

Steganografija i vizualizacija informacija kroz perspektivu obradbe slike i računalne grafike

Doc. dr. sc. Hrvoje Kalinić

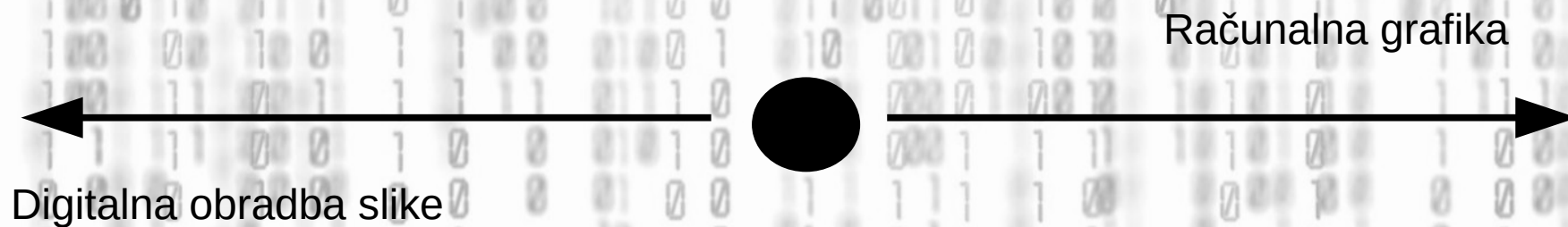
Sadržaj

- Digitalna obradba slike
- Steganografija
- Vizualizacija informacija

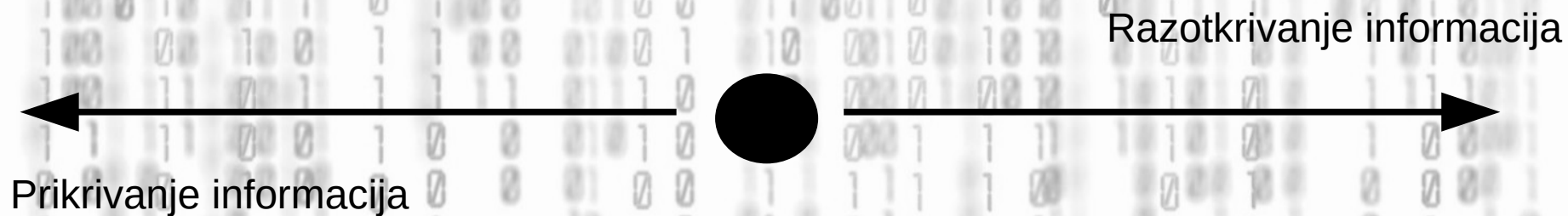
Sadržaj

- Digitalna obradba slike
- Steganografija
- Vizualizacija informacija

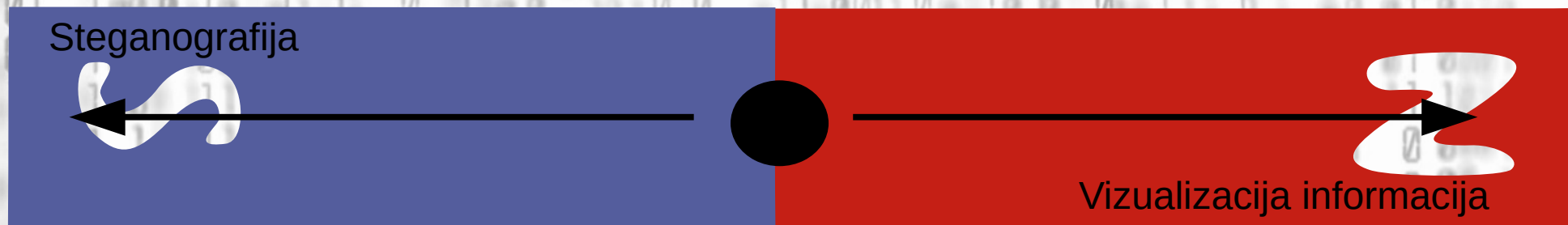
Digitalna obradba slike vs. Računalna grafika



