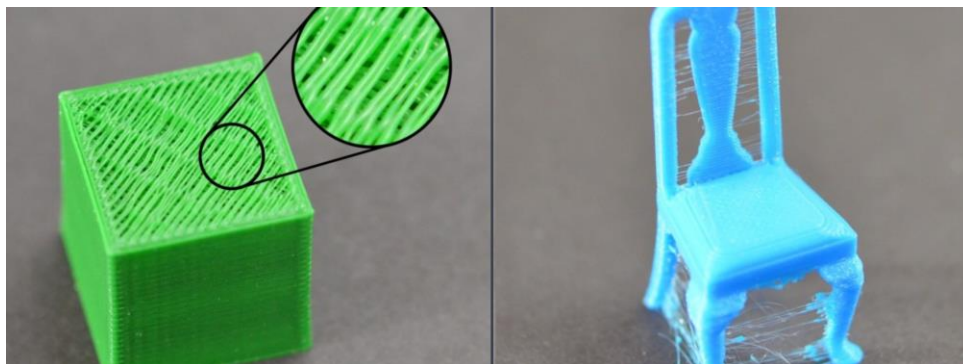
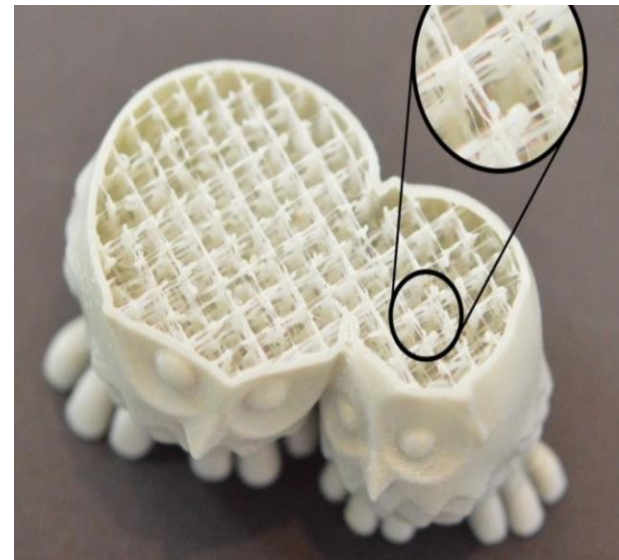
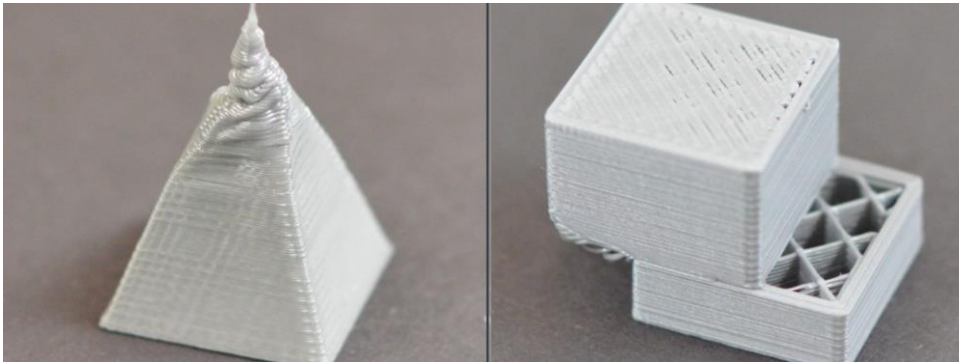
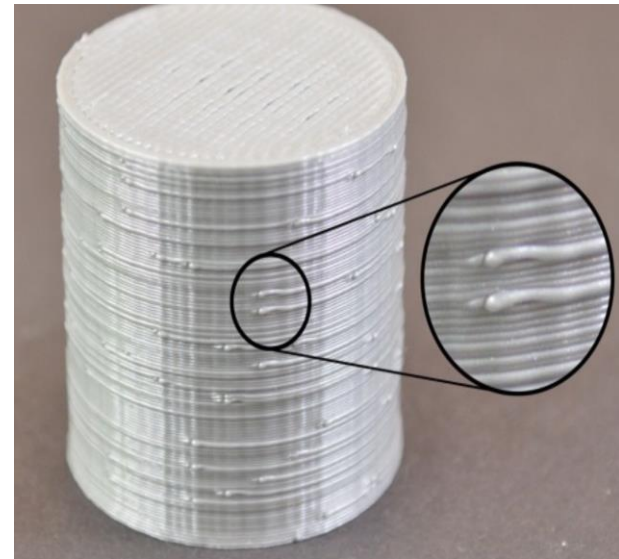
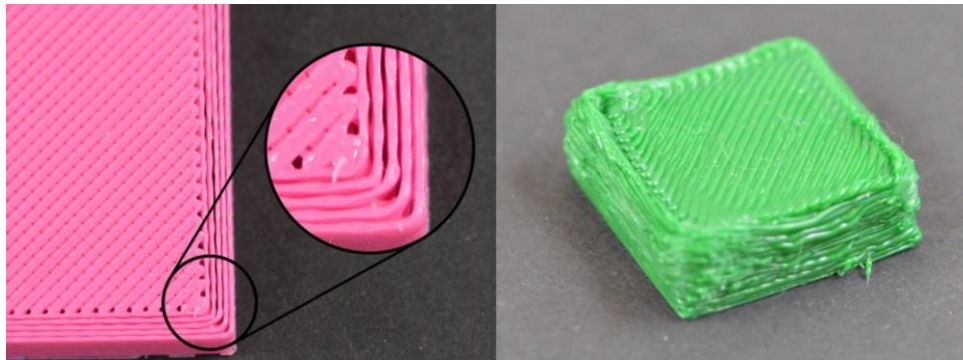
priprava	skeniranje modeliranje optimizacija modela za tisk! ...	način nanosa barve barvne vrednosti Lab, XYZ navzemanje enakomernost nanosa TB ...	barva
tisk	programska / strojna oprema tehnologija tiska ...	velikost šobe / laserja debelina sloja ...	ločljivost
materiali	tekoč, trden, praškast ...	kalibracija ...	skladje
dodelava	brušenje premazovanje lepljenje ...	gladkost, prehodi med sloji, enakomernost, motling ...	površina



- ❑ 3D tisk s polimernimi in kovinskimi materiali bo naraščal
- ❑ razvoj programske opreme
- ❑ avtomatizacija naknadne obdelave
- ❑ globalna standardizacija – hitrejši razvoj
- ❑ 3D tisk bo postal „pametnejši“ bolj integriran > pametne tovarne, industrija 4.0