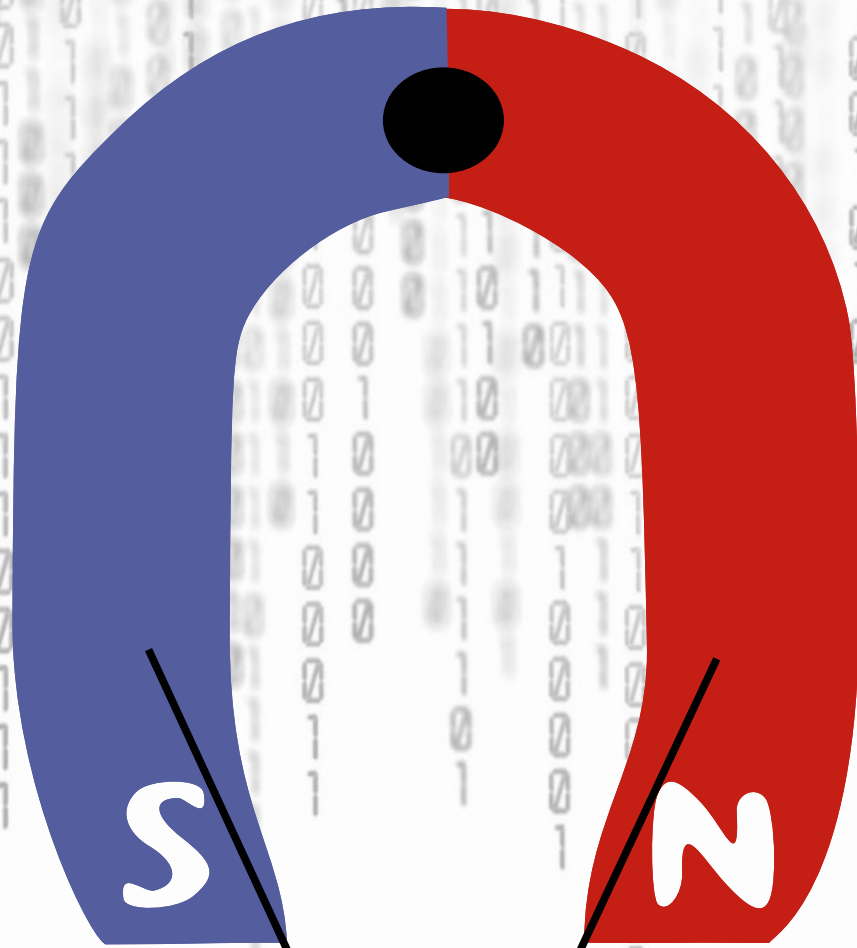
Digitalna obradba slike



Digitalna obradba slike



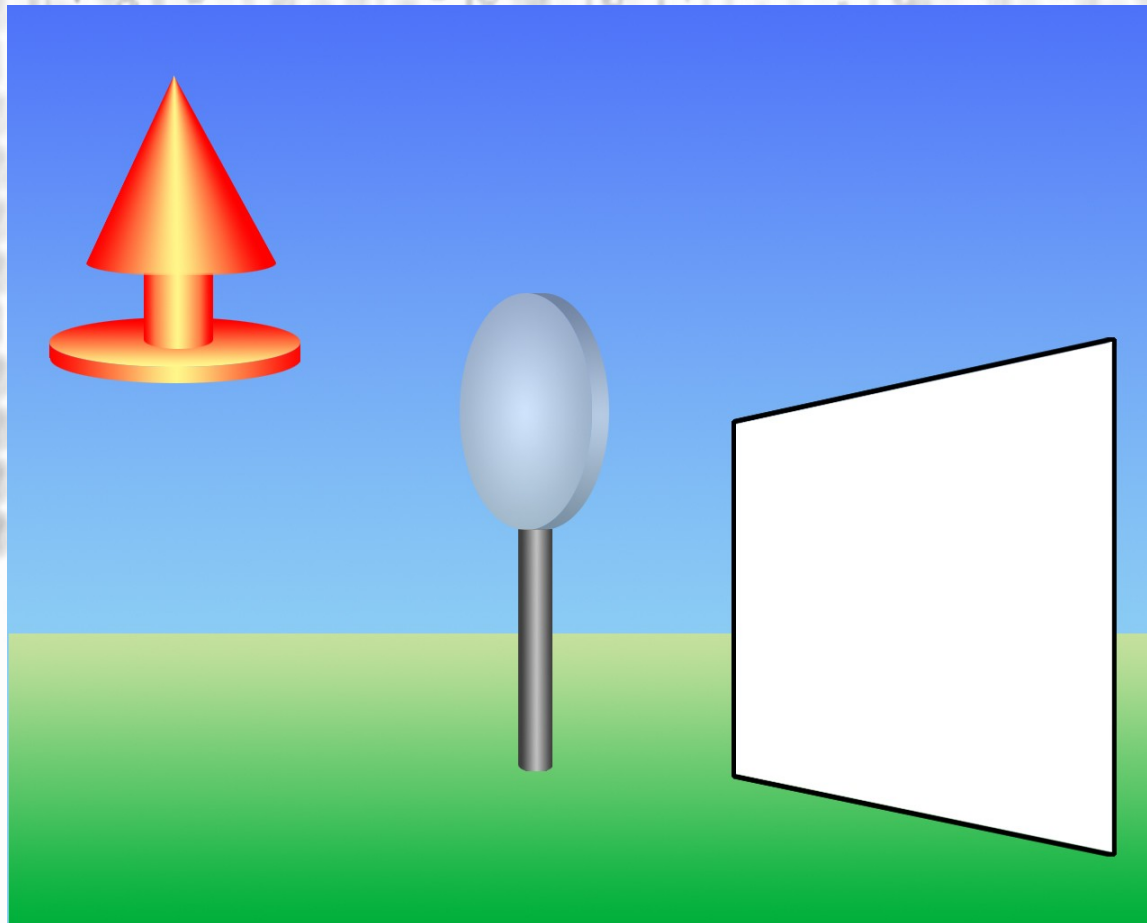
Digitalna obradba slike



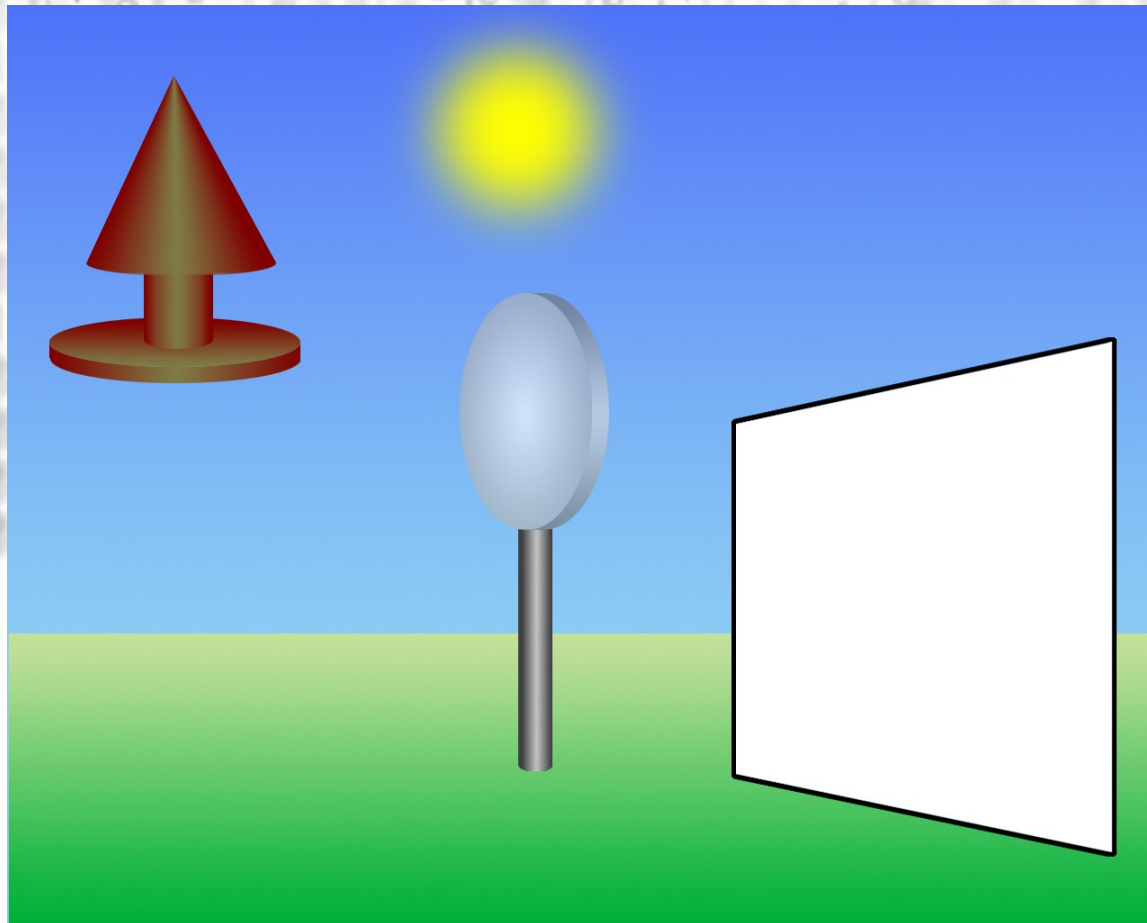
Steganografija

Vizualizacija informacija

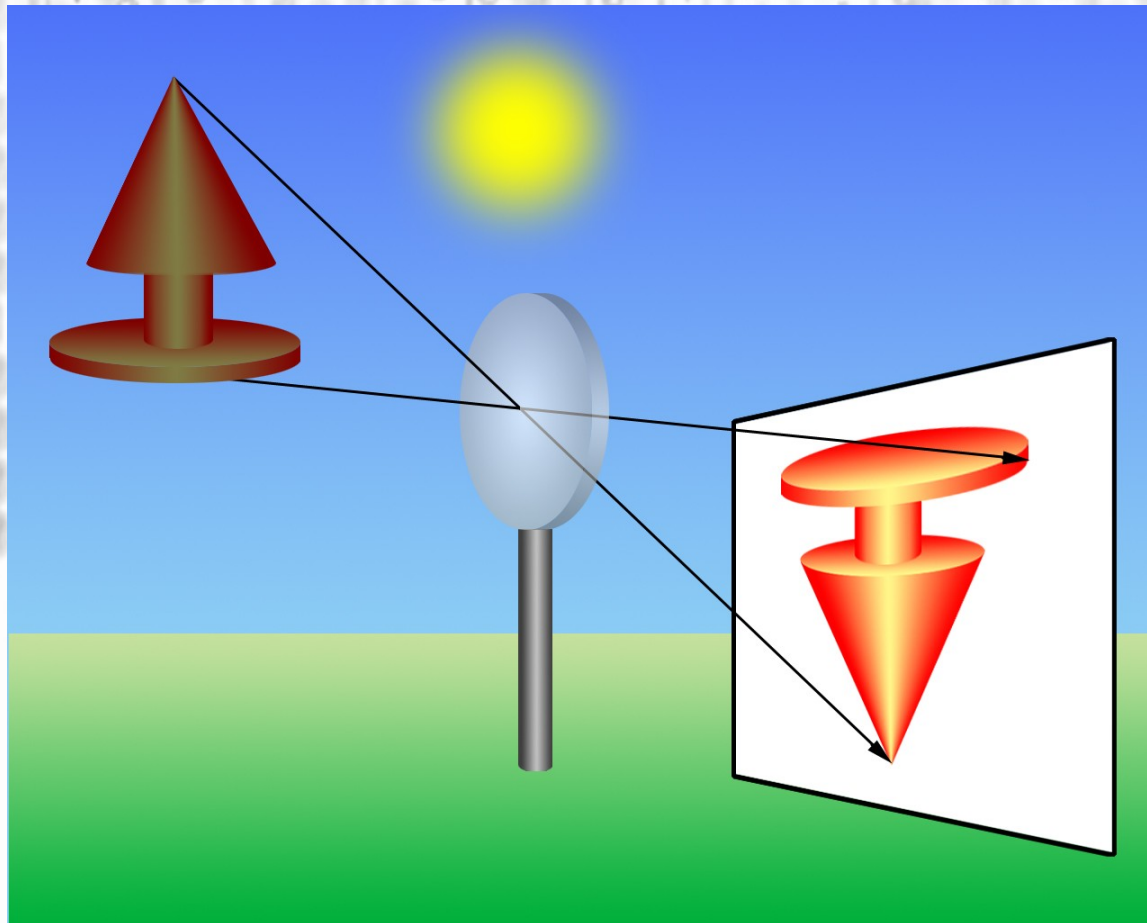
Formiranje slike



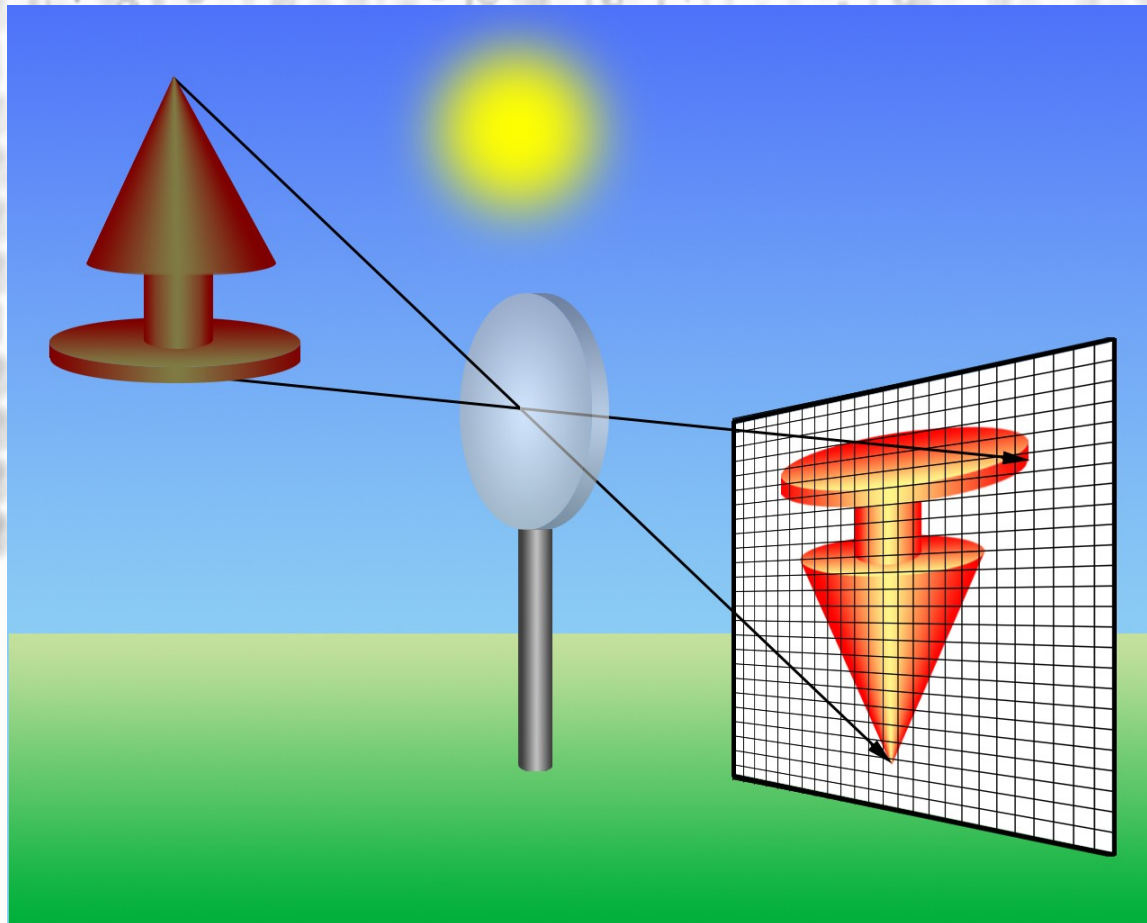
Formiranje slike



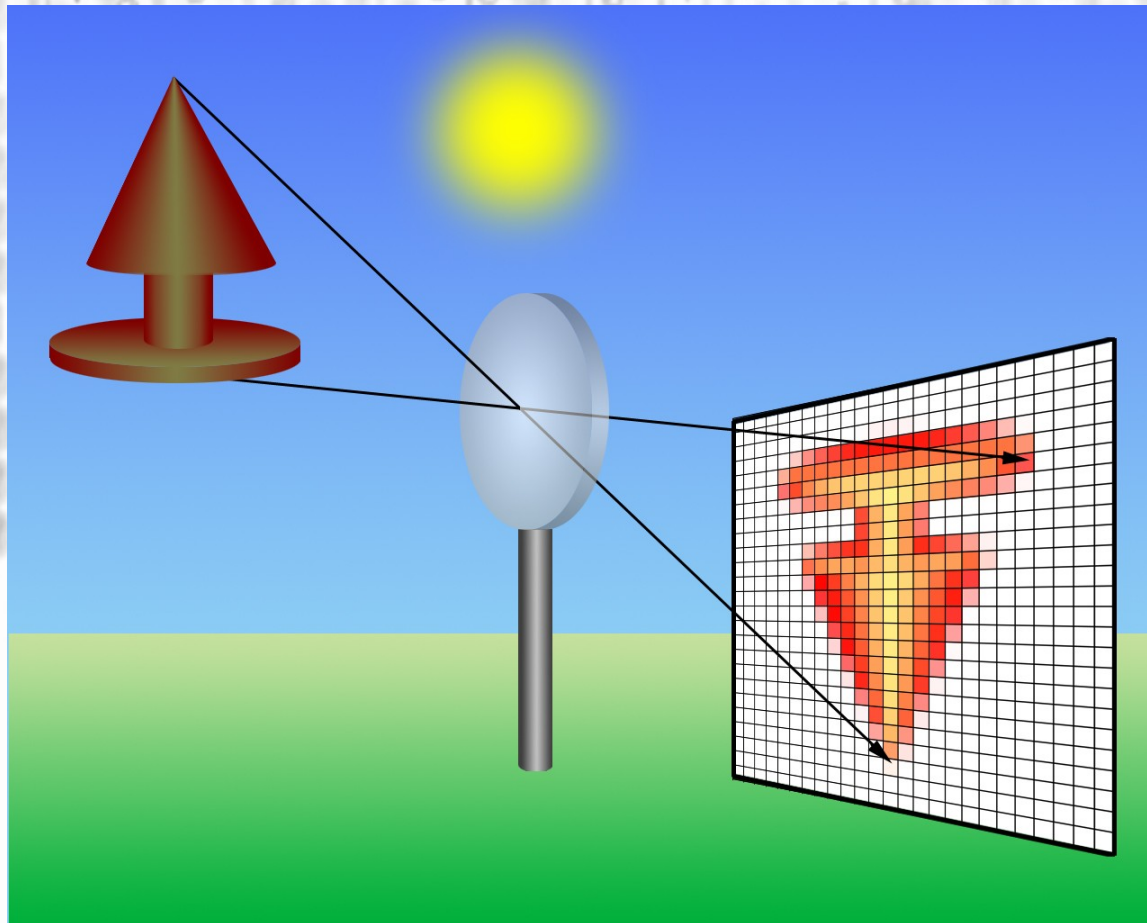
Formiranje slike



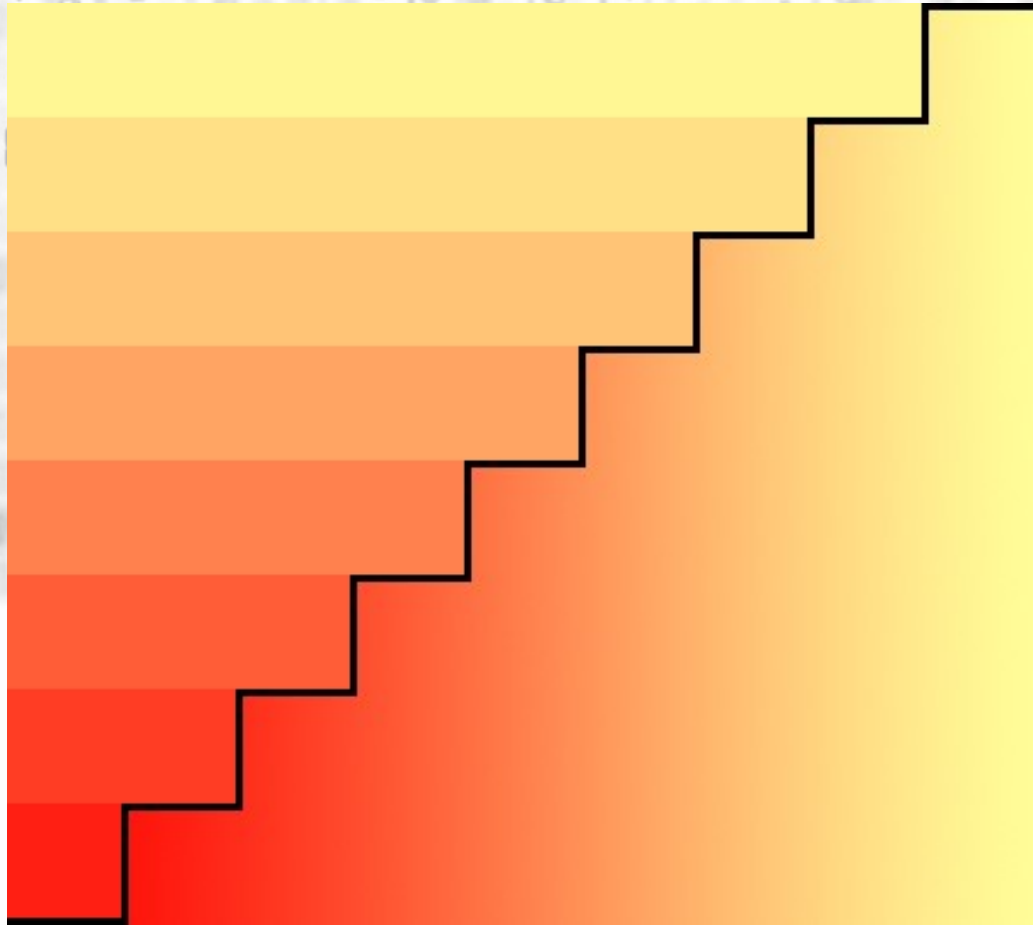
Formiranje slike



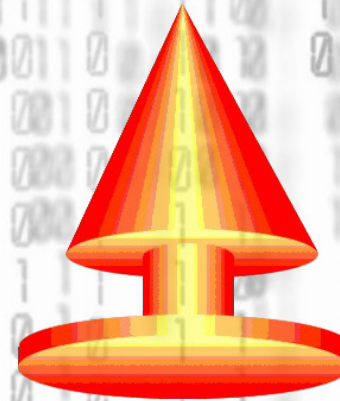
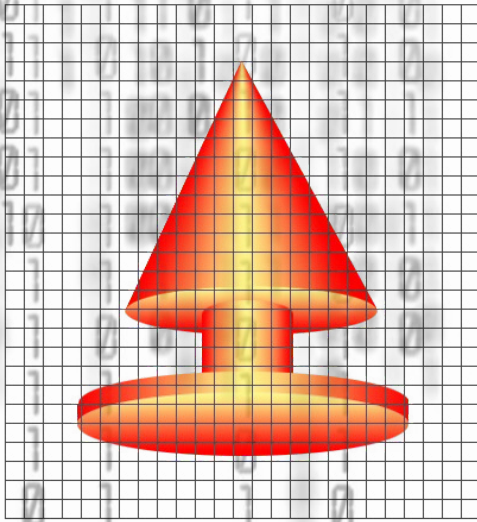
Formiranje slike



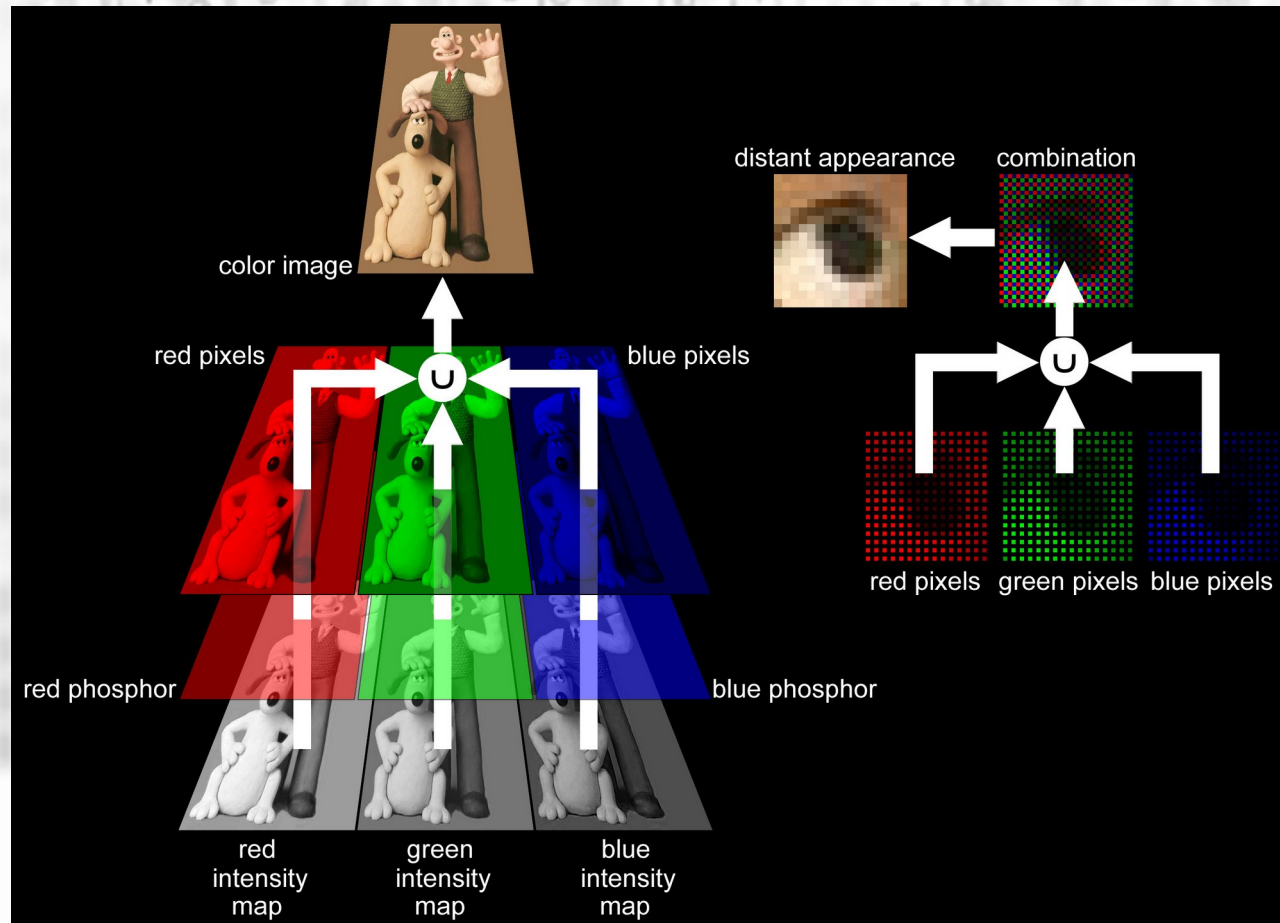
Kvantizacija



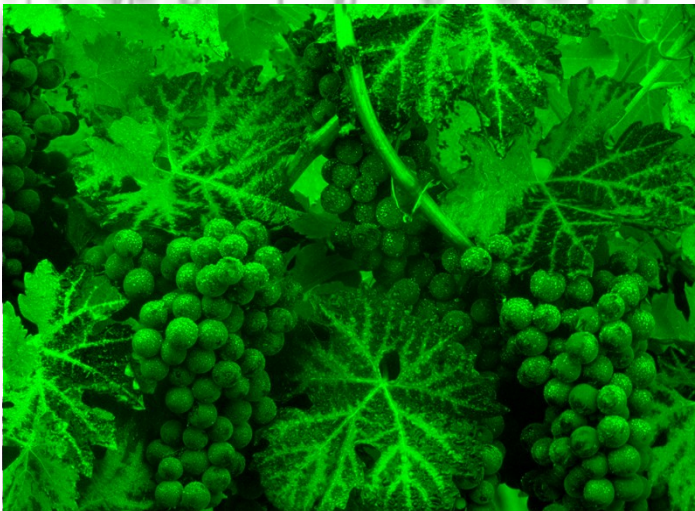
Kvantizacija



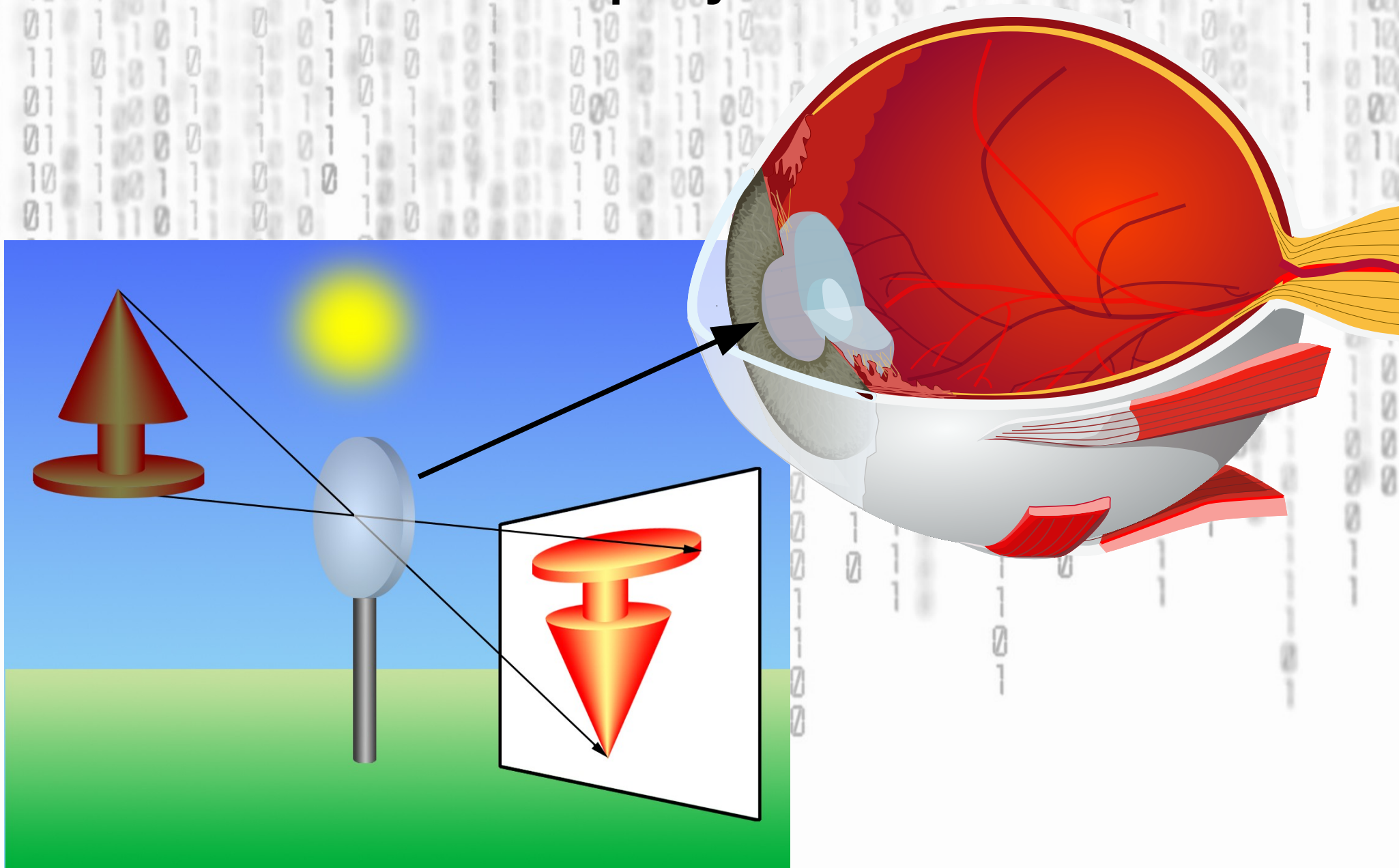
Formiranje RGB slike

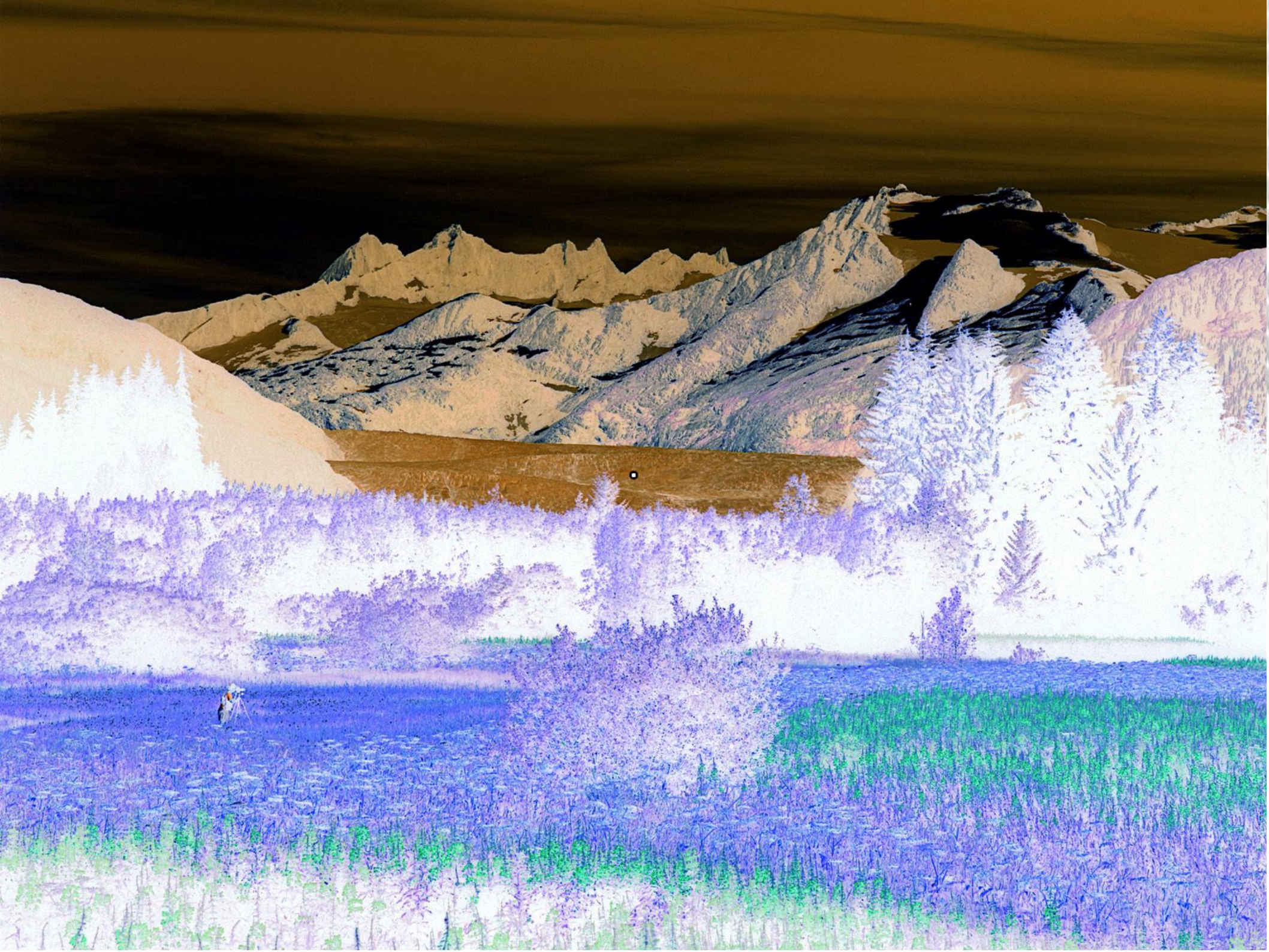


Zapis RGB slike



Percepcija slike

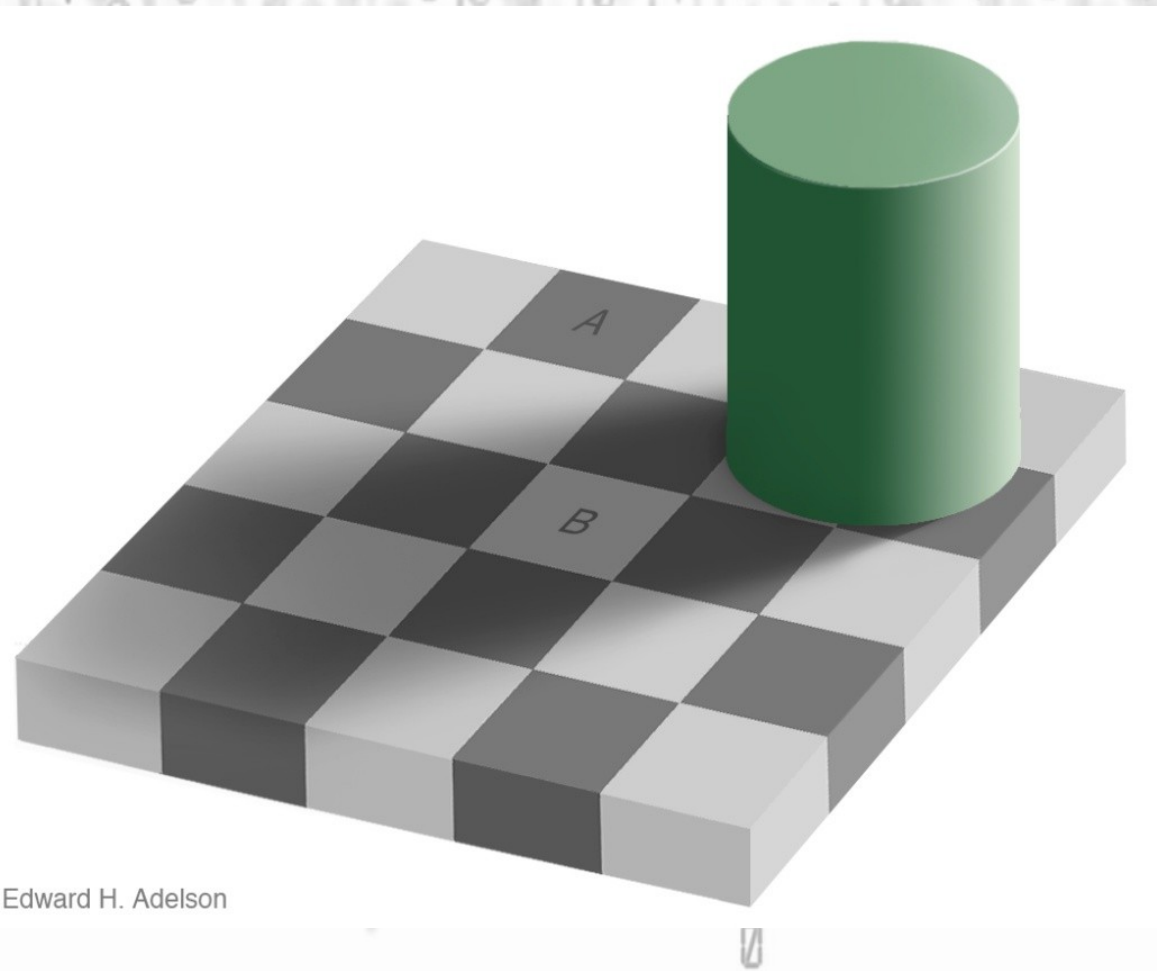






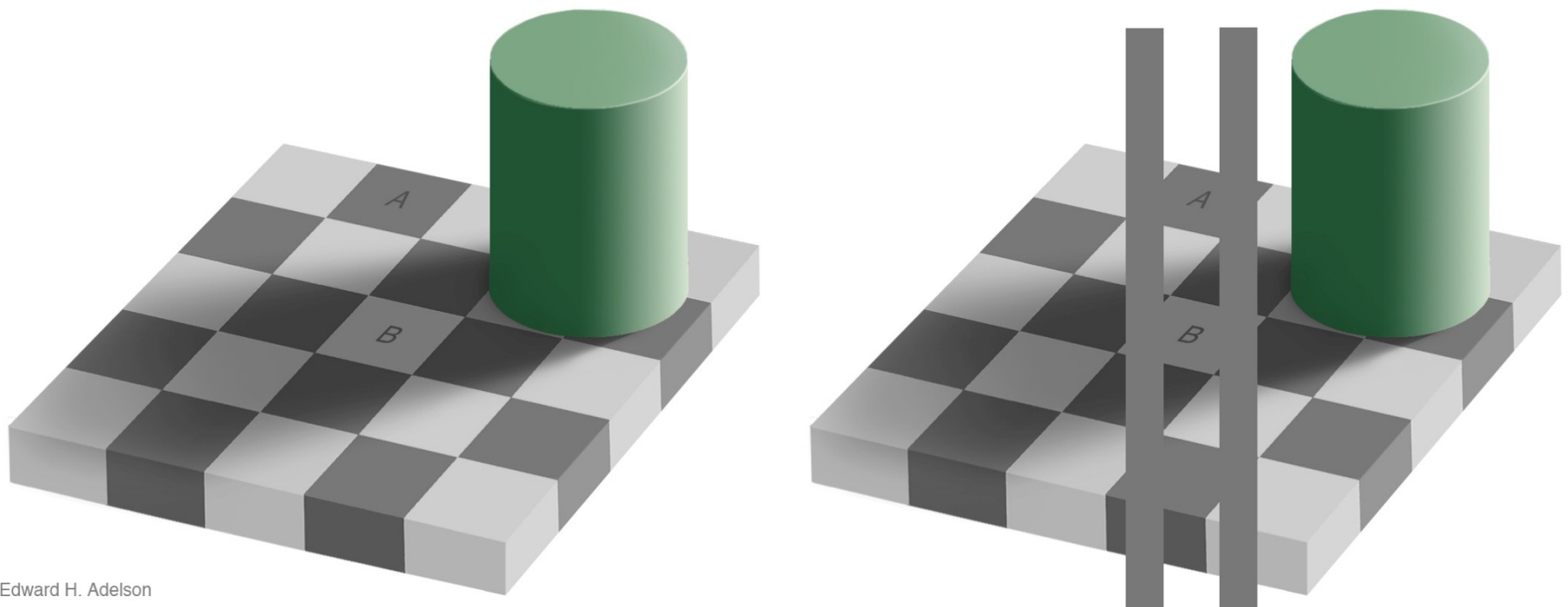


Percepcija boje



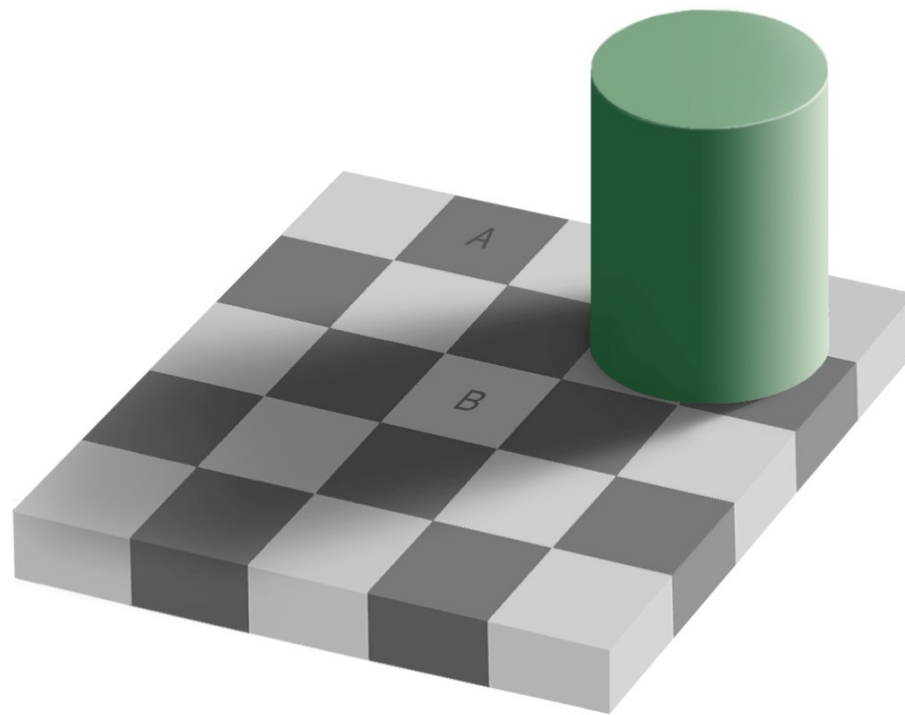
Edward H. Adelson

Percepcija boje

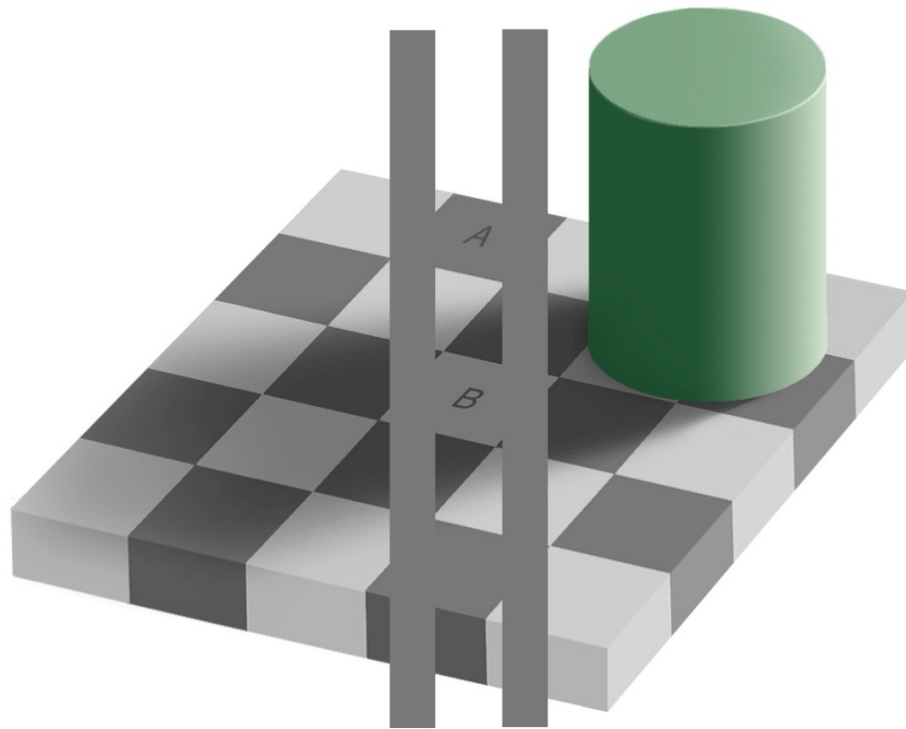


Edward H. Adelson

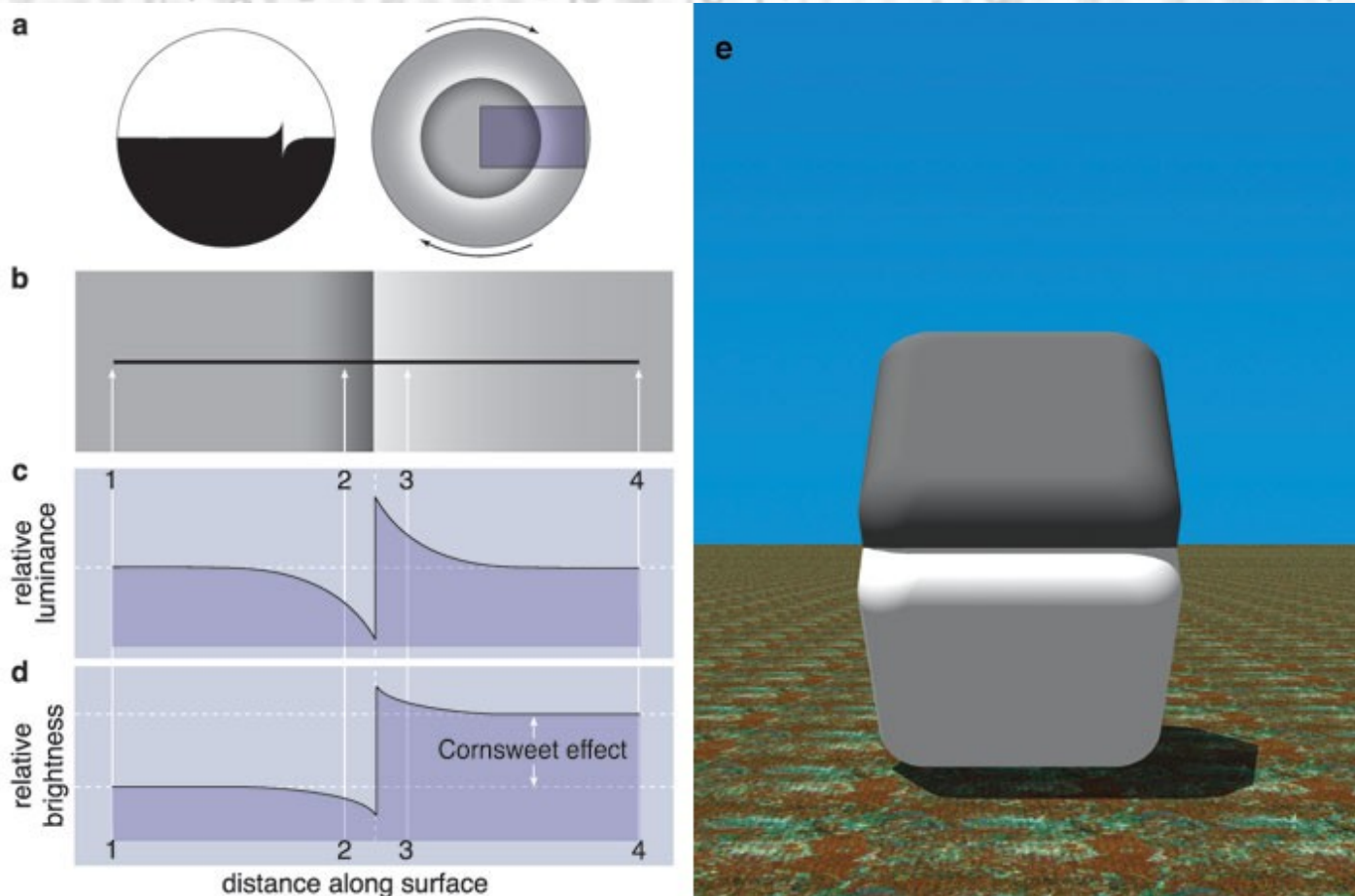
Percepcija boje



Percepcija boje



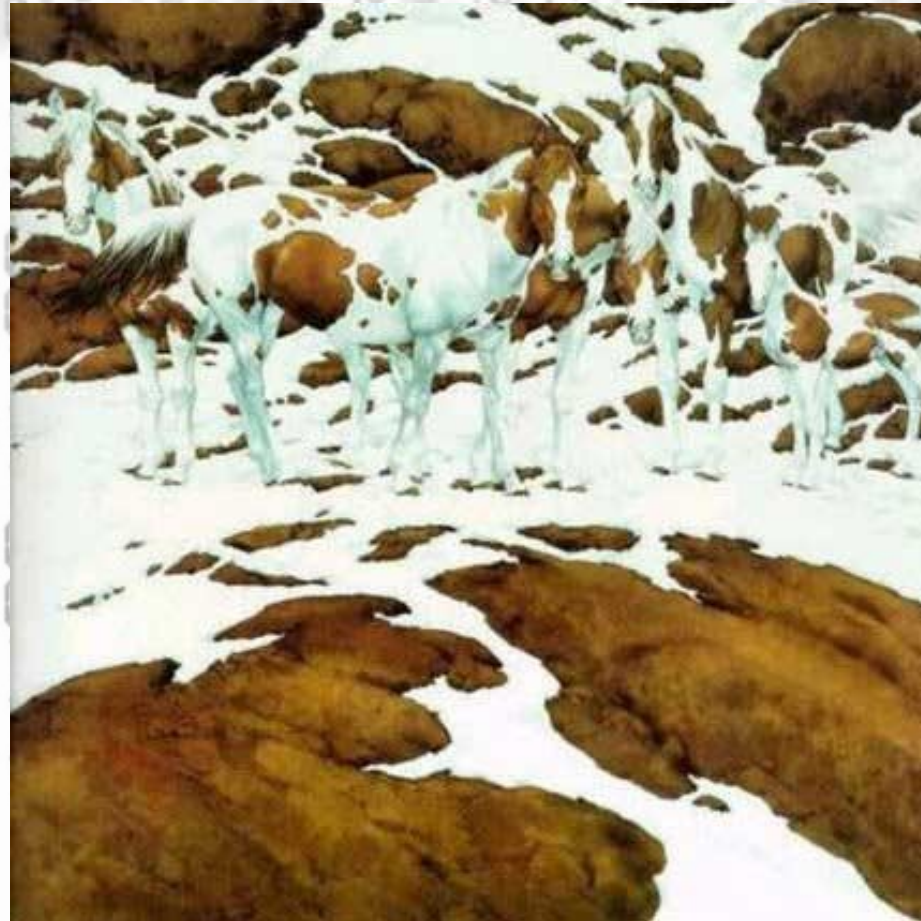
Percepcija boje



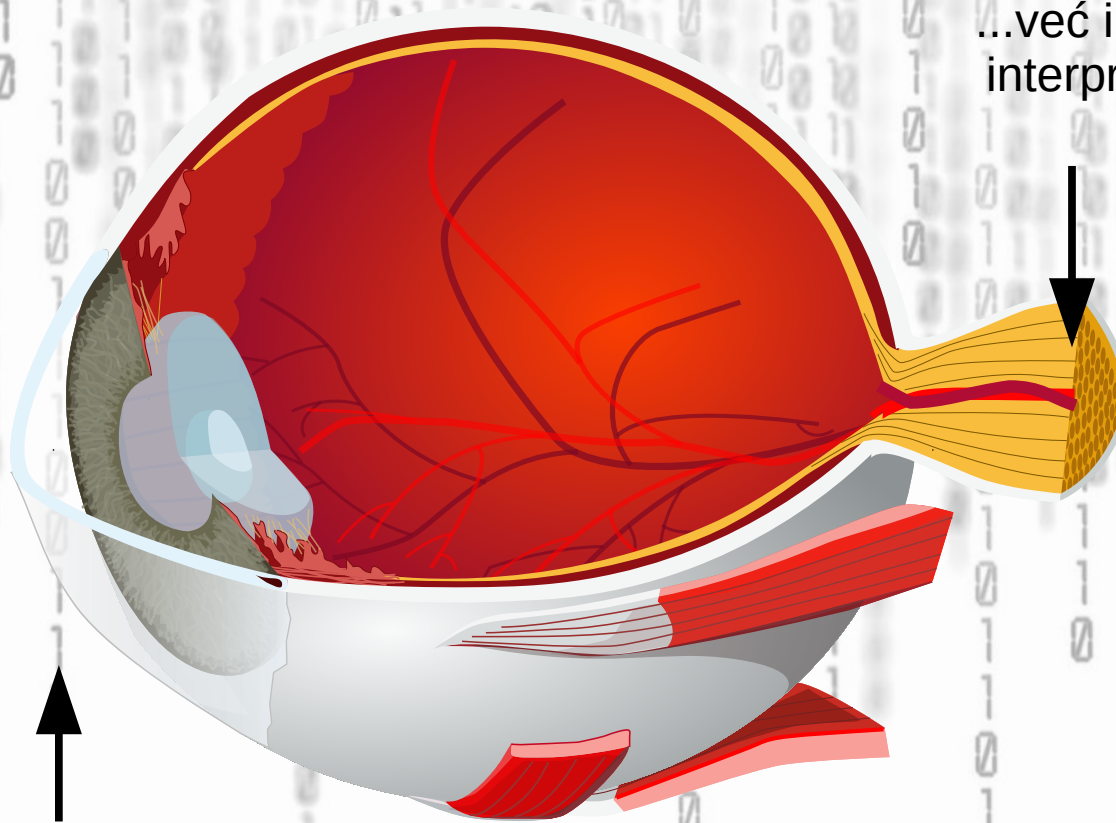
Percepcija oblika



Percepcija oblika



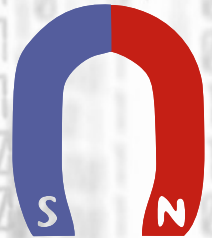
Percepcija



Ne samo kako
sliku vidimo...