UVOD

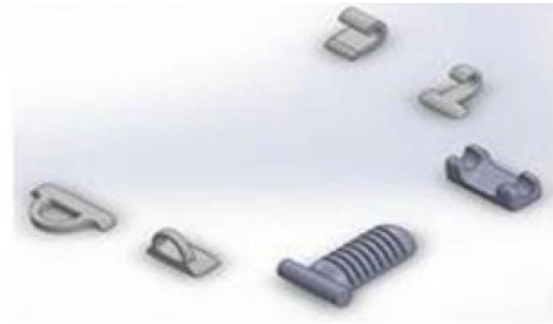
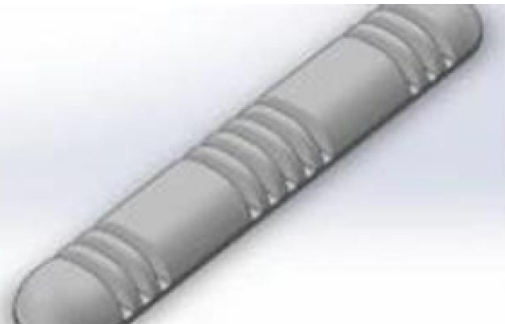
3D-TISK



UVOD

TRENDI 3D-TISK

Tisk funkcionalnih in dekorativnih elementov > analiza vpliva parametrov na končno kakovost, funkcionalnost.

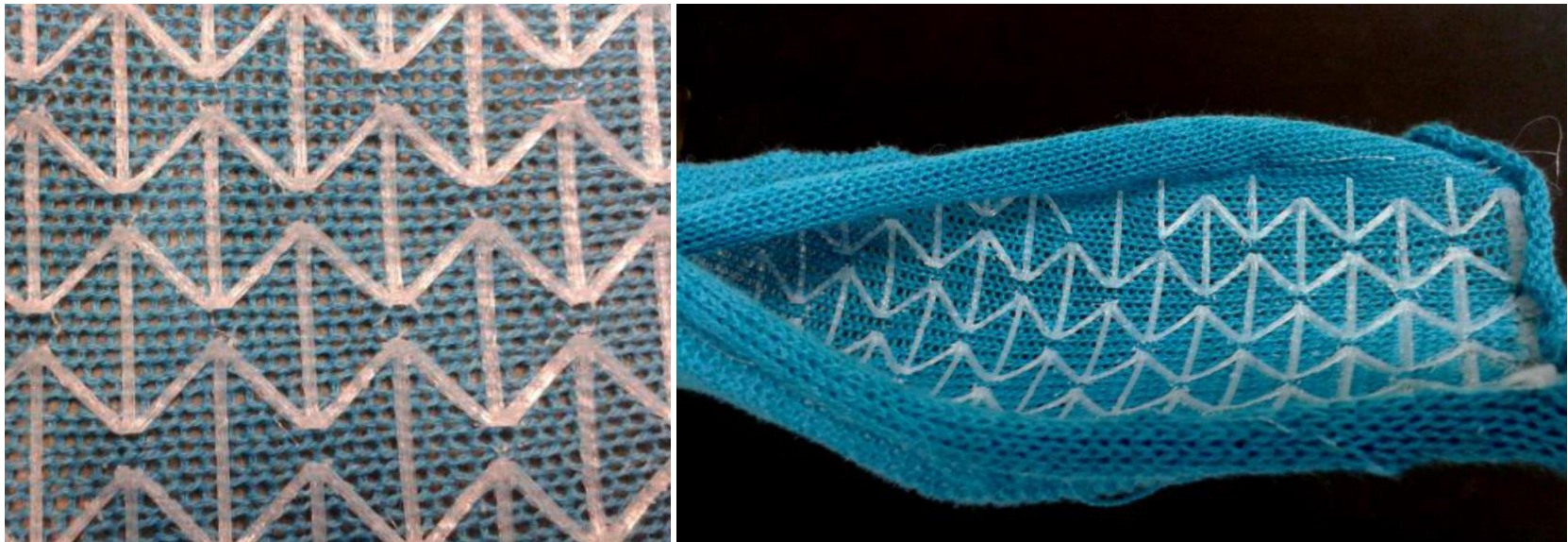


UVOD

TRENDI 3D-TISK

Tisk geometrijskih likov z oksetičnim potencialom na tekstilni temelj - toga mreža prisili pletivo, da se ob vzdolžnem raztezanju tudi prečno raztegne (Andrea Ehrmann).

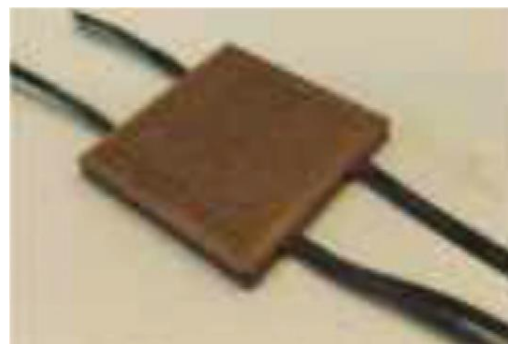
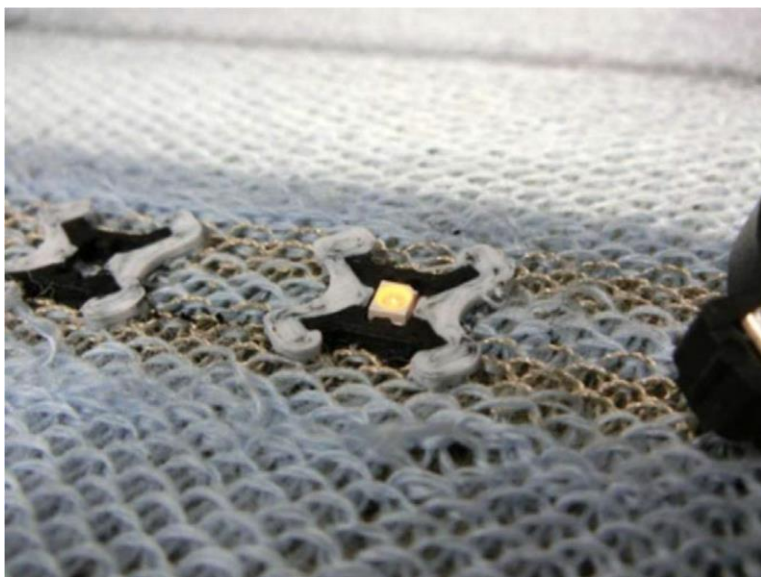
- mehanske lastnosti, prepustnost tekstilij (tekstilni filtri ...)