...već i kako ju
interpretiramo



Sadržaj

- Digitalna obrada slike
- Steganografija
- Vizualizacija informacija

Steganografija

- steganos (starogrč. στεγανός) – zaštićeno, skriveno
- graphein (starogrč. γράφειν) – pisanje
- "metaenkripcija" – skrivanje slanja poruke, a ne samo sadržaja poruke
- Najstariji pisani primjer
 - Herodot 5. stoljeće prije Krista

Steganografija

- Obavijest o Perzijskom napadu donosi Histijsov rob



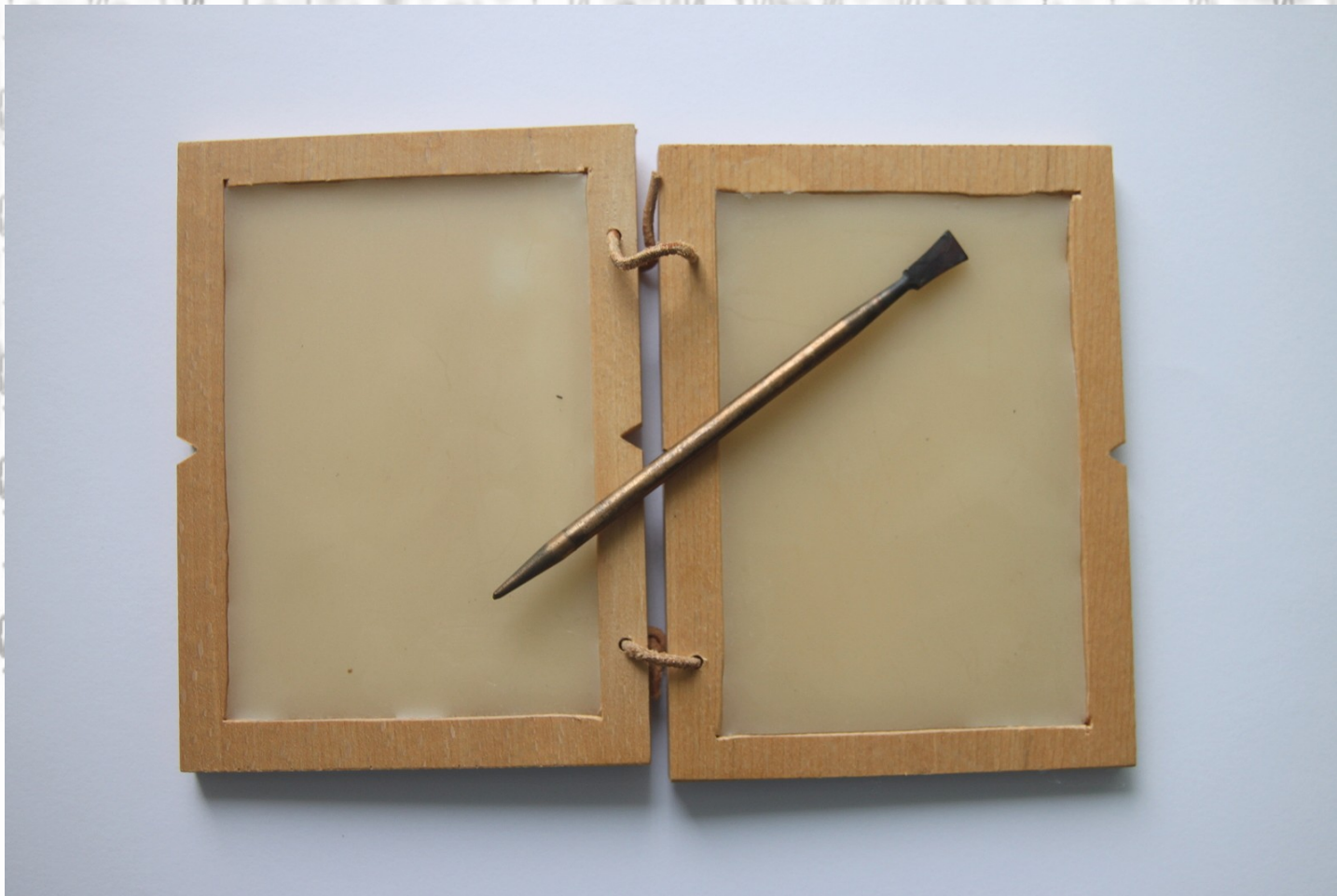
Steganografija

- Obavijest o Perzijskom napadu donosi Histiusov rob



Steganografija

- Vjerojatno starije metode



Steganografija

- Nevidljiva tinta
- Poruke iza poštanskih marki
- Rese Morseovog koda
- Mikrotočke
- Doll Woman (Velvalee Dickinson)

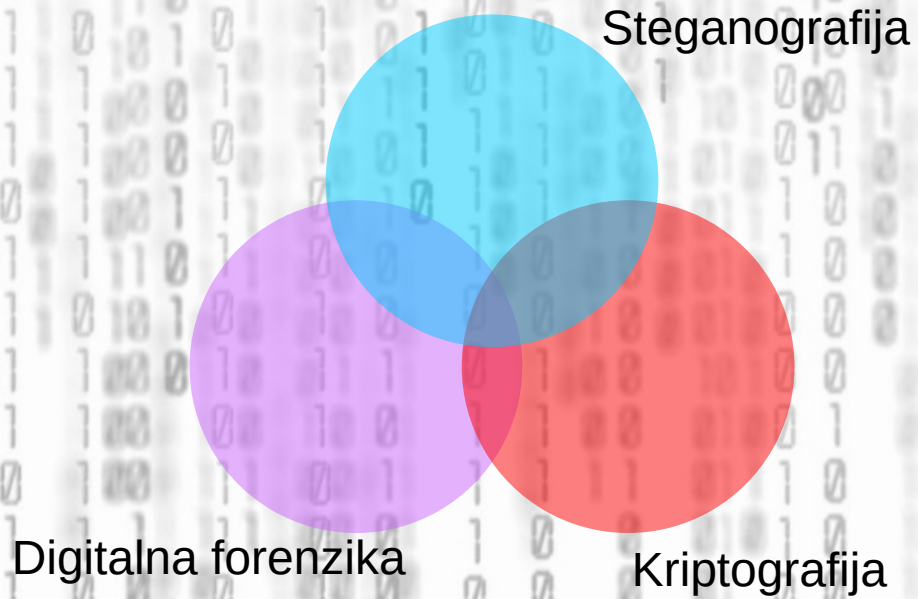
Steganografija

- Mikrotočke

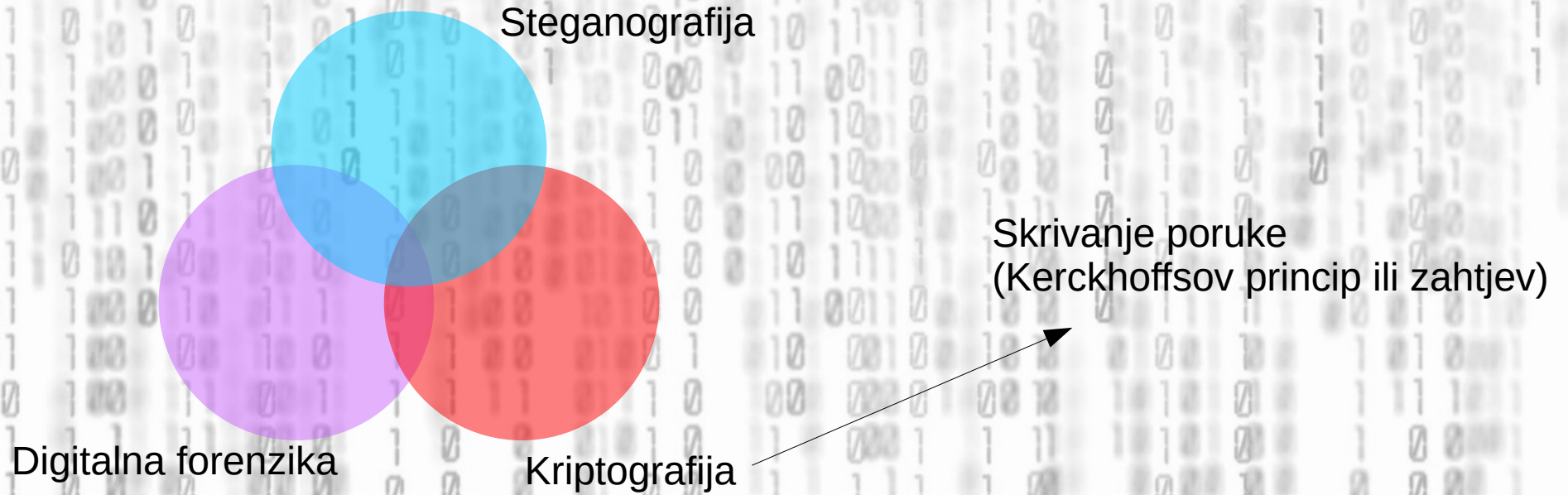


PORUKE OD
NOVINSKI H
SLOVA

Steganografija



Steganografija



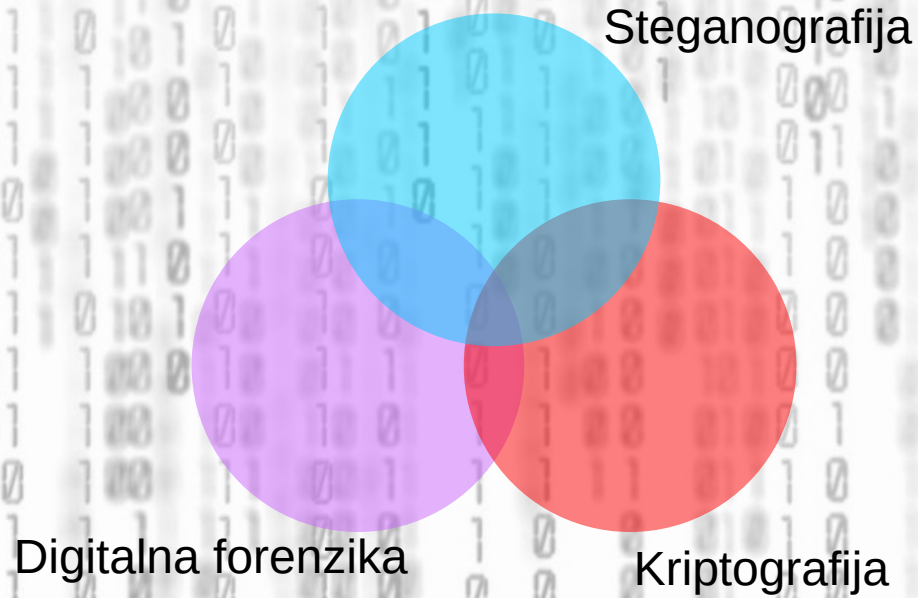
Steganografija

Skrivanje poruke
(Kerckhoffsov princip ili zahtjev)

Digitalna forenzika

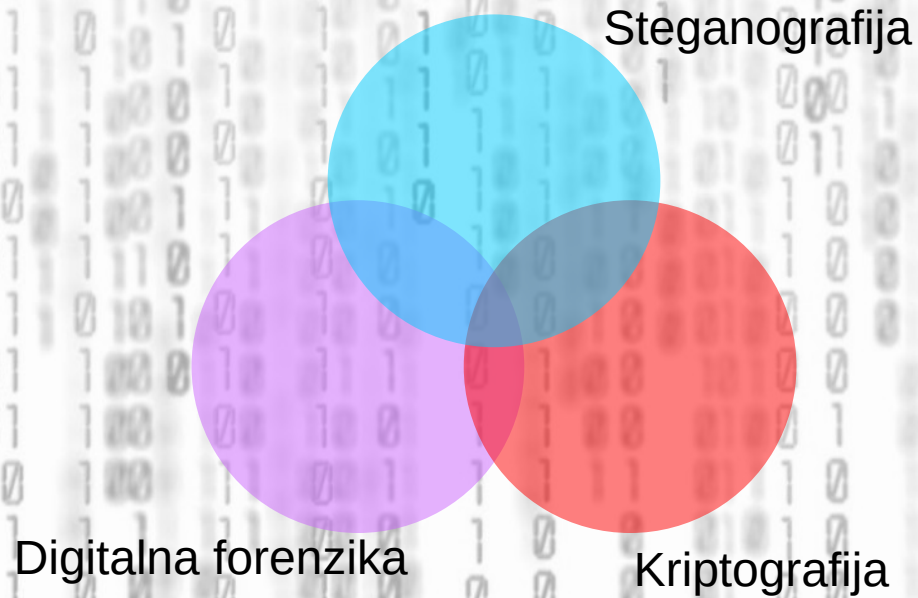
Kriptografija

Steganografija



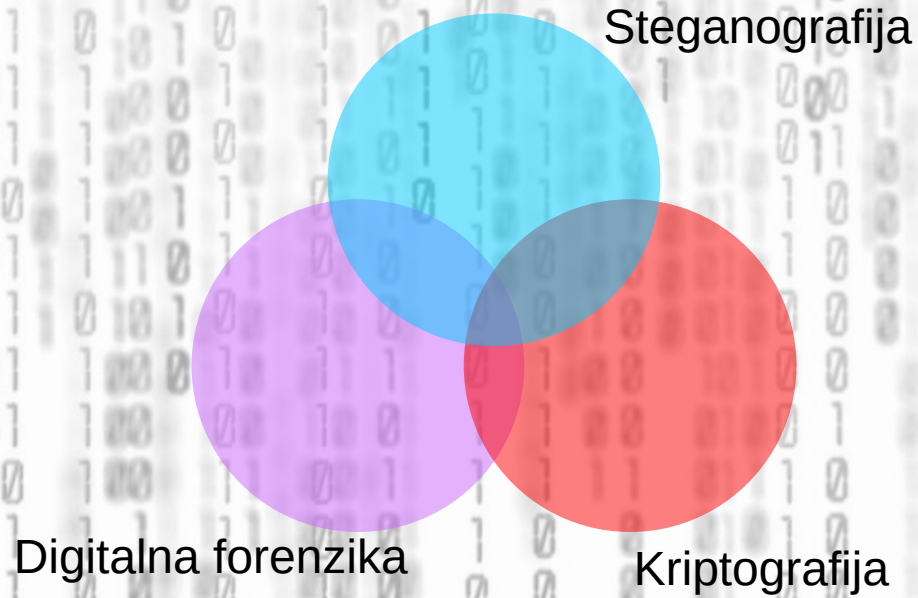
- Jesu li slike koje promatramo stvarne?

Steganografija



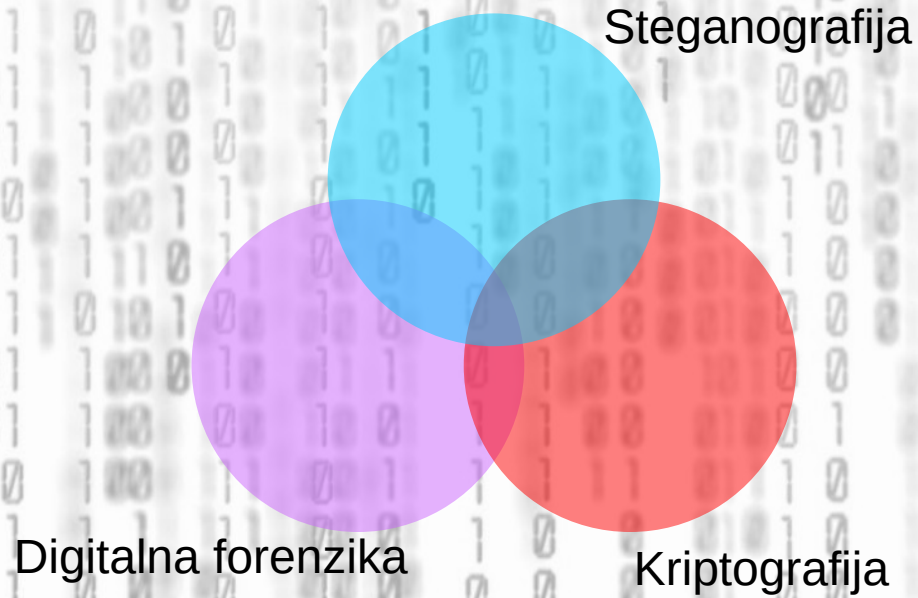
- Jesu li slike koje promatramo stvarne?
- Jesu li umjetno izmijenjene?

Steganografija



- Jesu li slike koje promatramo stvarne?
- Jesu li umjetno izmijenjene?
- Sadrže li skrivenu poruku?

Steganografija



- Jesu li slike koje promatramo stvarne?
 - Jesu li umjetno izmijenjene?
 - Sadrže li skrivenu poruku?
-
- Steganaliza

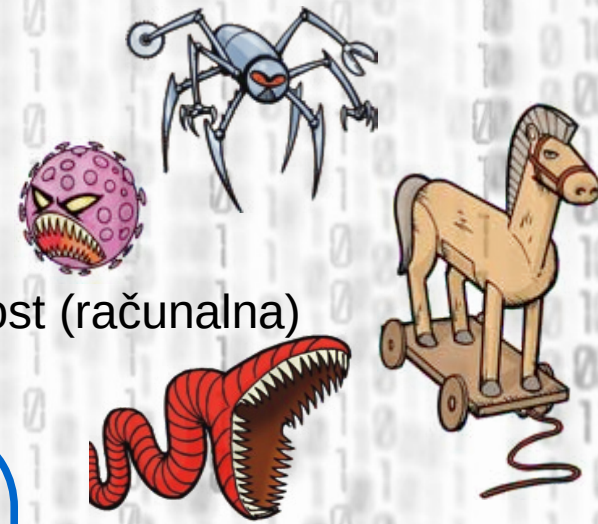


Steganografija

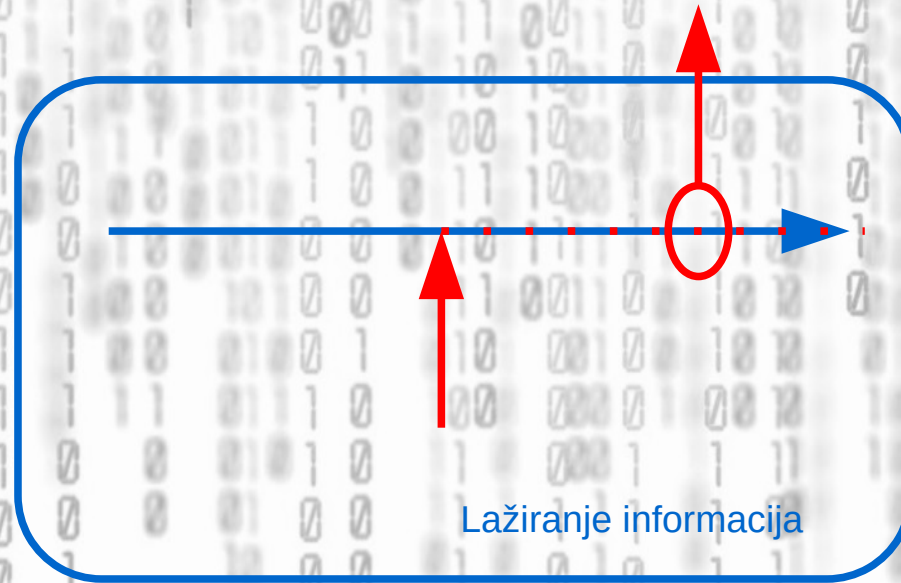


Lažiranje informacija

Steganografija



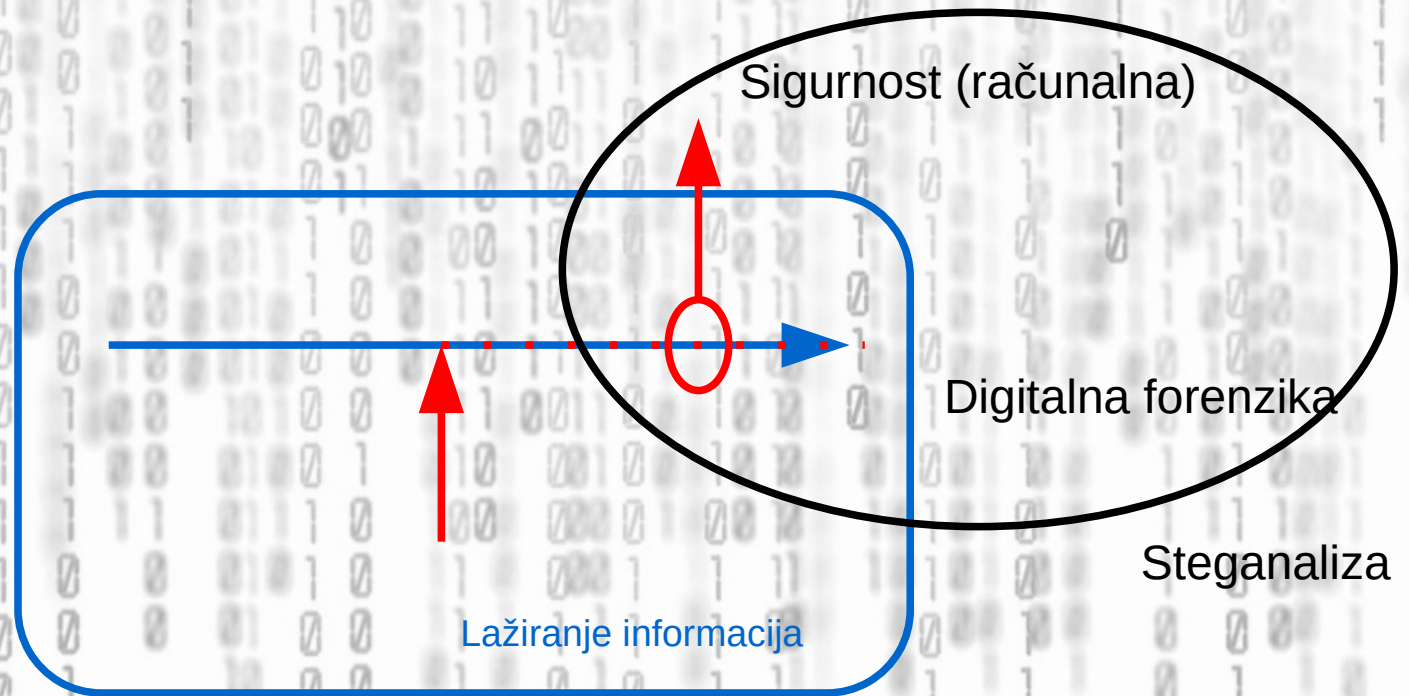
Sigurnost (računalna)