UVOD

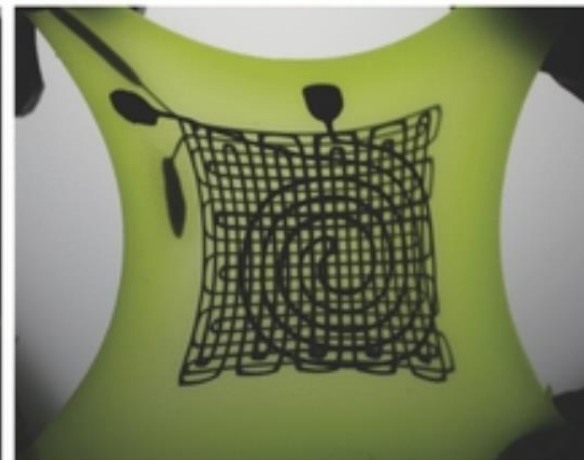
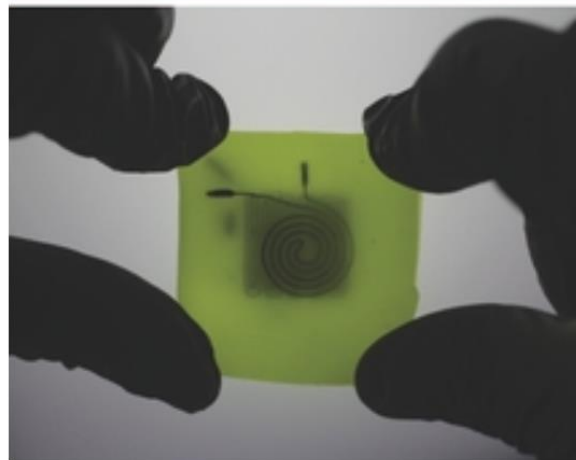
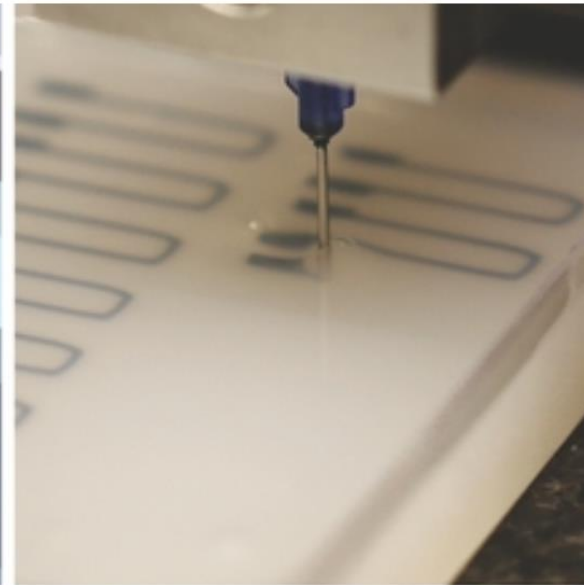
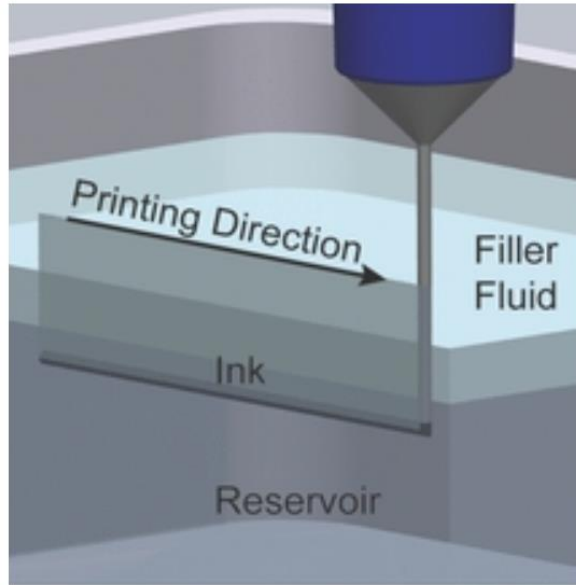
TRENDI 3D-TISK

Lažje kontaktiranje konvencionalnih elementov tiskane elektronike > nosljiva elektronika, več-materialni objekti.



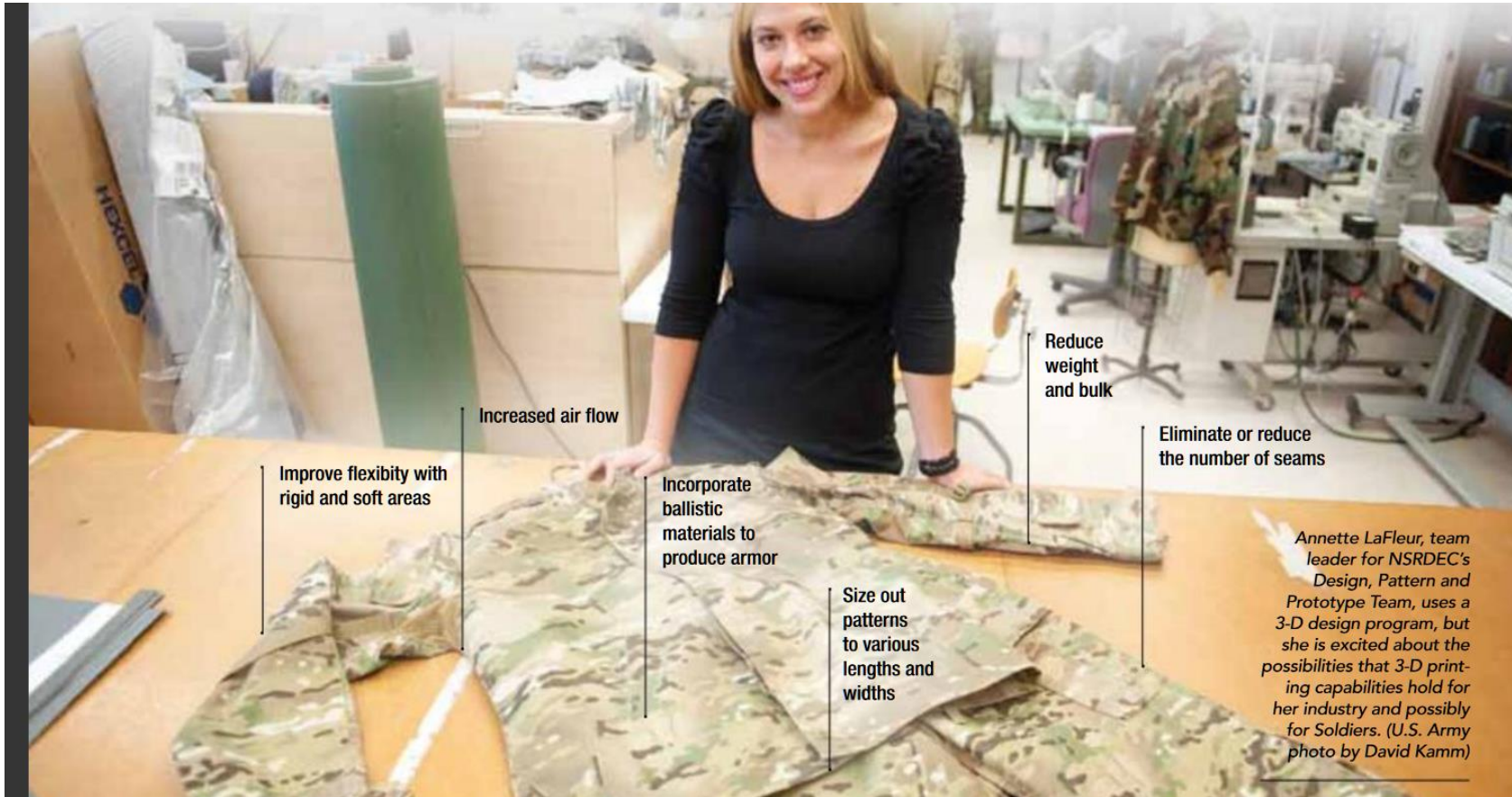
UVOD

TRENDI 3D-TISK



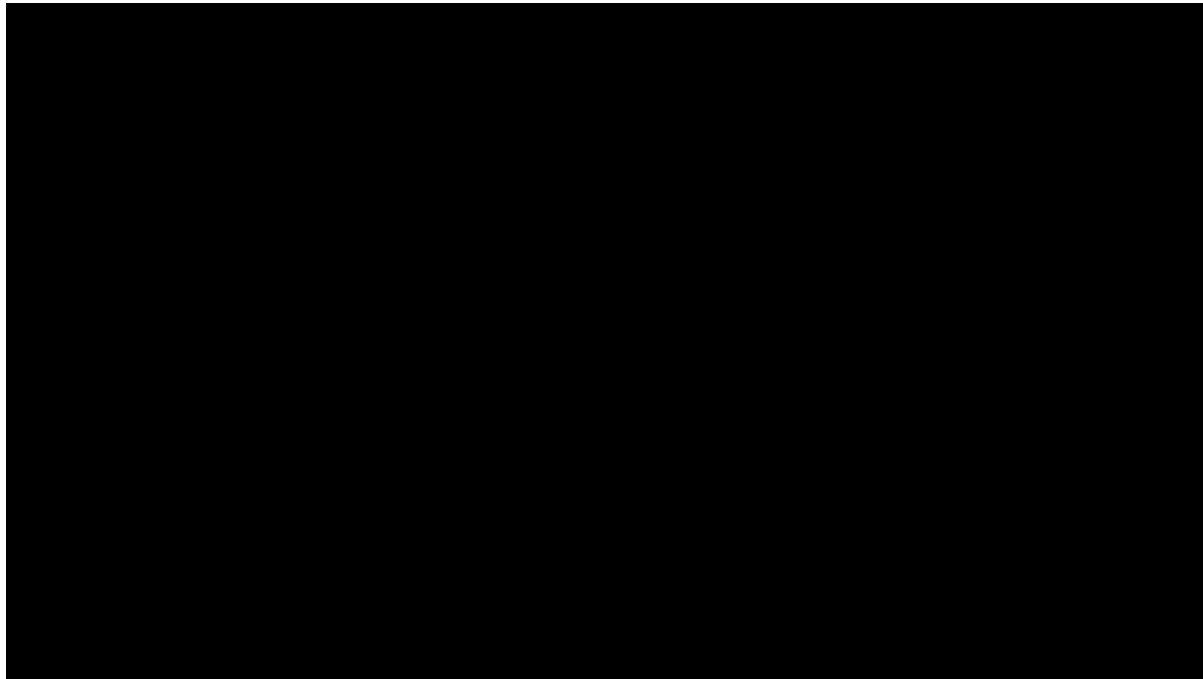
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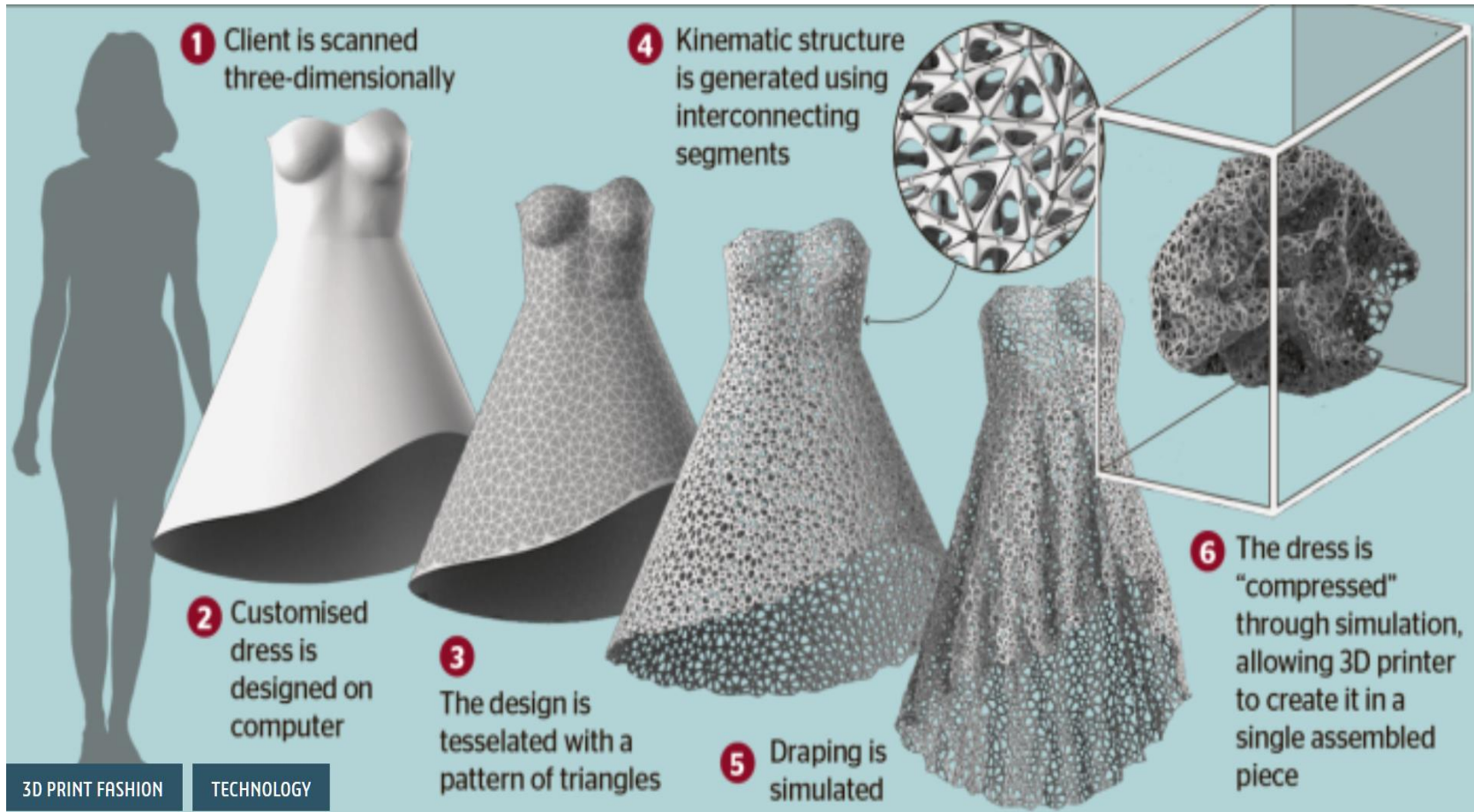
TRENDI 3D-TISK