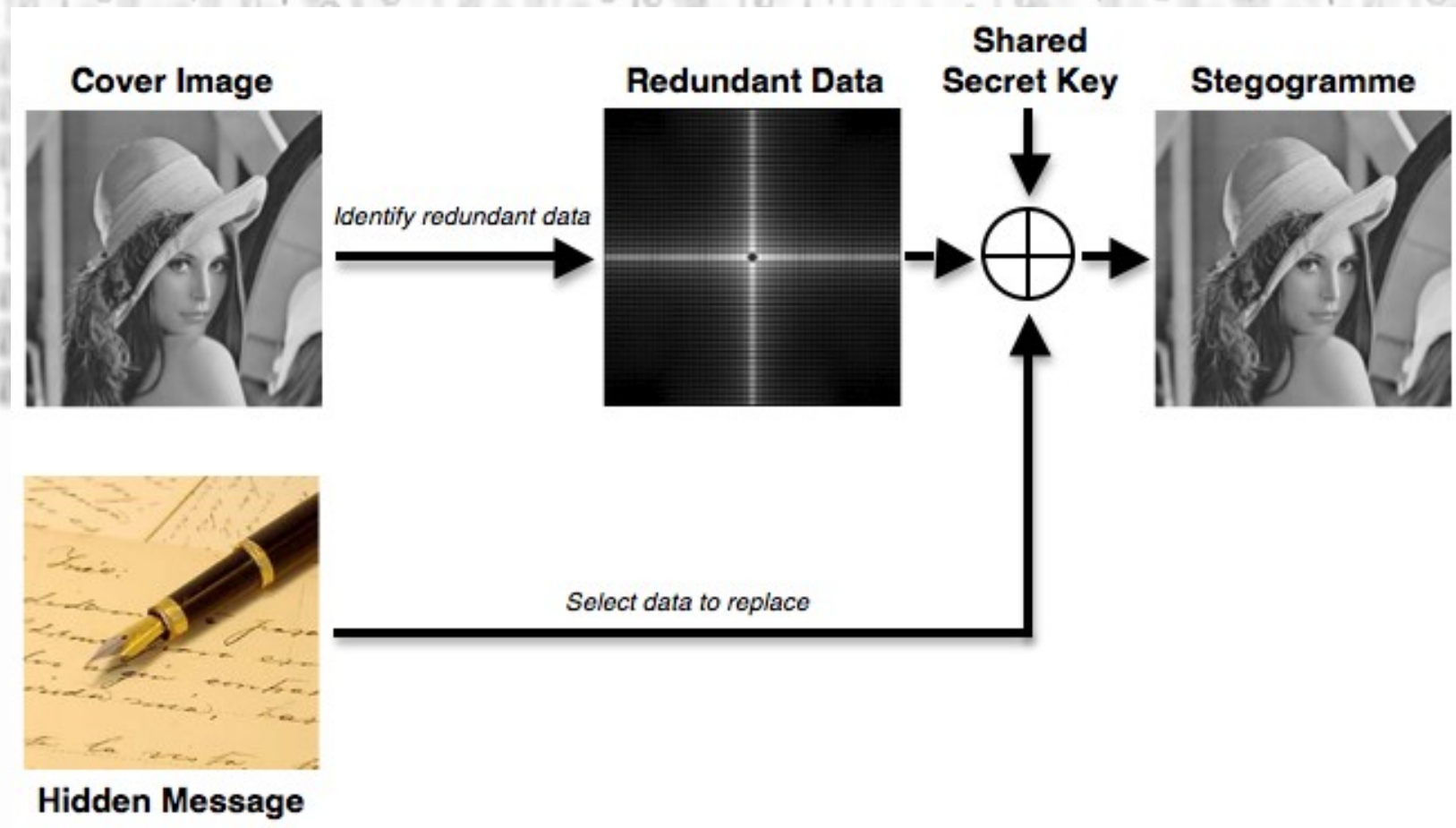
Lažiranje informacija

Digitalna forenzika

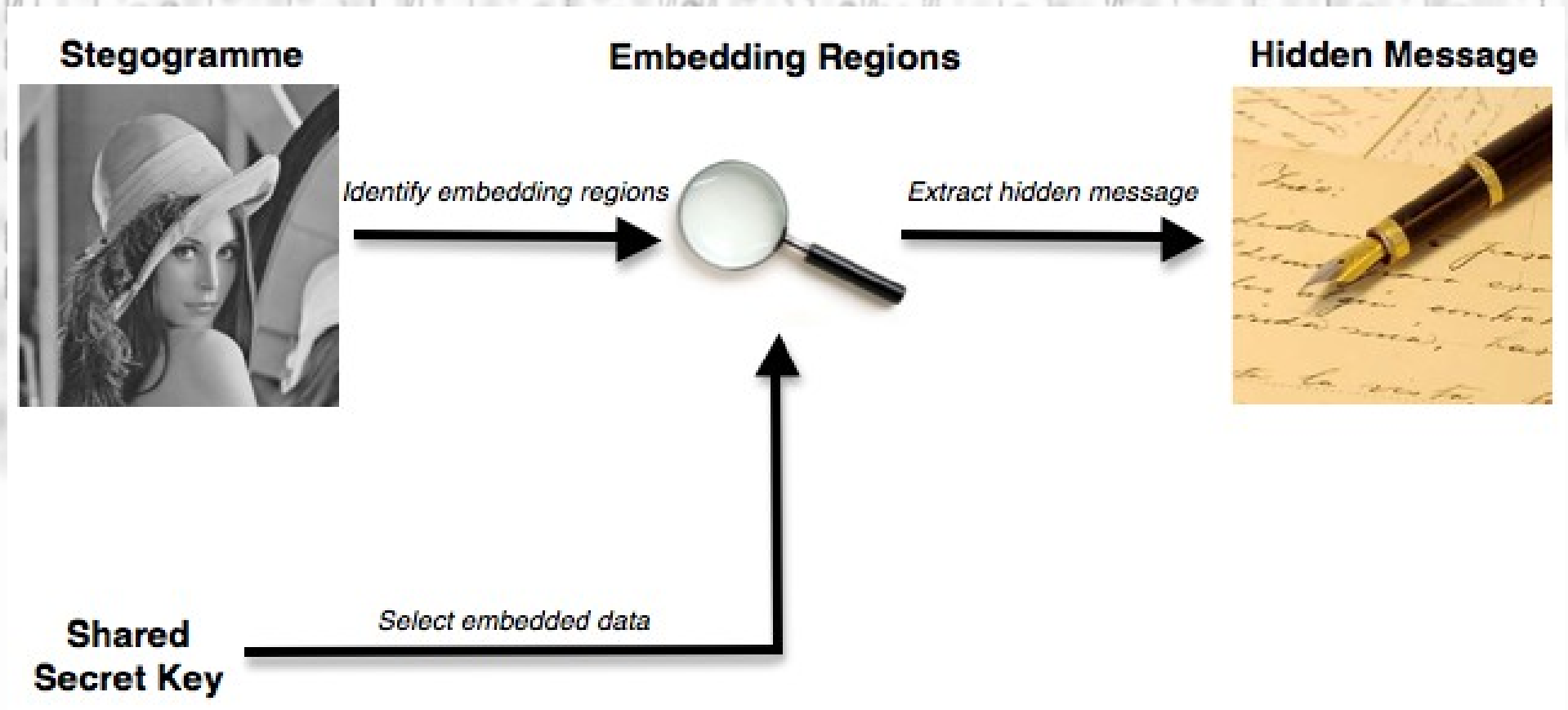
Steganografija



Steganografija - primjeri



Steganografija - primjeri





Slika (svih 8 ploha)



Ploha bita 8



Ploha bita 7



Ploha bita 6

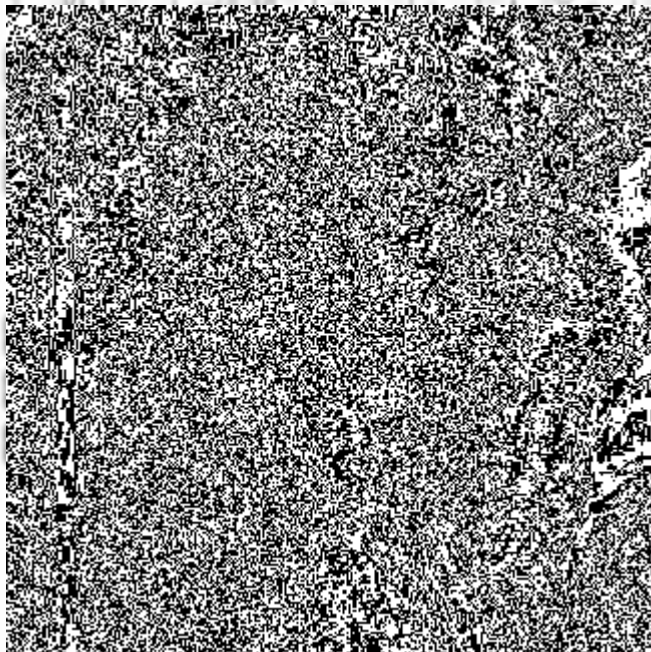


Ploha bita 5

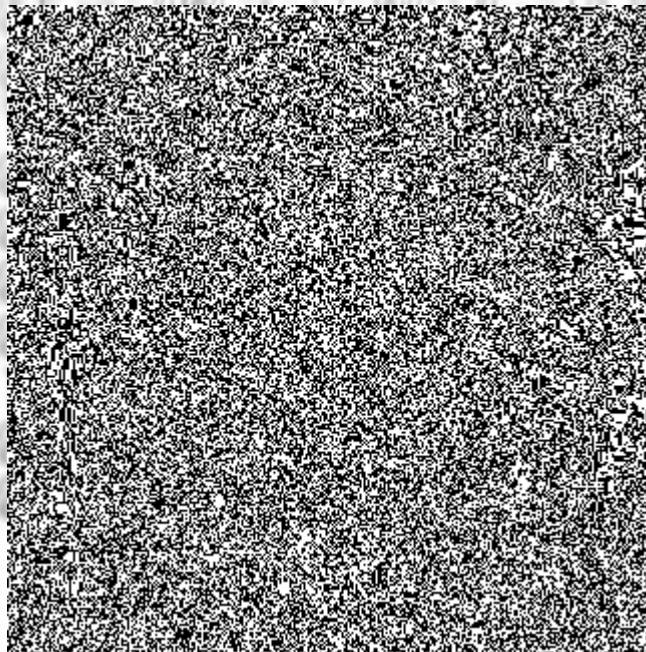


Ploha bita 4

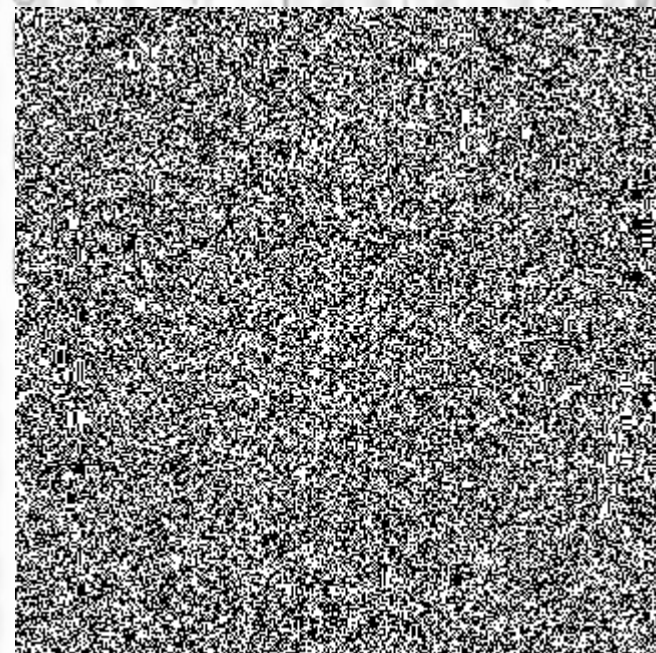
Steganografija - primjeri



Ploha bita 3



Ploha bita 2



Ploha bita 1

Steganografija - primjeri



Originalna slika



Skrivena slika

Steganografija - primjeri

- LSB pakiranje
 - Prostorna domena
 - Frekvencijska domena (JPEG)

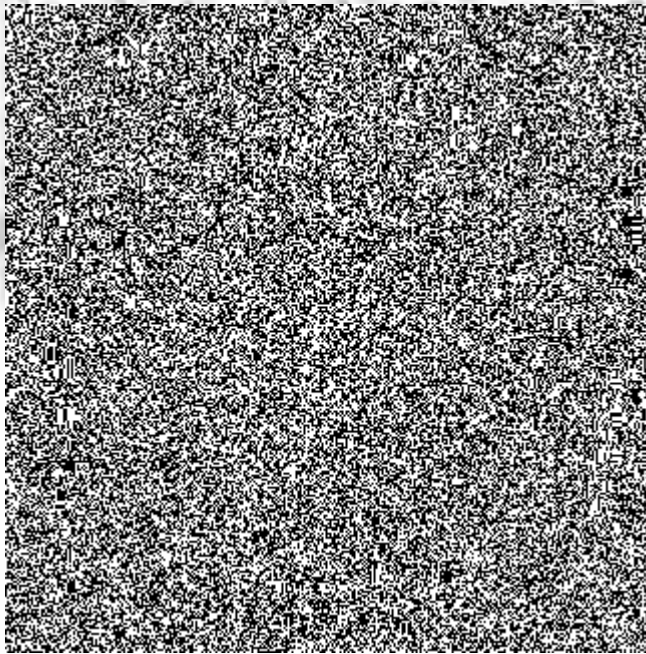
Steganografija - primjeri

- LSB pakiranje
 - Prostorna domena
 - Frekvencijska domena (JPEG)

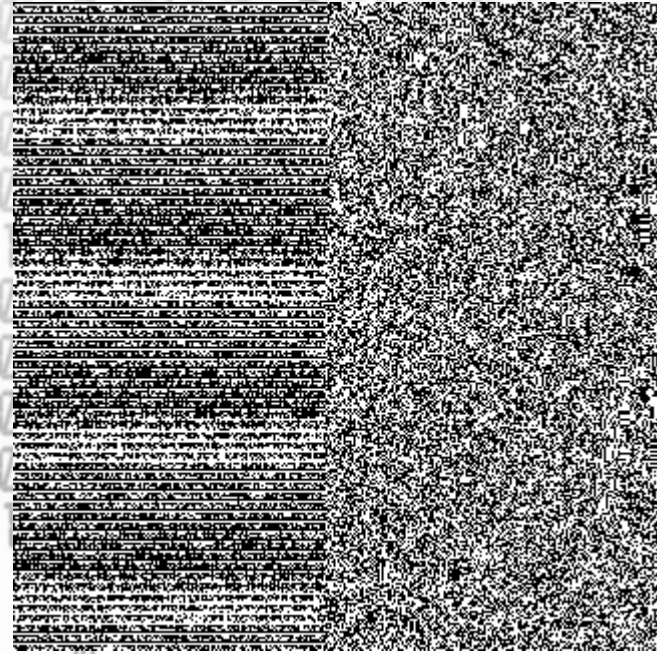


Steganografija - primjeri

- Steganaliza
 - Vizualni napadi na steganografiju



Ploha X



Sumnjiva ploha

Sadržaj

- Digitalna obrada slike
- Steganografija
- Vizualizacija informacija

Vizualizacija informacija

- Segmentacija
 - Raspoznavanje uzoraka
- Superpozicija
- Atlasi
- Slojevi
- Vizualizacija apstraktnih informacija
- Vizualizacija multidimenzionalnog prostora