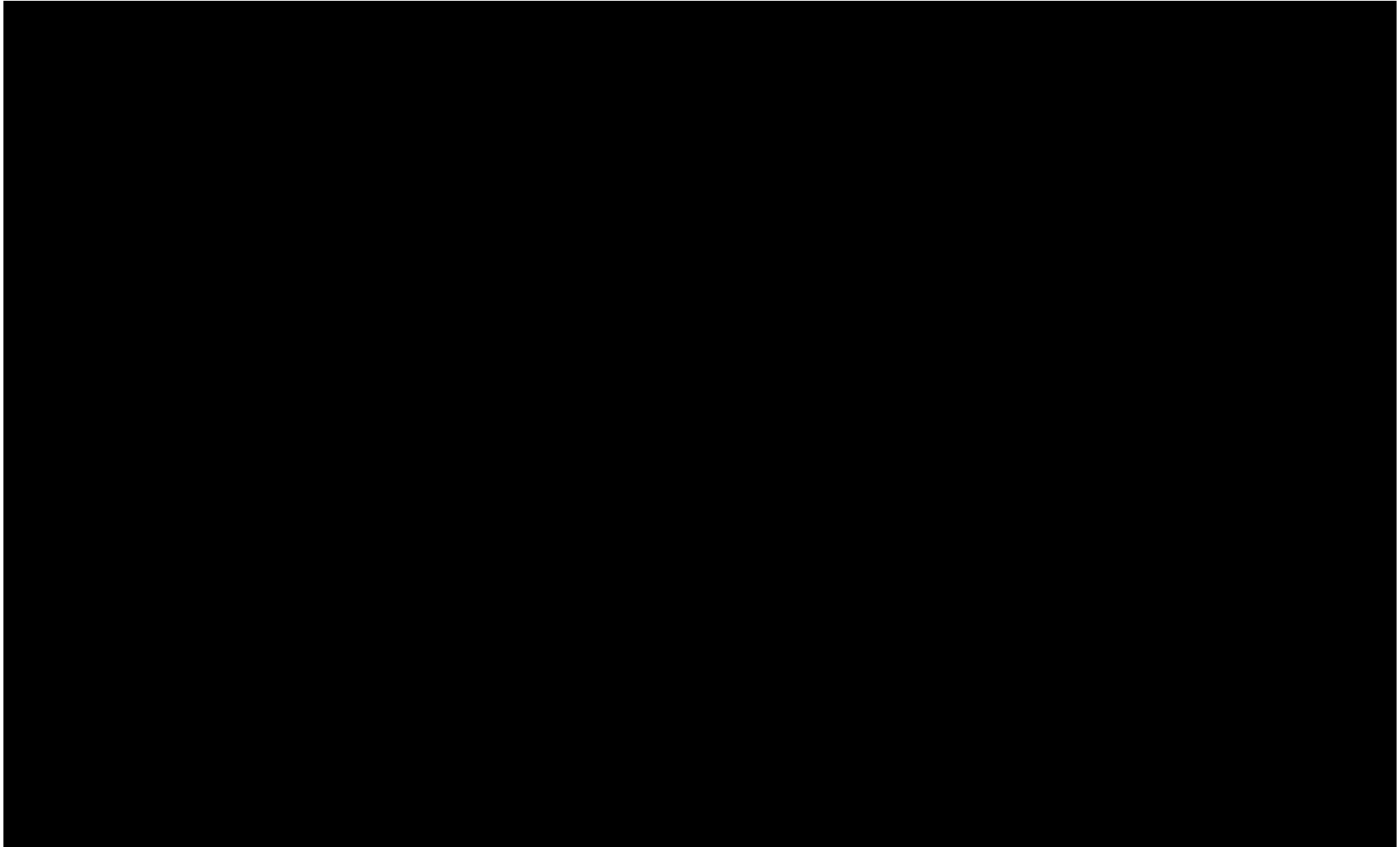


UVOD

TRENDI 3D-TISK

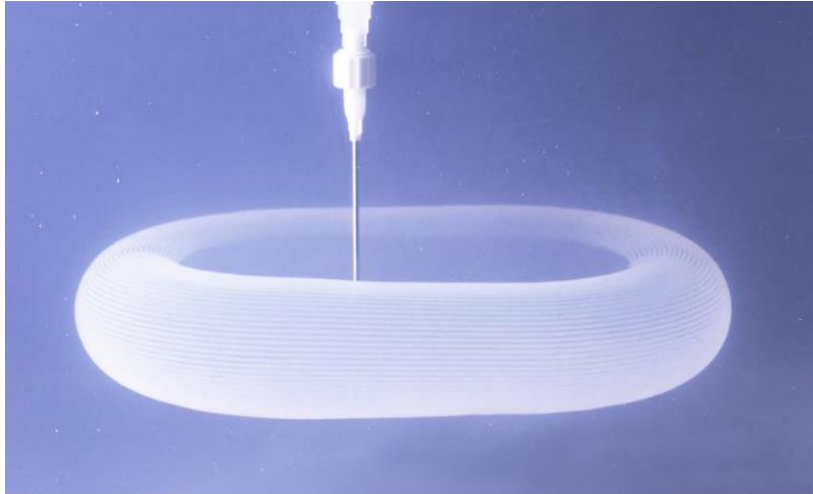




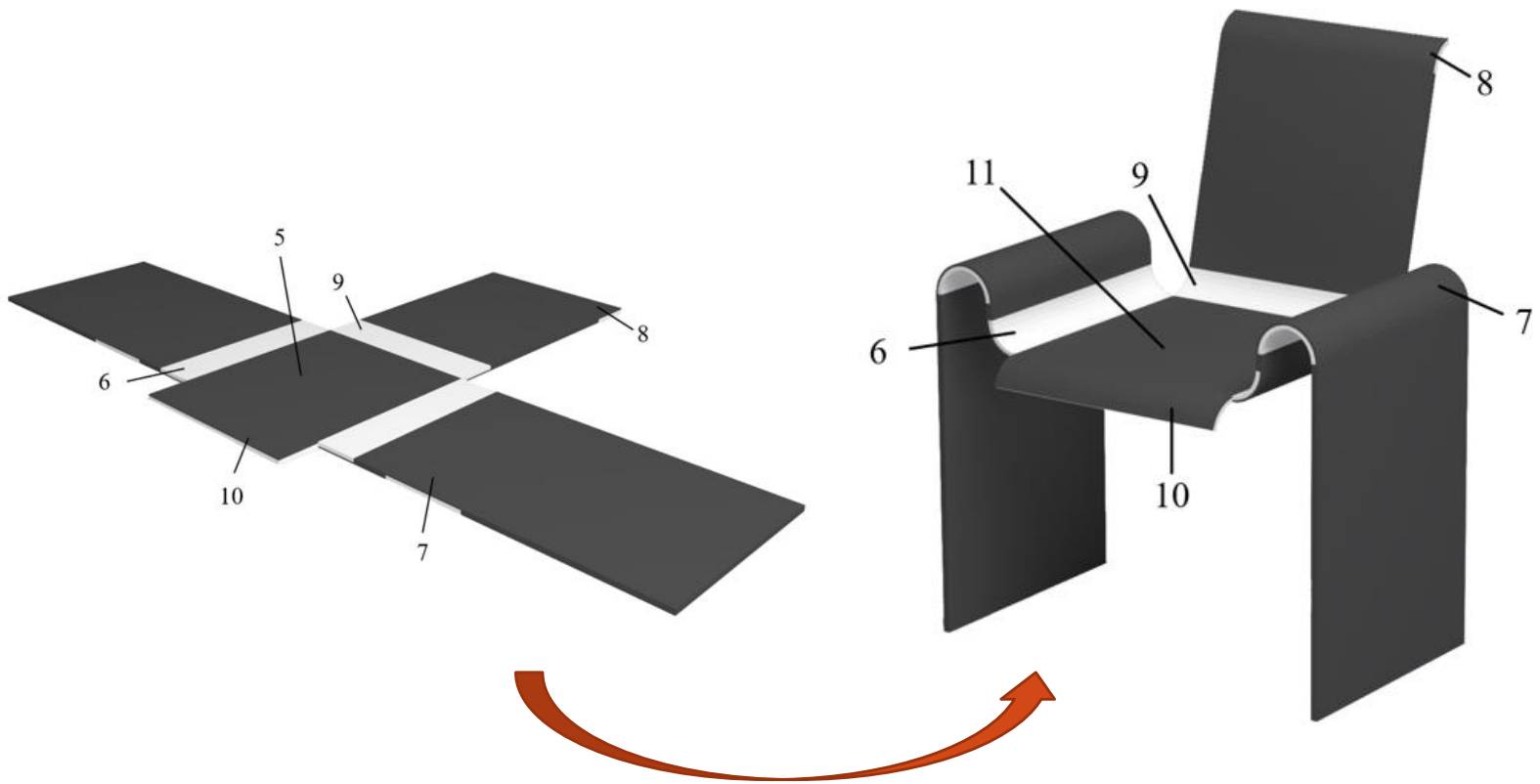


UVOD

MIT – SELF-ASSEMBLY LAB



POSTOPEK IZDELAVE SAMO-SESTAVLJIVIH TELES

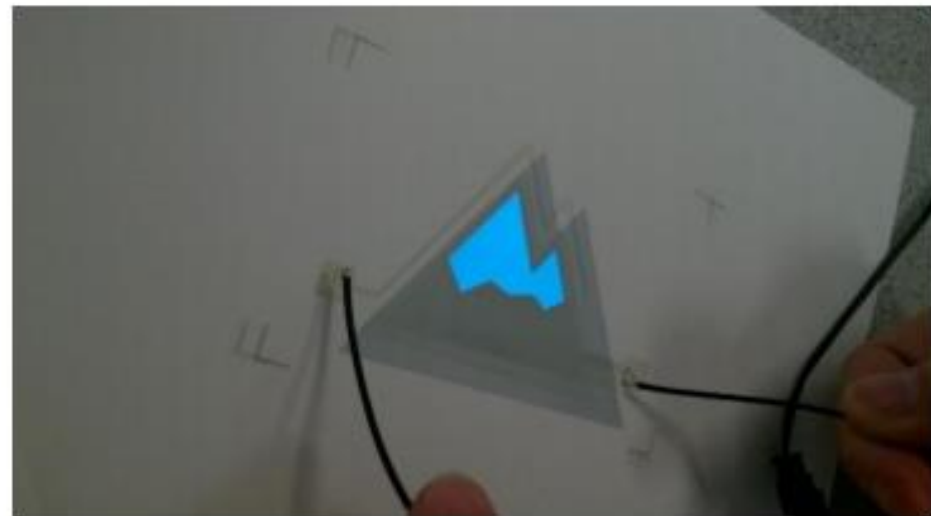
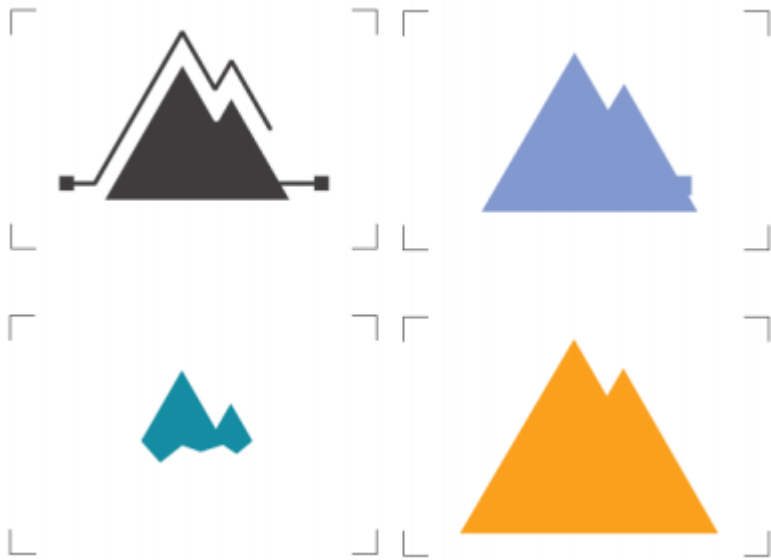