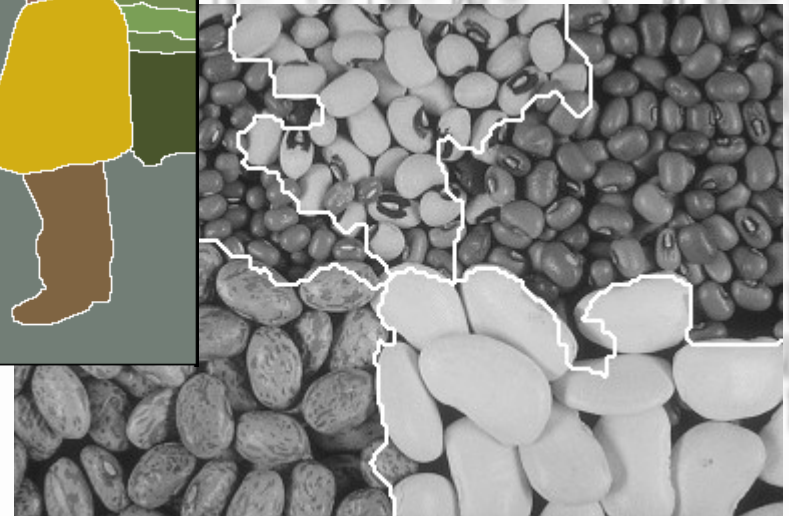
Segmentacija slike



Segmentacija slike



Segmentacija slike



Angiografija



Vizualizacija informacija



Vizualizacija informacija



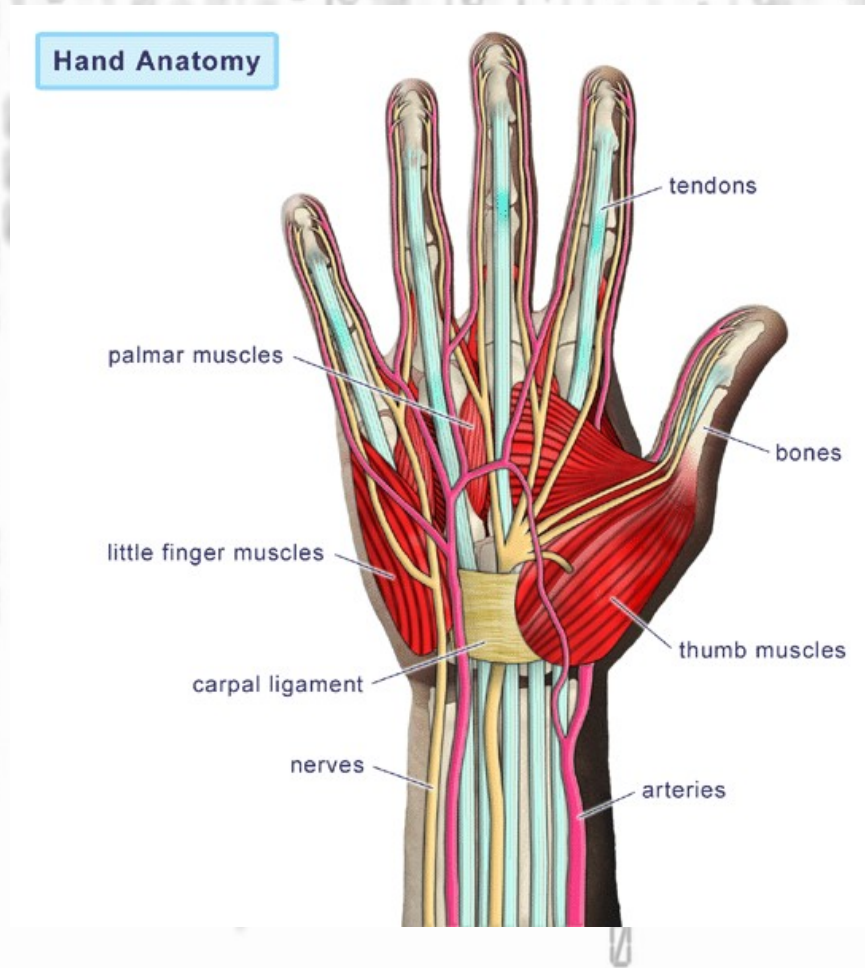
Vizualizacija informacija



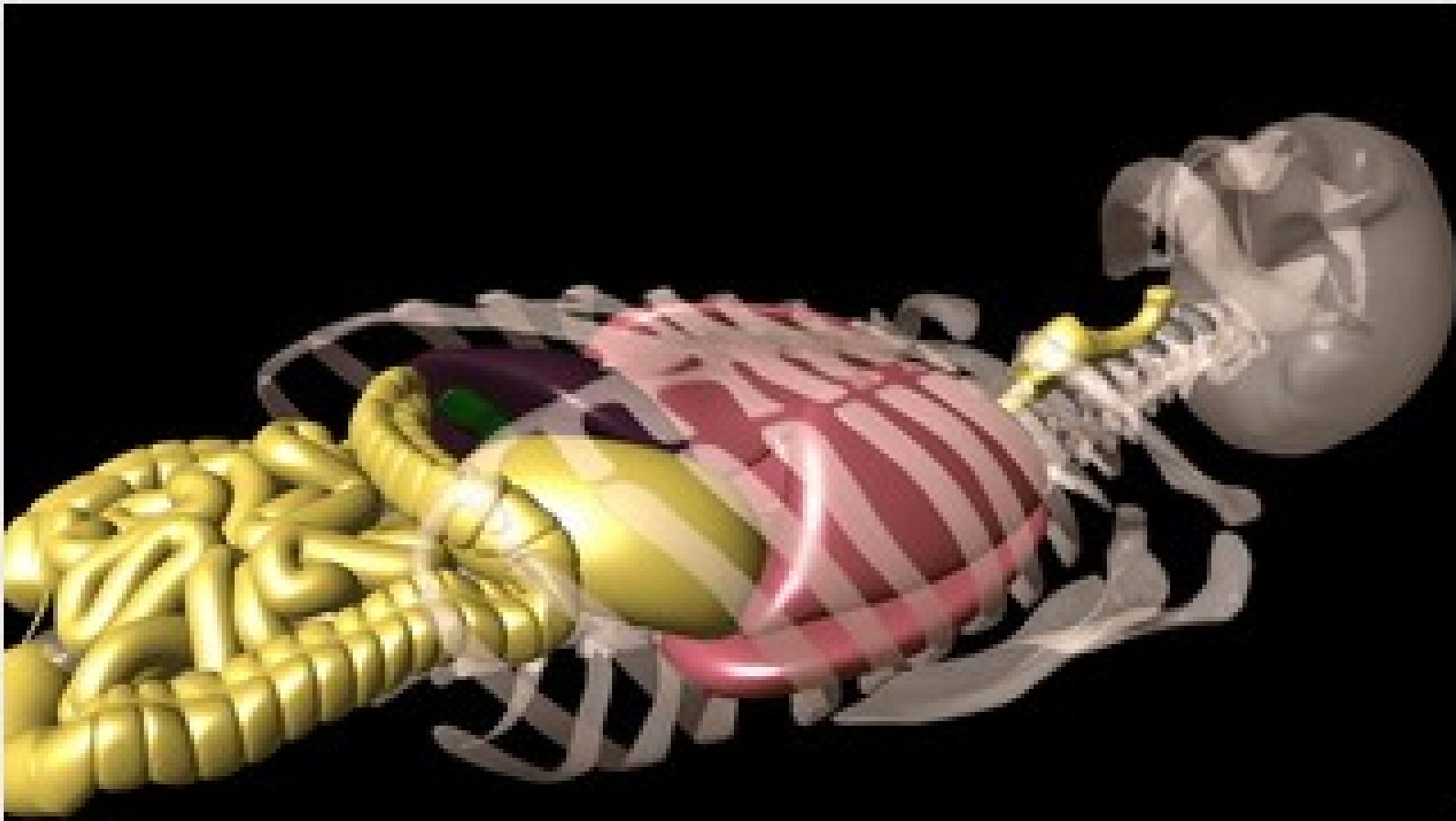
Vizualizacija informacija



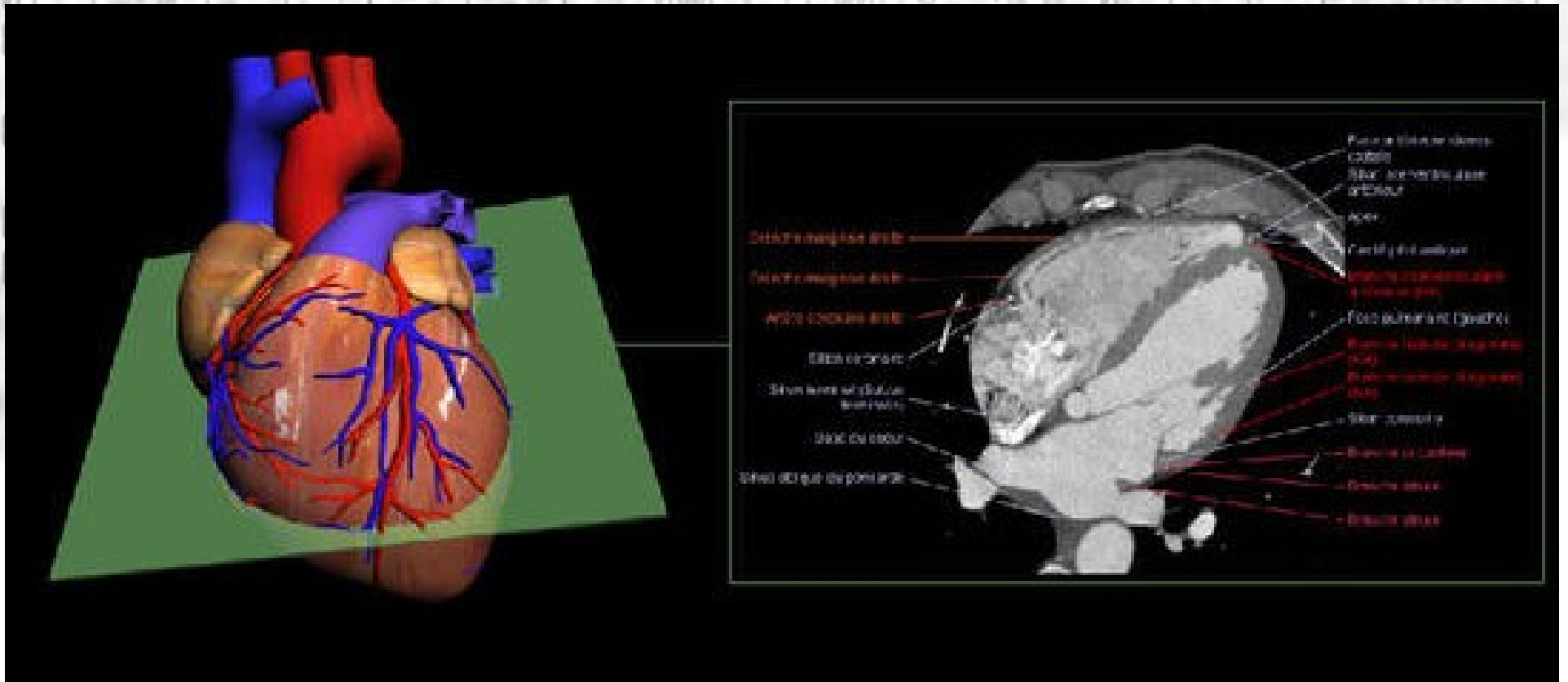
Vizualizacija informacija



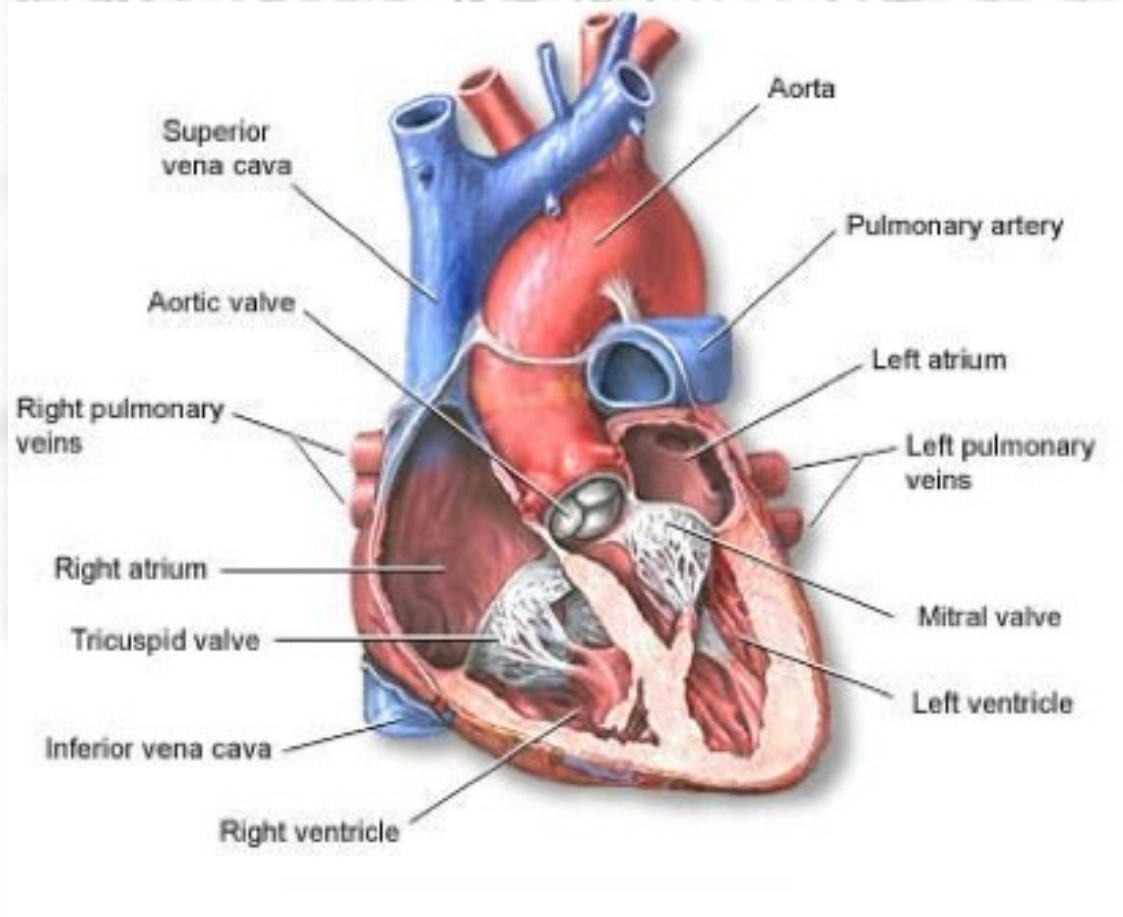
Atlasi



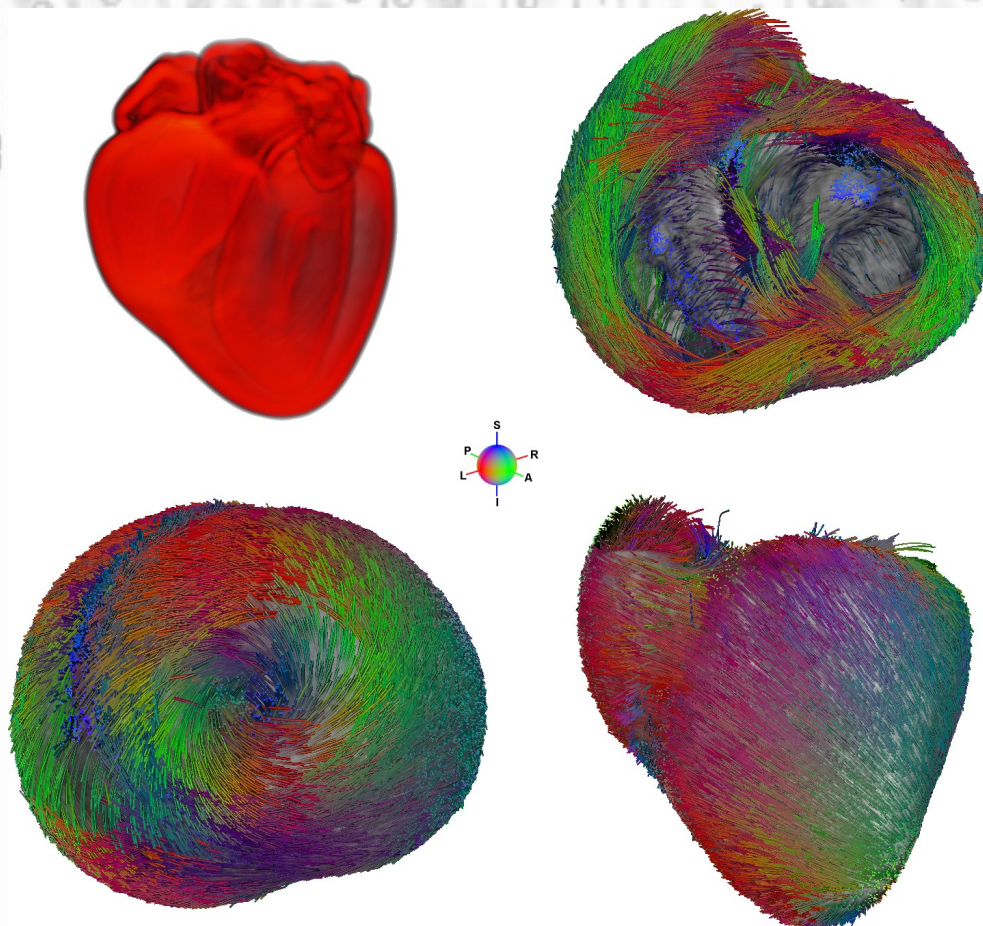
Atlasi



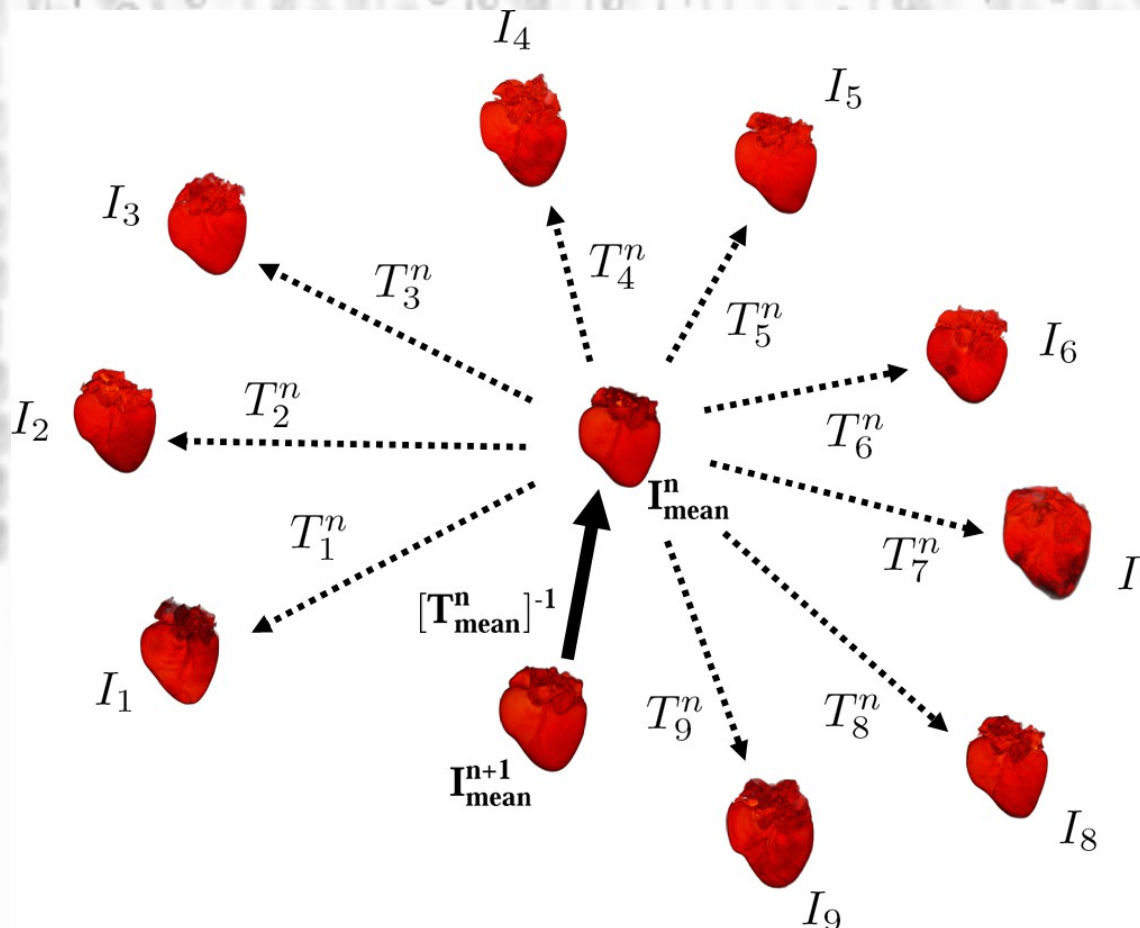
Atlasi



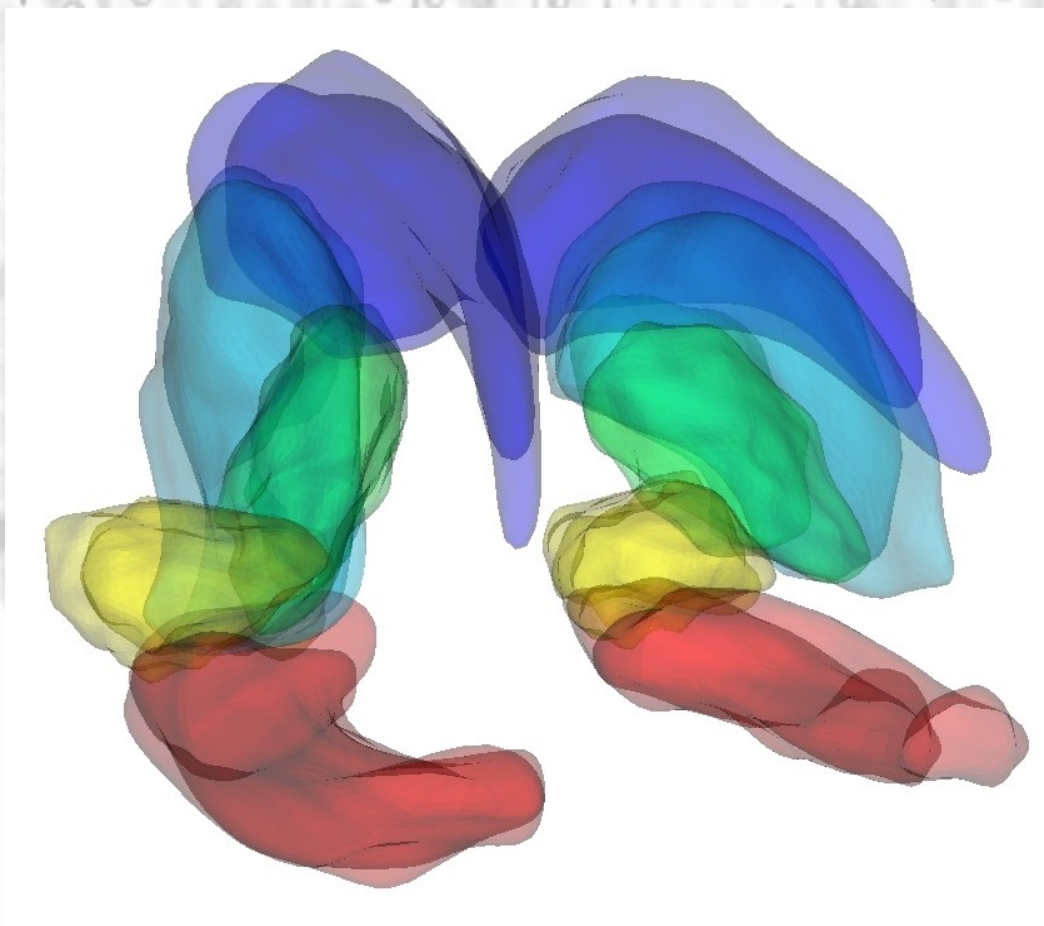
Atlasi



Izgradnja atlasa



Statistički atlasi



Atlas – vizualizacija informacija



Atlas – vizualizacija informacija



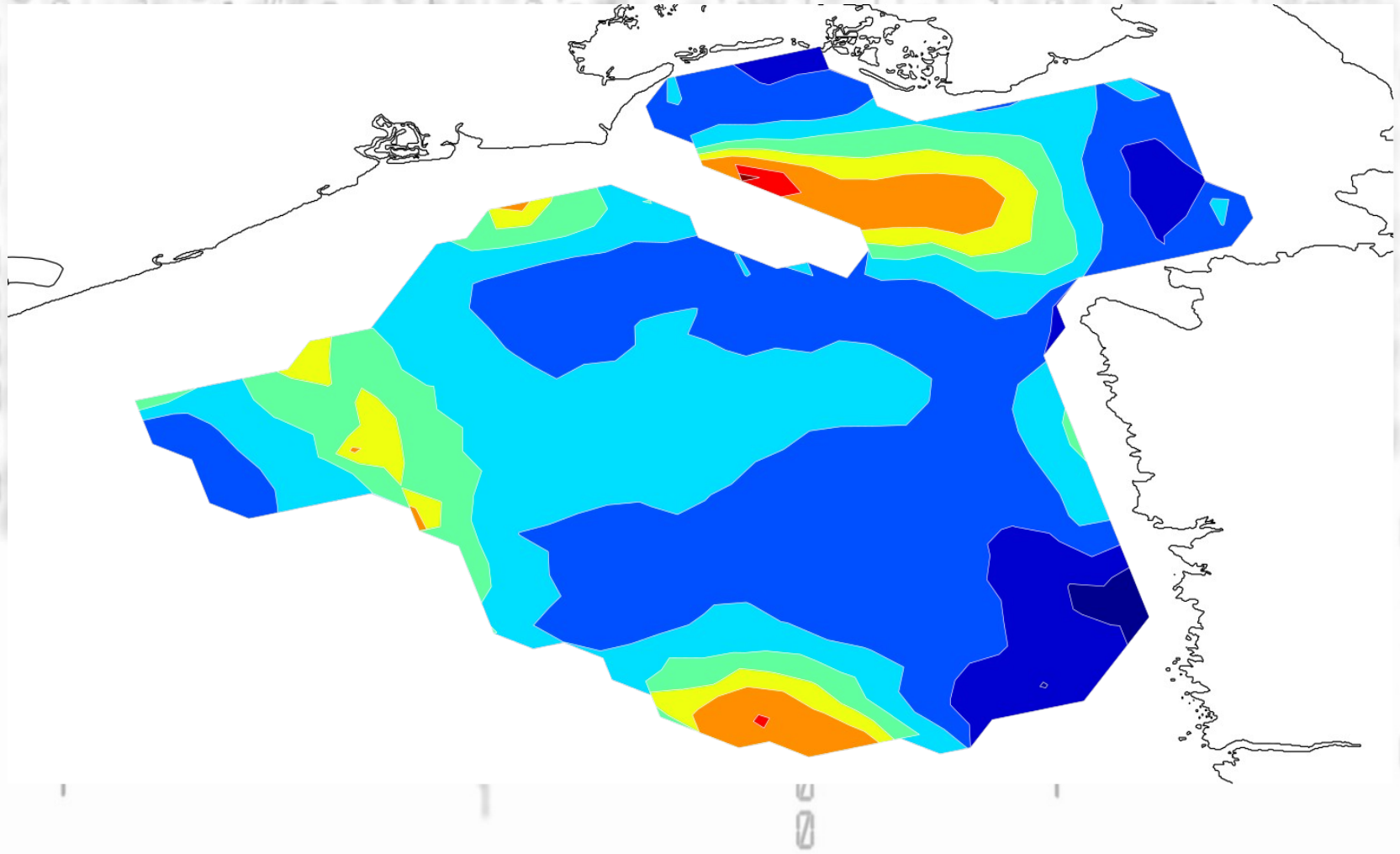