aktivacijski medij – vroča voda

VSEBINA NA KRATKO

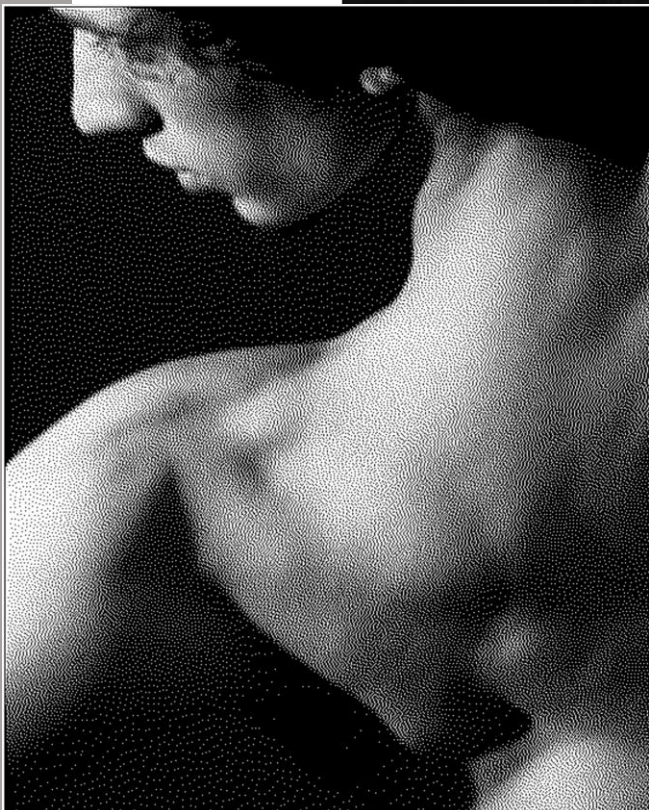
UVOD

TISKANA ELEKTRONIKA



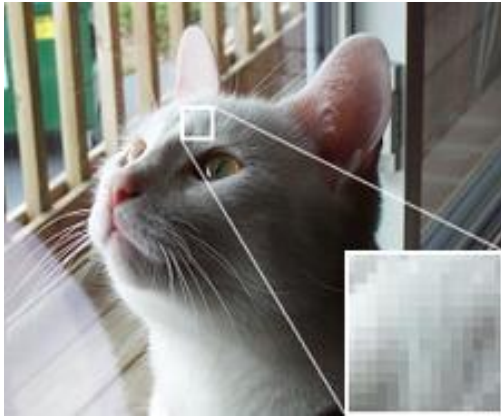
METODE RASTRIRANJA

- študij vpliva rastrske pike (velikosti, oblike ...) na kakovost končne reprodukcije



METODE RASTRIRANJA

ERROR DIFFUSION (raztros napake)



1. original



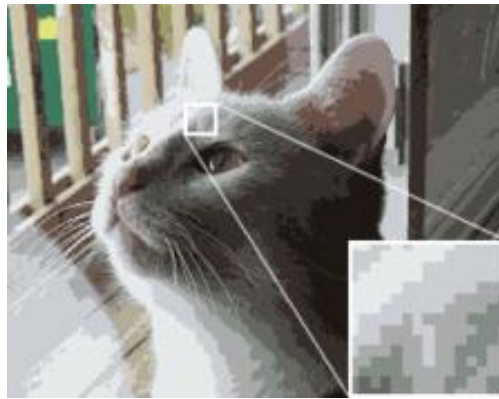
2. Web safe color brez rastriranja



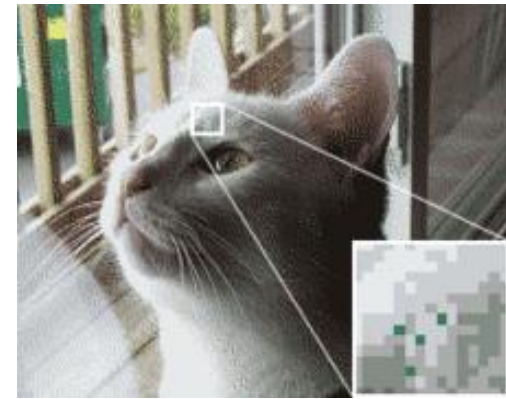
3. enako 2. + Floyd-Steinberg



4. Optimizacija na 256 barv + Floyd-Steinberg dithering.



5. Optimizacija na 16 barv



6. Enako 5. + Floyd-Steinberg dithering.

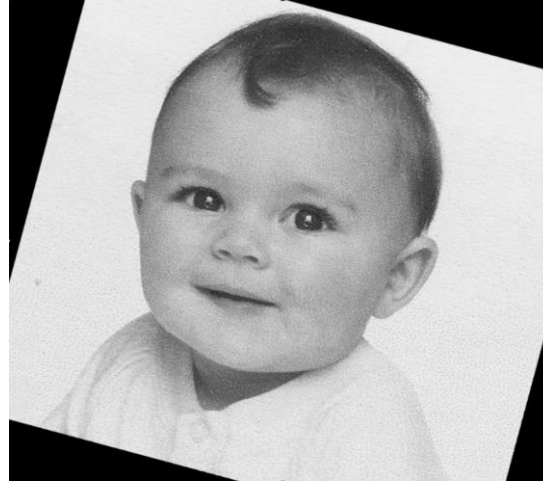
METODE OBJEKTIVNEGA VREDNOTENJA

- kako objektivno (**numerično**) določiti z očesom zaznano razliko med **originalno in reproducirano (rastrirano) sliko**?
- algoritmi rastriranja vnesejo neko napako – t.i. napako (**šum**) kvantizacije (quantization error/noise) > zmanjšanje bitne globine slike npr. iz 8 (256 odtenkov sive) na 1 (binarna slika)



METODE OBJEKTIVNEGA VREDNOTENJA

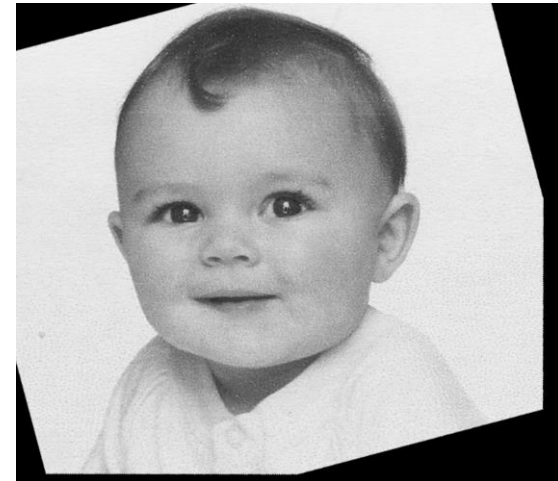
- REGISTRACIJA SLIK



Izvorna slika (Source): deformirana (zamik, rotacija)



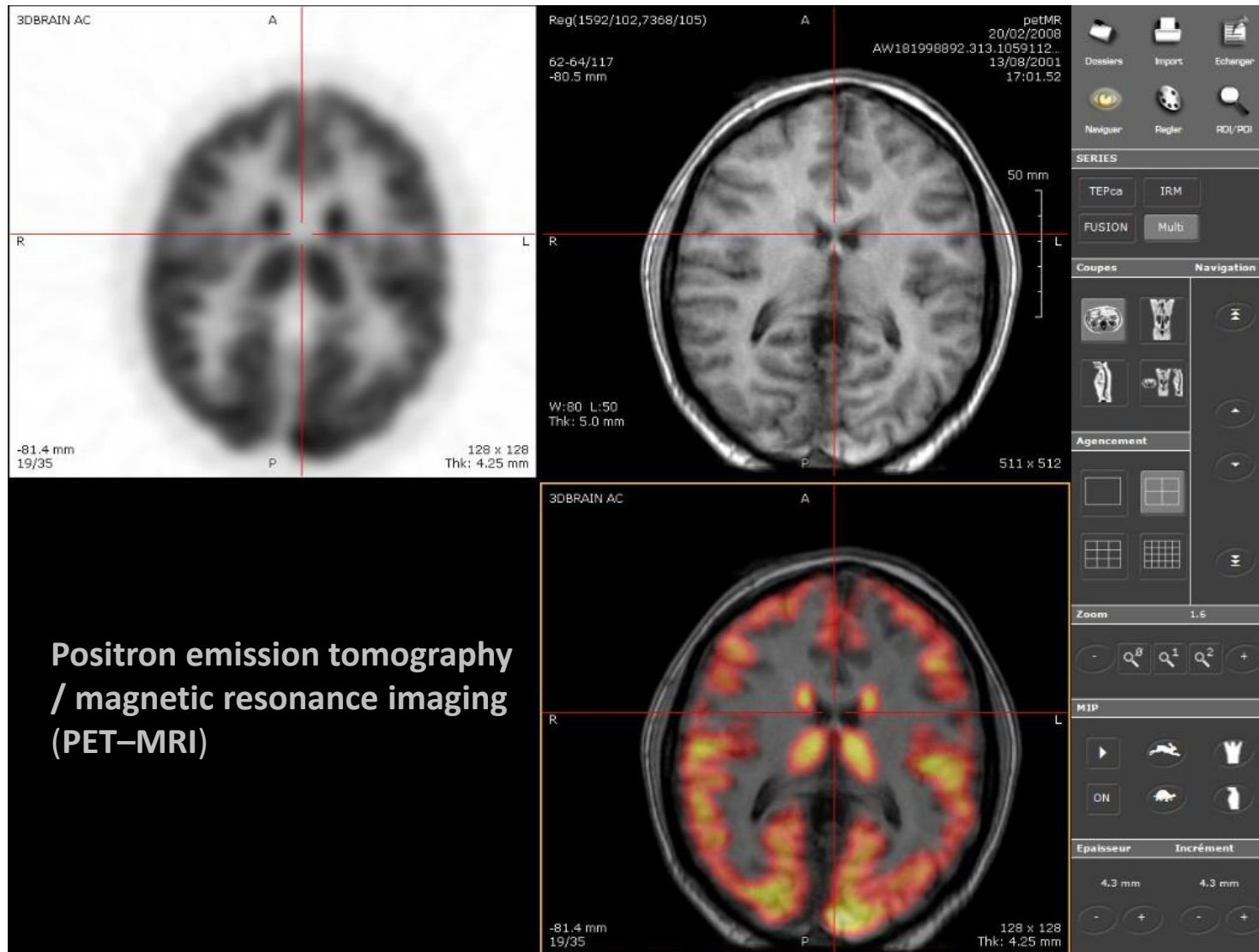
Ciljna slika, original (Target)



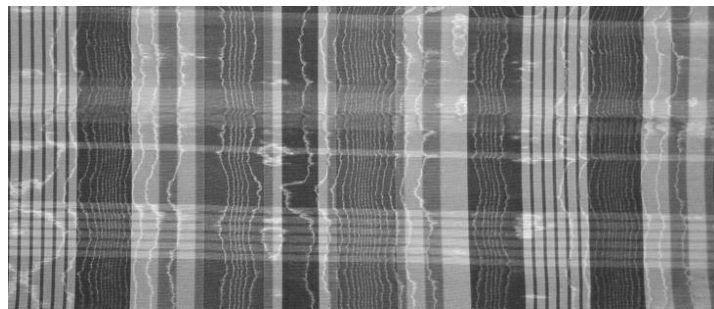
Registrirana slika

METODE OBJEKTIVNEGA VREDNOTENJA

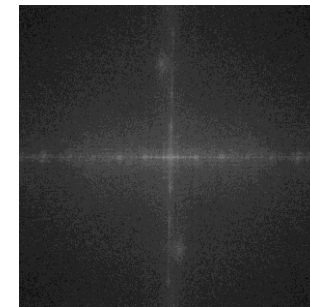
- REGISTRACIJA SLIK



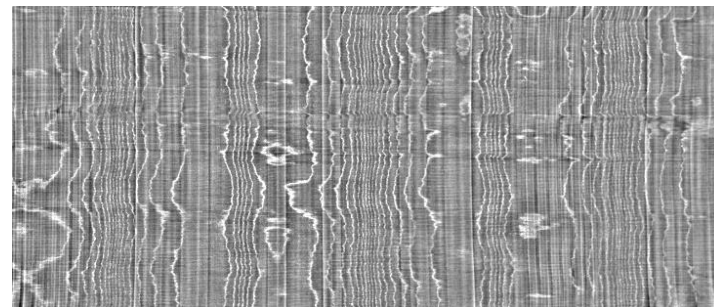
SLIKOVNE TRANSFORMACIJE



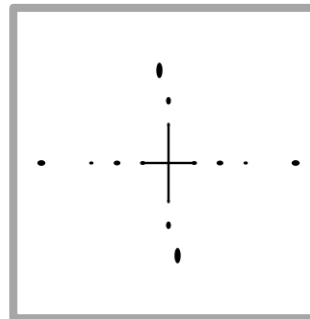
originalna slika



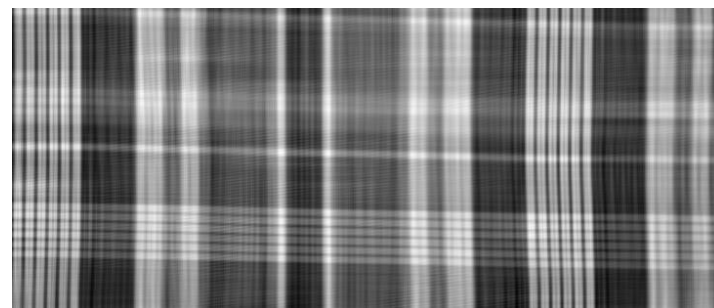
FFT



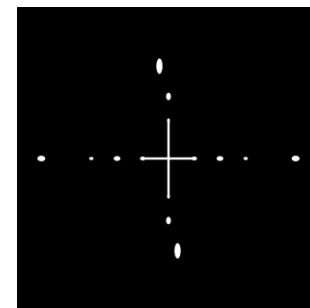
šum „moire“



bela maska



očiščena slika



črna maska

3D-TISK