Atlas – vizualizacija informacija



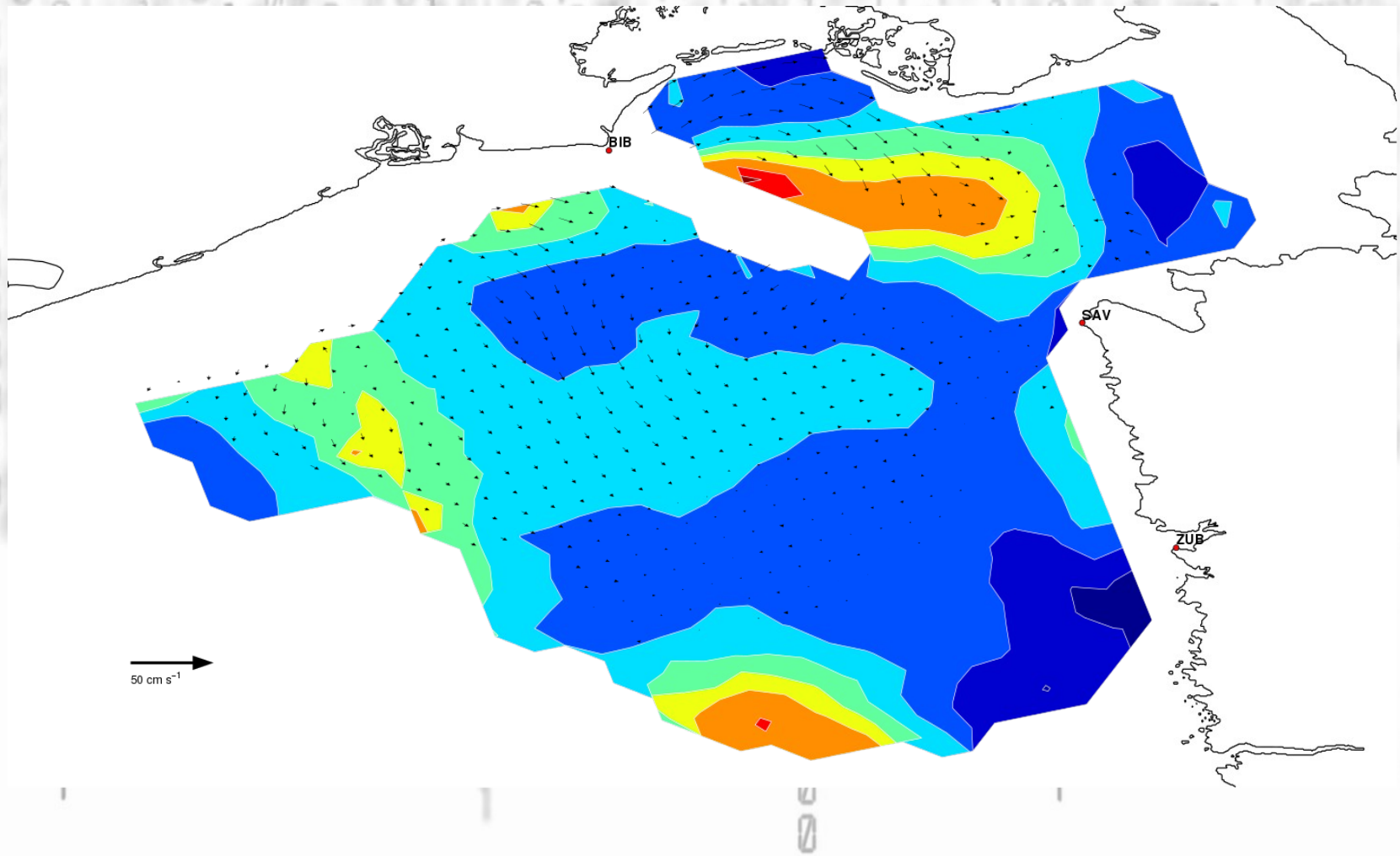
Atlas – slojevi



Atlas – slojevi



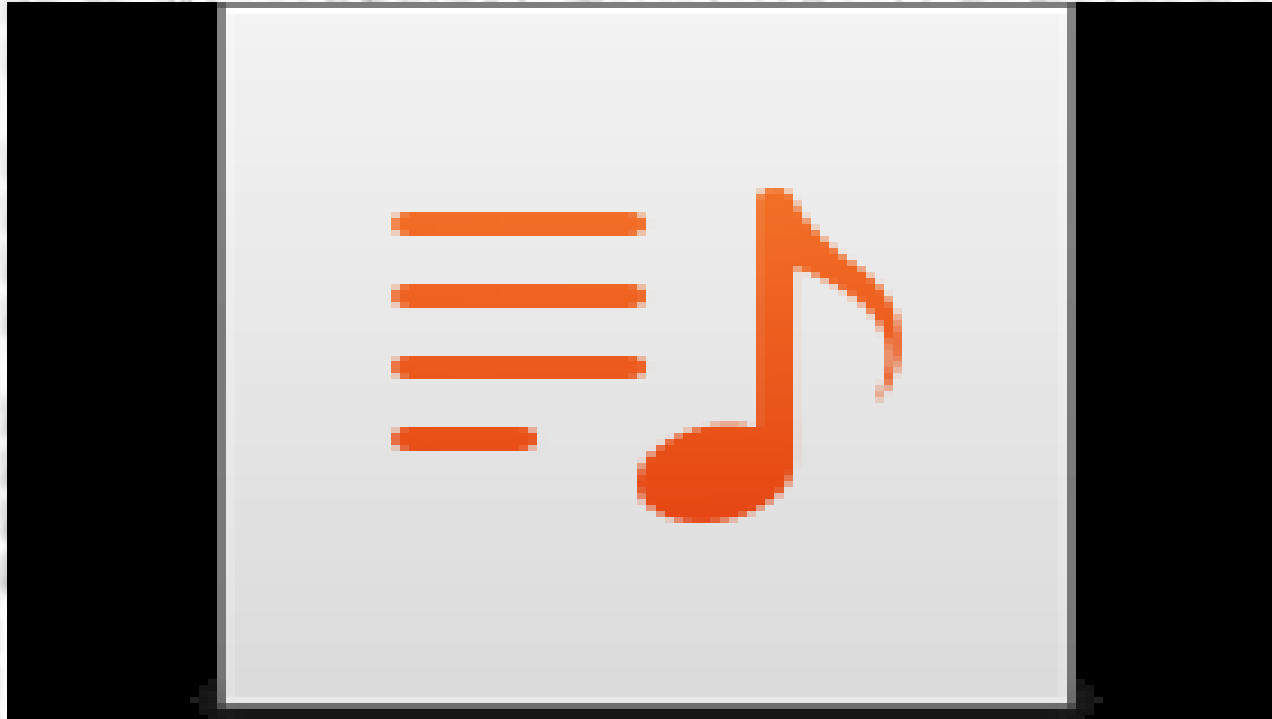
Atlas – slojevi



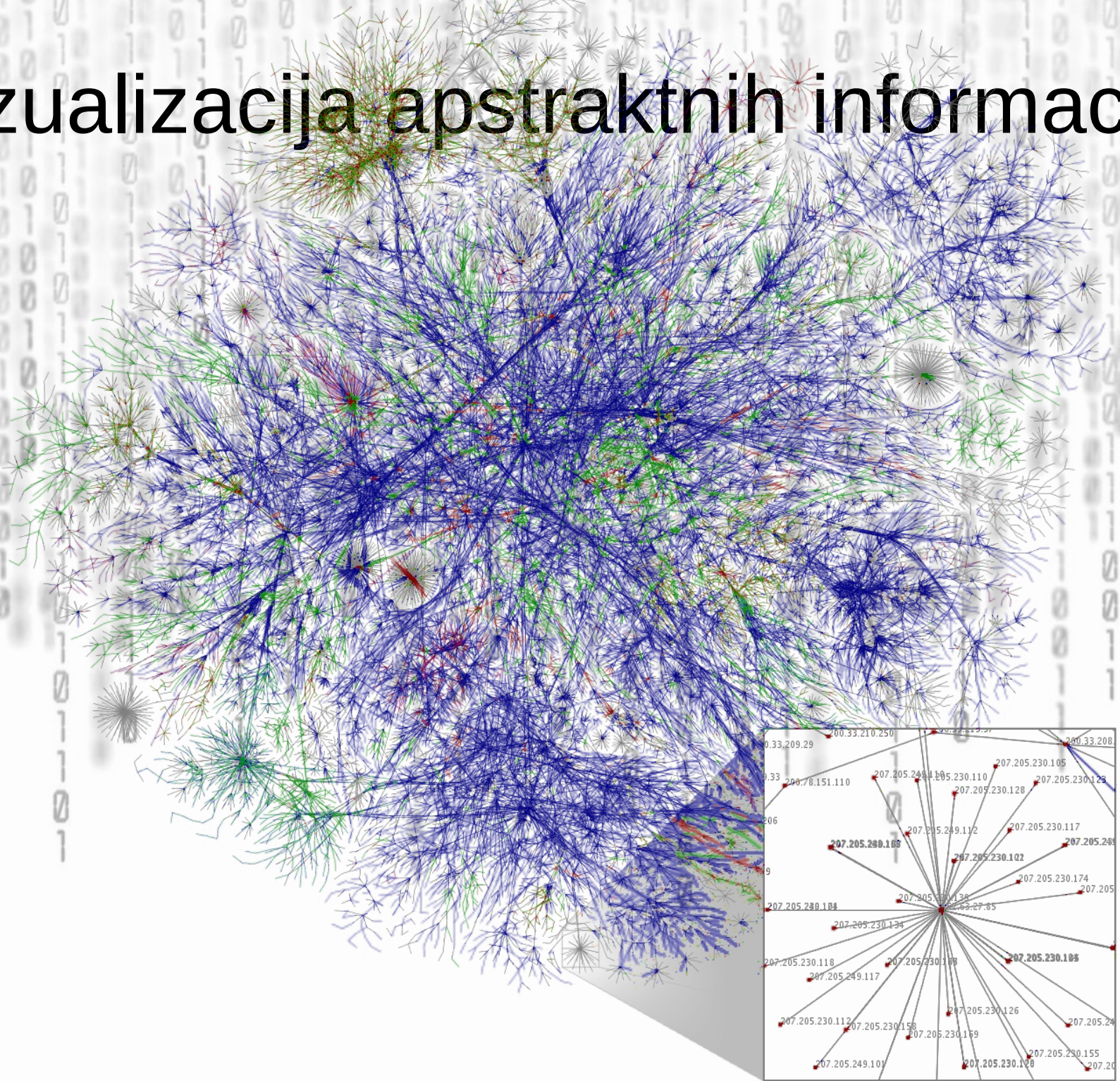
Vizualizacija apstraktnih informacija



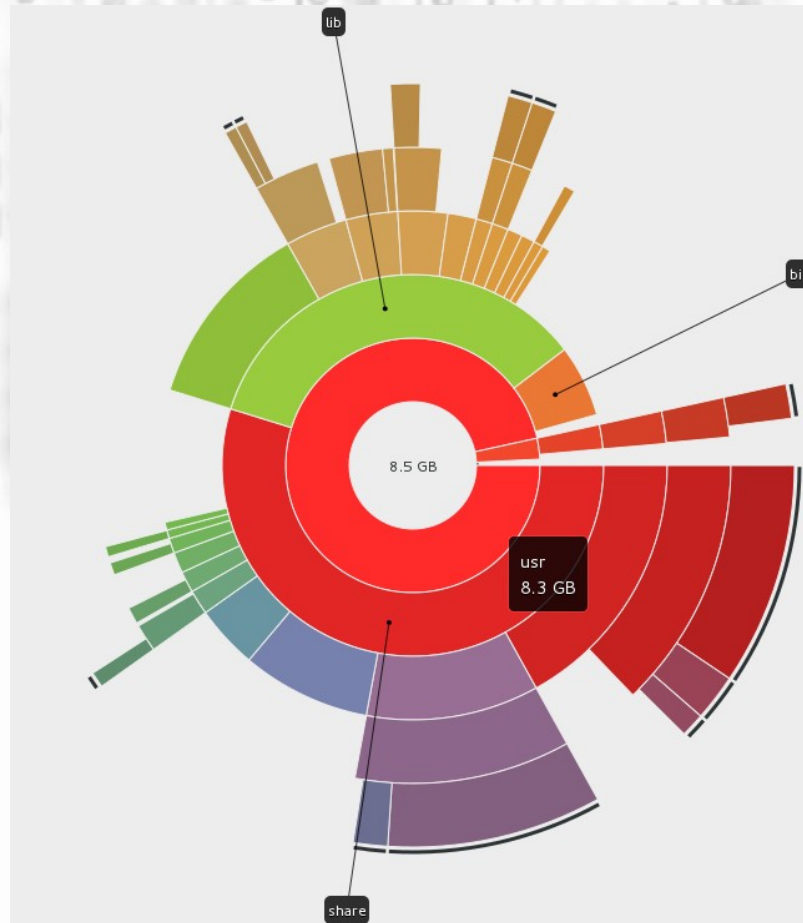
Vizualizacija apstraktnih informacija



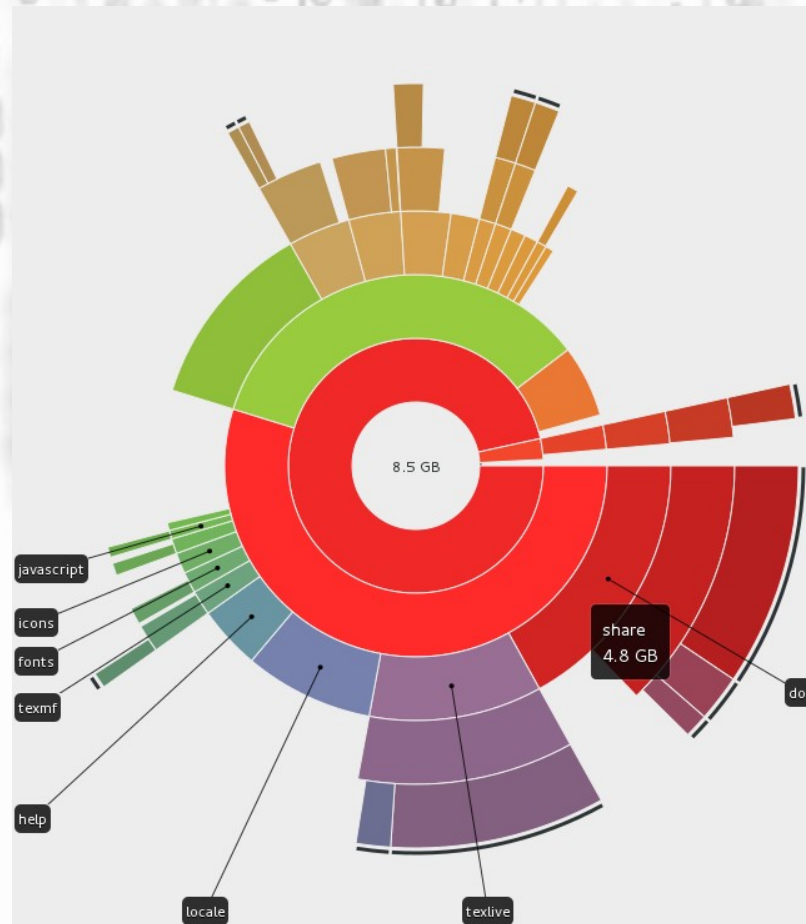
Vizualizacija apstraktnih informacija



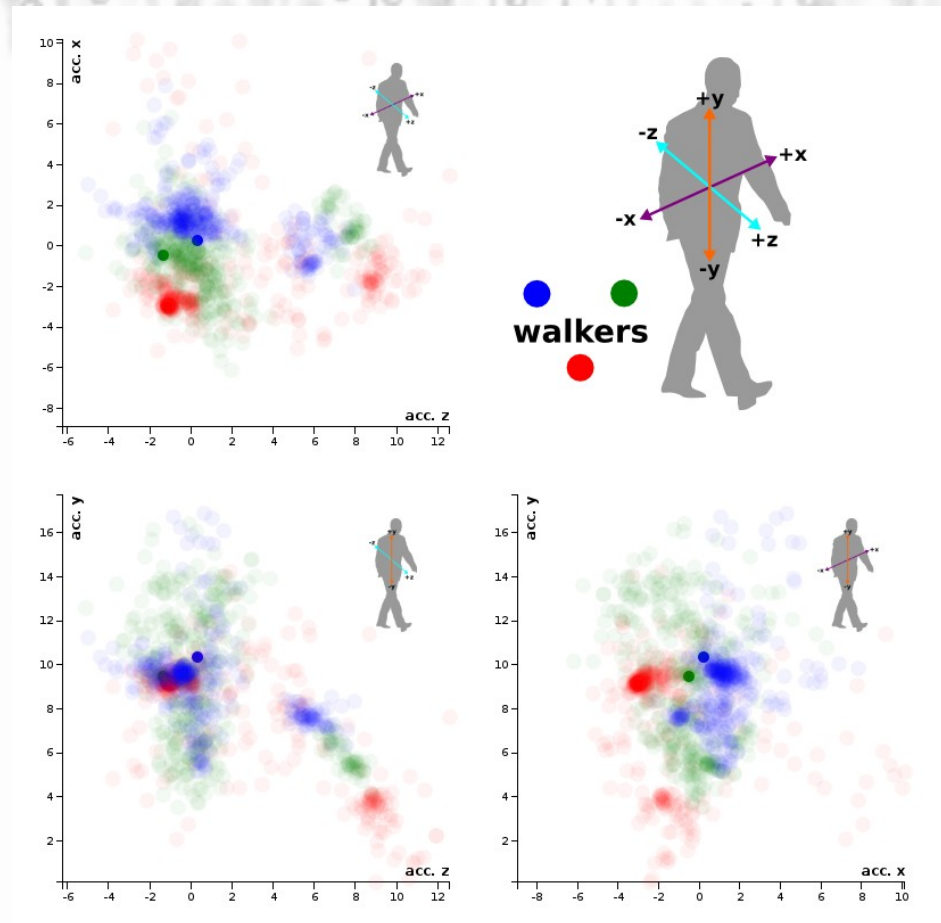
Vizualizacija apstraktnih informacija



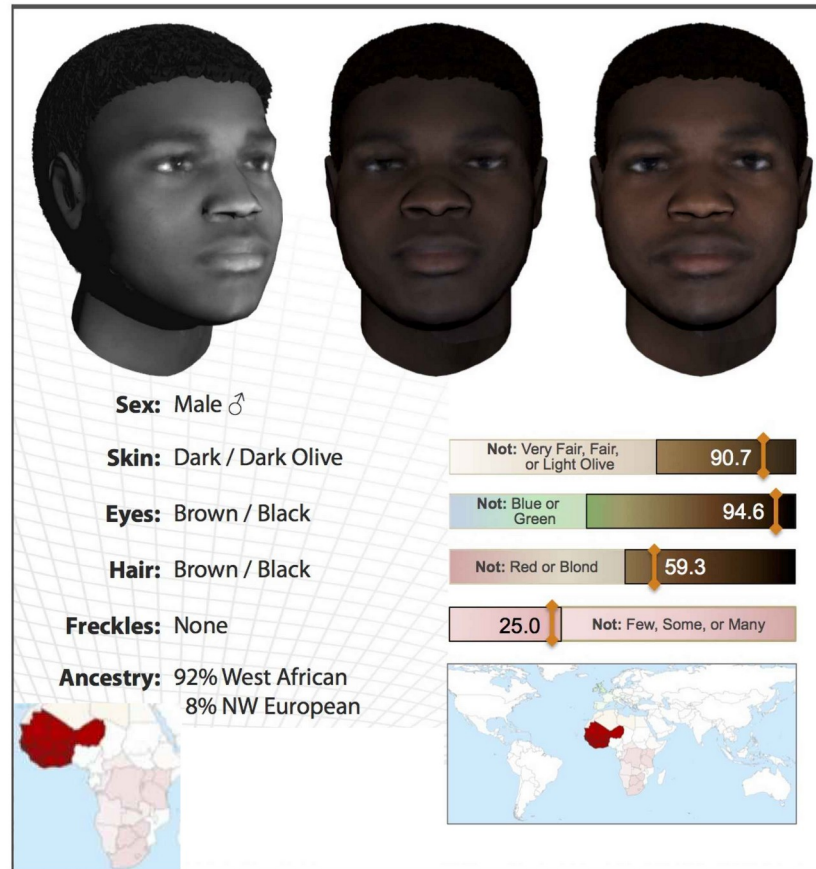
Vizualizacija apstraktnih informacija



Vizualizacija apstraktnih informacija



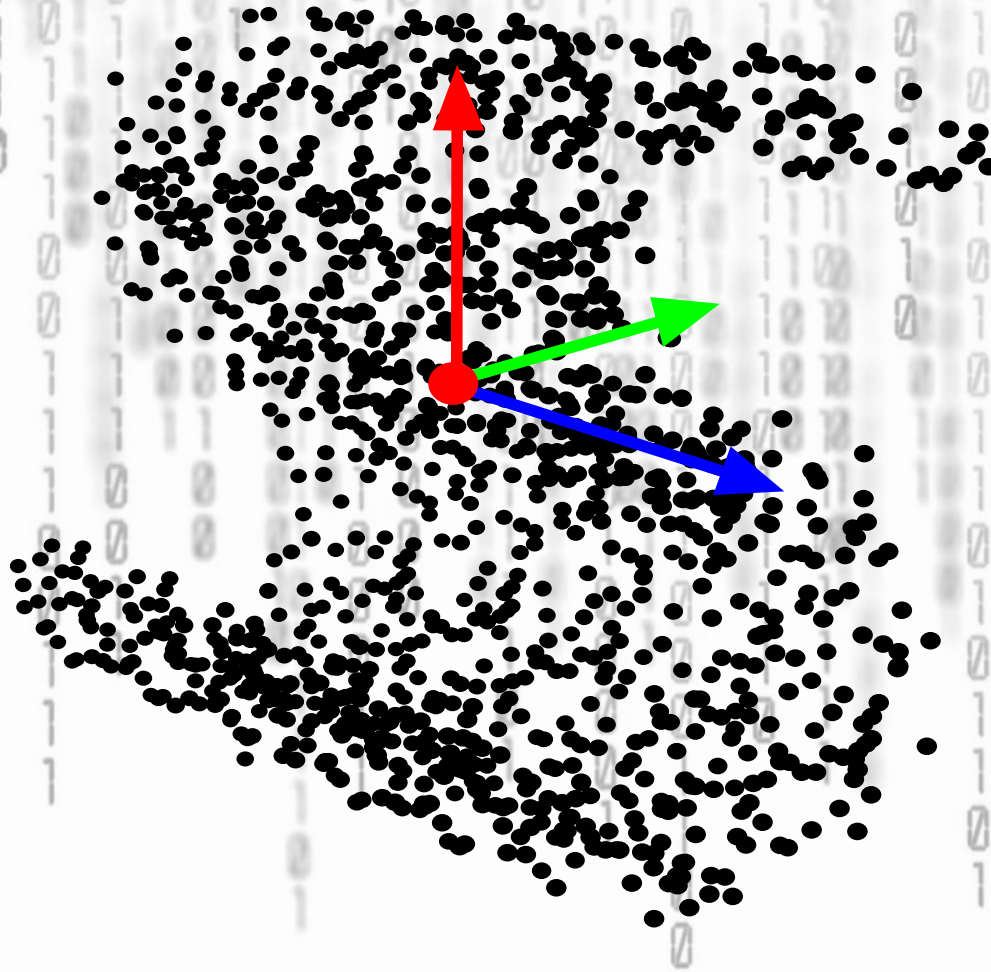
Vizualizacija apstraktnih informacija



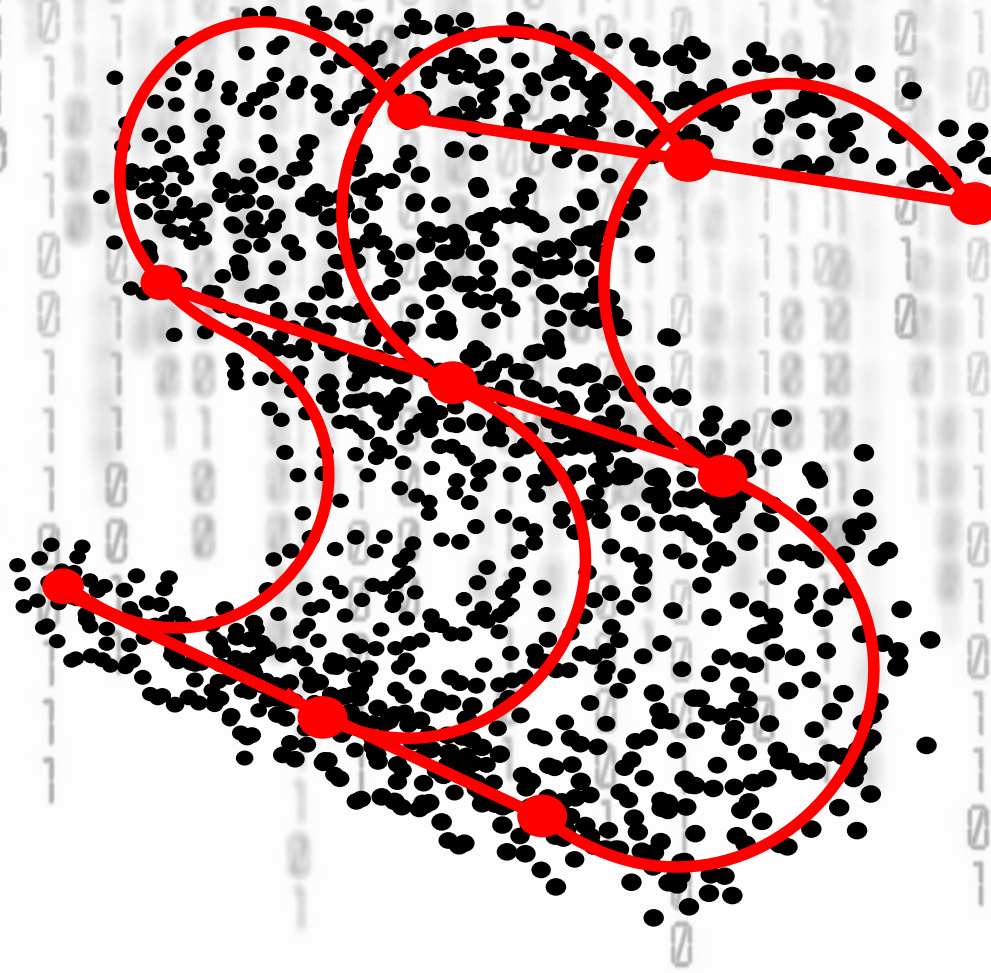
Vizualizacija apstraktnih informacija



Vizualizacija multidimenzionalnog prostora



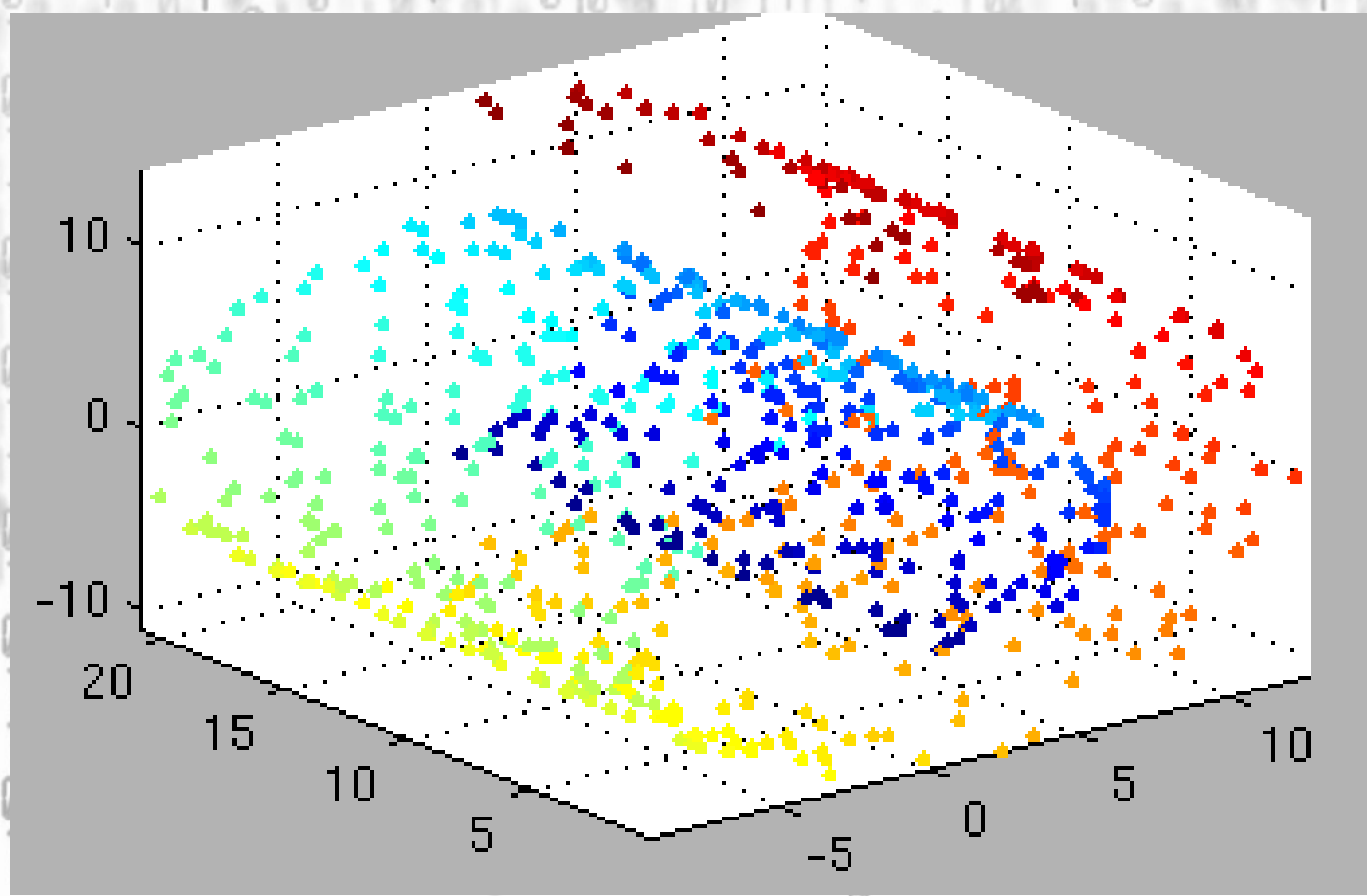
Vizualizacija multidimenzionalnog prostora



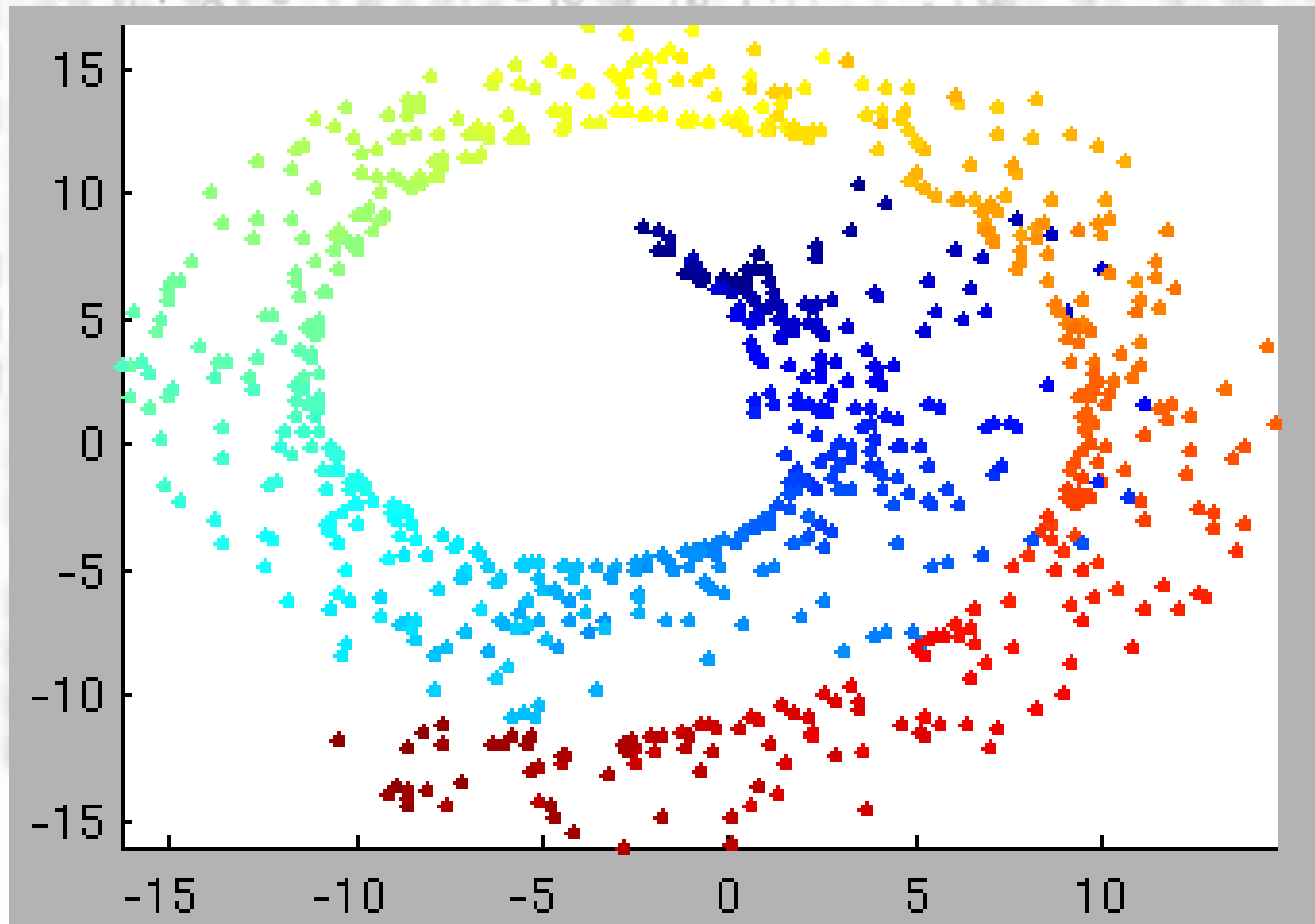
Vizualizacija multidimenzionalnog prostora



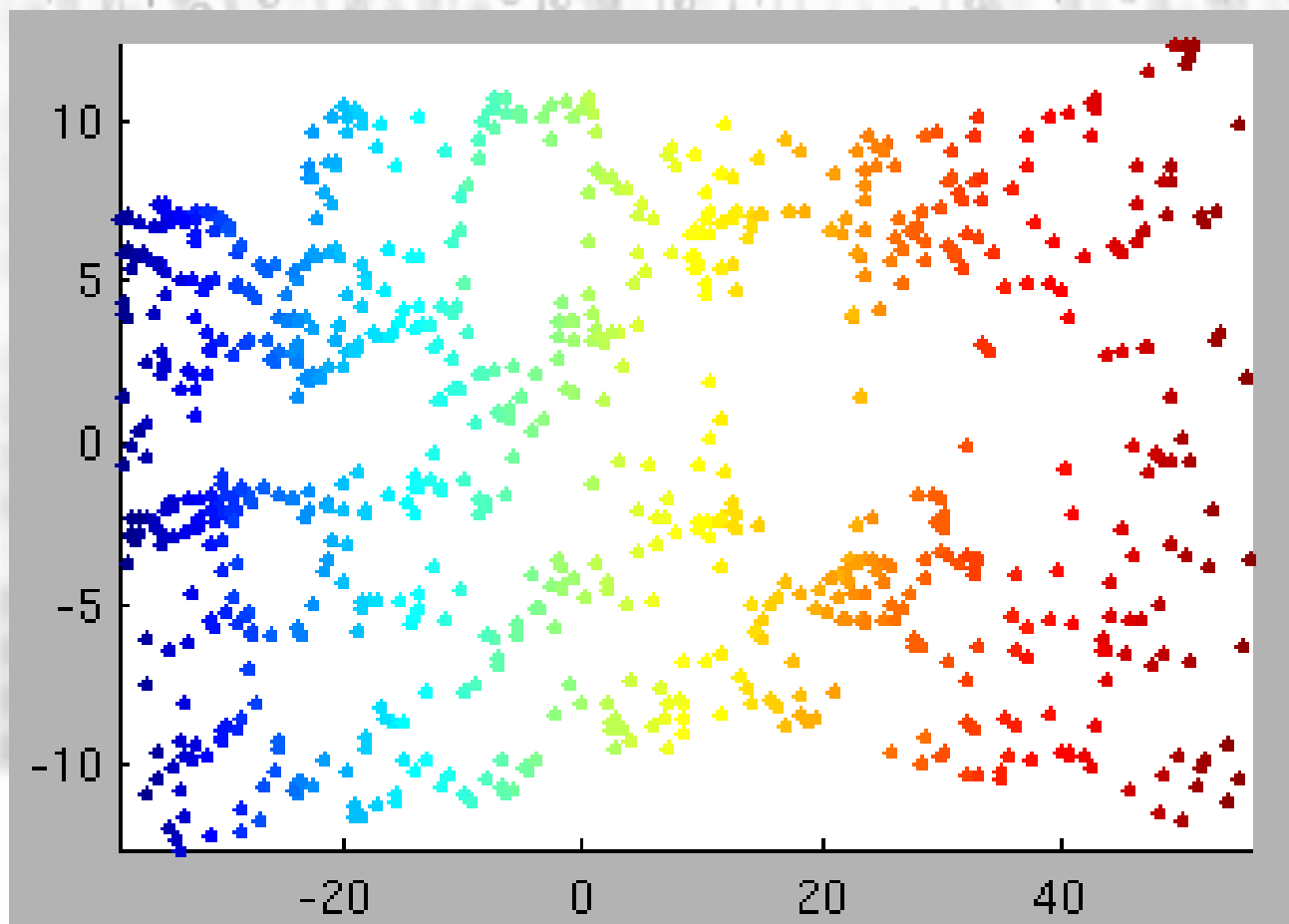
Vizualizacija multidimenzionalnog prostora



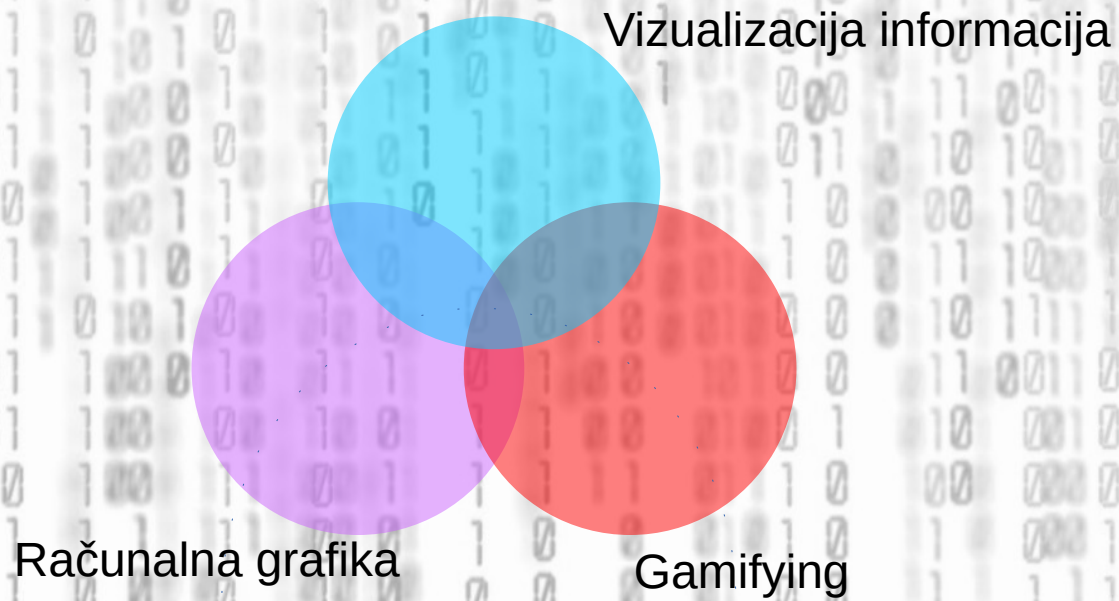
Vizualizacija multidimenzionalnog prostora



Vizualizacija multidimenzionalnog prostora



Vizualizacija informacija



Zaključak

- Je li stablo palo u šumi, ako to nitko nije percipirao? (G. Berkeley, 17.st.)
- Percipirati = vjerovati?
- Kako poboljšati svoju percepciju?

Zaključak

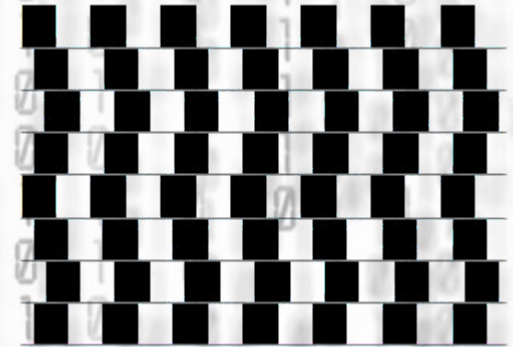
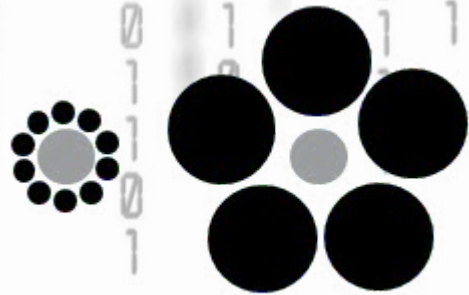




Zaključak



Zaključak



Zaključak





