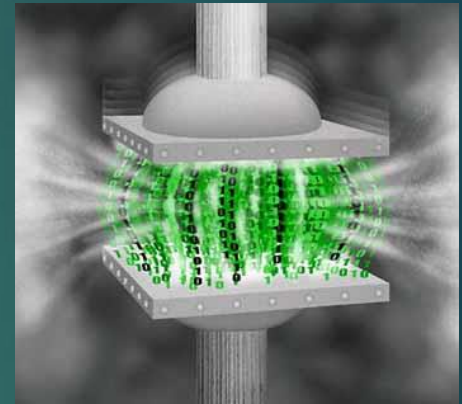


Kompresija i zaštita podataka

DR MARKO D. PETKOVIĆ

dexterofnis@gmail.com

www.pmf.ni.ac.rs/dexter



Sadržaj predmeta i način polaganja ispita

► Sadržaj predmeta:

- Kompresija podataka
- Prenos i zaštita podataka
- Bezbednost podataka

► Ispit

- Dva studentska projekta (implementacija određenih algoritama)
- Završni ispit: odbrana projekata + usmeni deo (po želji)

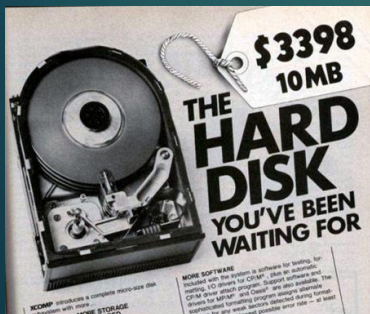
Kompresija podataka

▶ Nekad (pre ~30god):

- ▶ Hard disk: 80 MB
- ▶ Diskete 1.44 MB, 1.2 MB, 360 kB
- ▶ Masovno “zipovanje” fajlova
 - ▶ “Ručni” alati za kompresiju i dekompresiju
 - ▶ Deljenje i prenos podataka na više disketa
- ▶ “Brzi” modemi ...

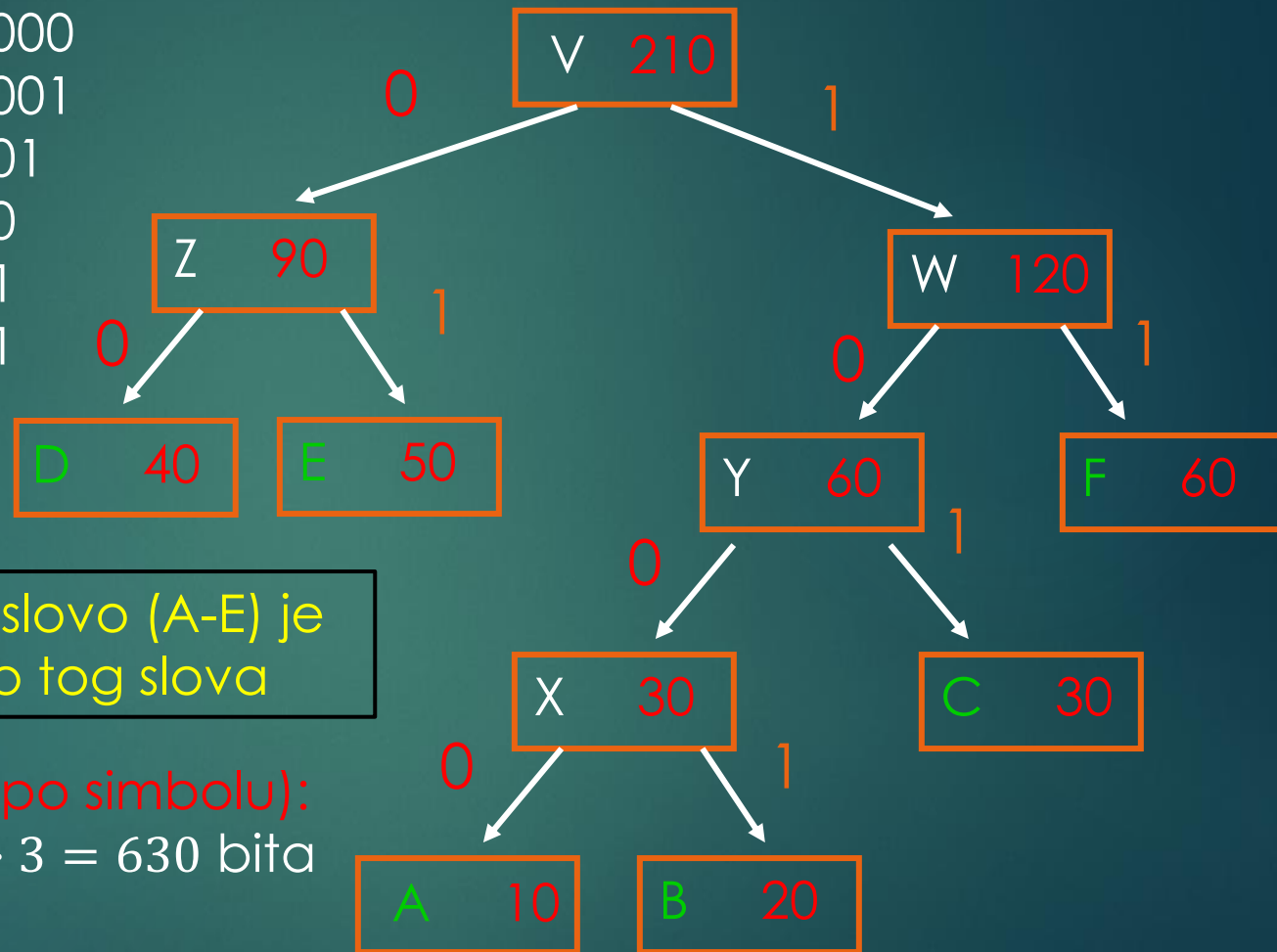
▶ Sad:

- ▶ Hard disk: 4 TB
- ▶ “U pozadini”
 - ▶ DOCX, XLSX, PPTX, ...
 - ▶ GIF, PNG, JPEG, MP3, MPEG
 - ▶ Instalacije programa
- ▶ E – mail
- ▶ Cloud servisi...



Hafmanov algoritam

A	:	V_A	=	1000
B	:	V_B	=	1001
C	:	V_C	=	101
D	:	V_D	=	00
E	:	V_E	=	01
F	:	V_F	=	11



Kodna reč za svako slovo (A-E) je put od korena (V) do tog slova

Bez kompresije (3 bita po simbolu):

$$(10 + 20 + \dots + 60) \cdot 3 = 630 \text{ bita}$$

Kompresovani fajl:

$$10 \cdot 4 + 20 \cdot 4 + 30 \cdot 3 + 40 \cdot 2 + 50 \cdot 2 + 60 \cdot 2 = 510 \text{ bita}$$

LZW algoritam (koder + dekoder)

Ulazni niz:

a b c a b a b c

Izlaz: indeks nađene reči u rečniku

Poslato:

1 2 3 5 5

Dekodirano:

a b c a b a b

Rečnik koder:

1	a	6	bc
2	b	7	ca
3	c	8	aba
4	d	9	abc
5	a b		

Rečnik dekoder:

1	a	6	bc
2	b	7	ca
3	c	8	aba
4	d		
5	a b		

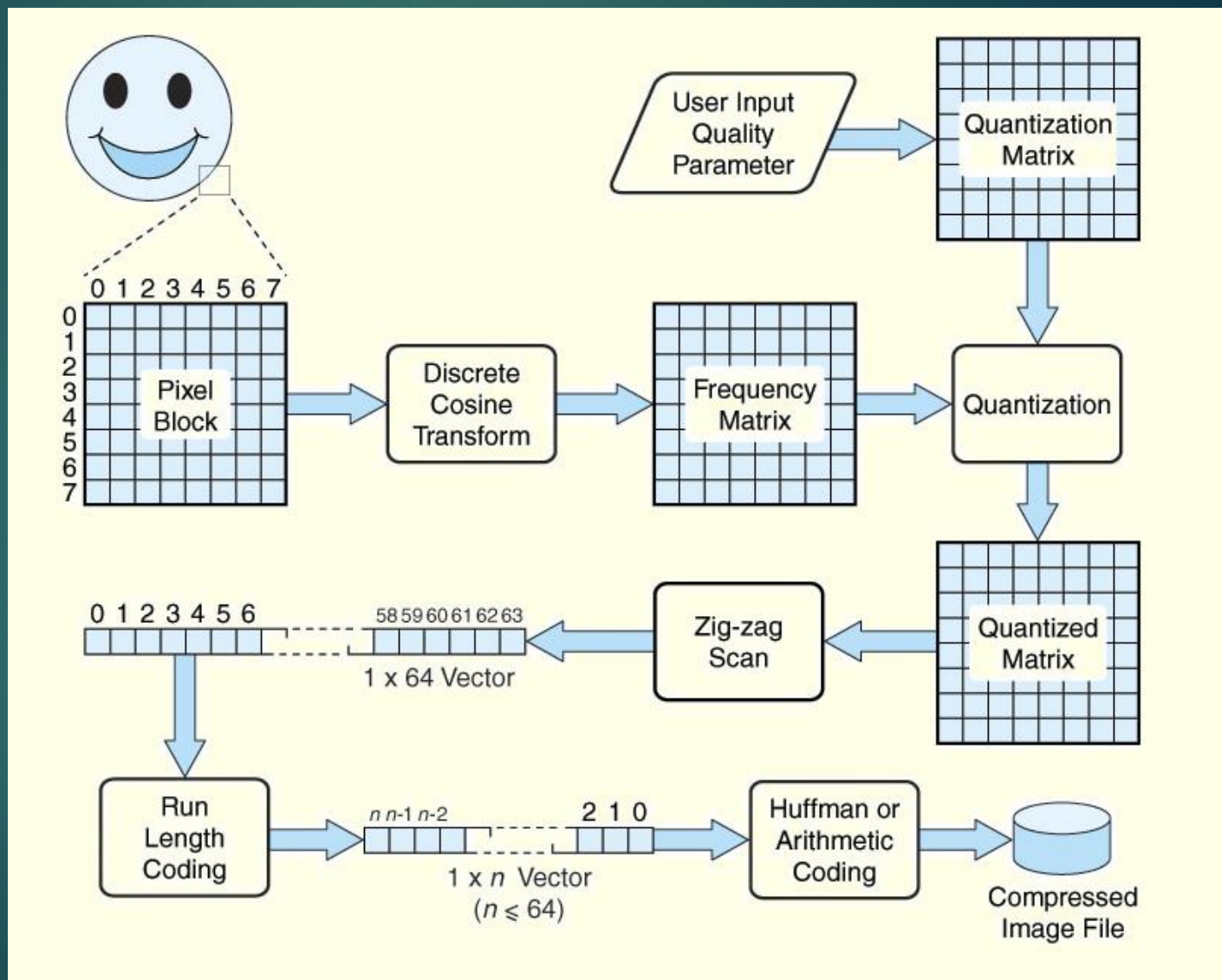
Praktične realizacije

- ▶ ZIP:
 - ▶ Najčešće DEFLATE (LZ77 + Huffman)
 - ▶ Ponekad: bzip2, PPM (arithmetical), itd.
- ▶ GIF slike: LZW
- ▶ PNG: DEFLATE
- ▶ RAR: Neobjavljeno!! Nezvanično (LZSS + PPM, DEFLATE,...)
- ▶ 7-ZIP: kao ZIP, poboljšan!!

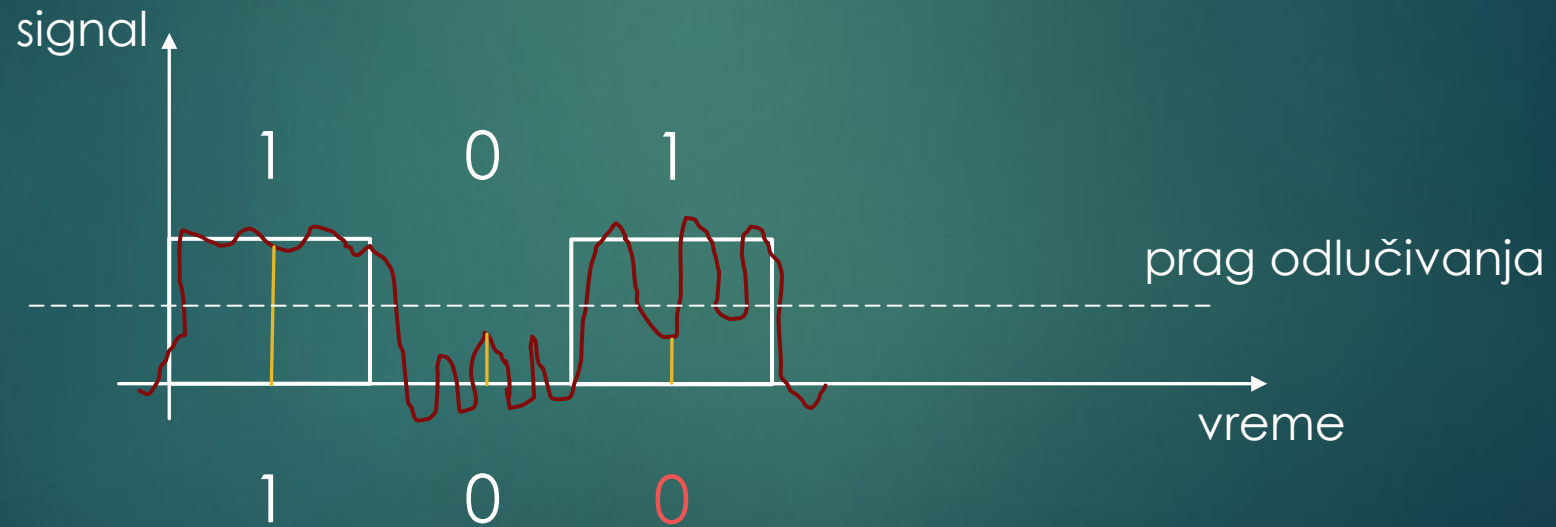
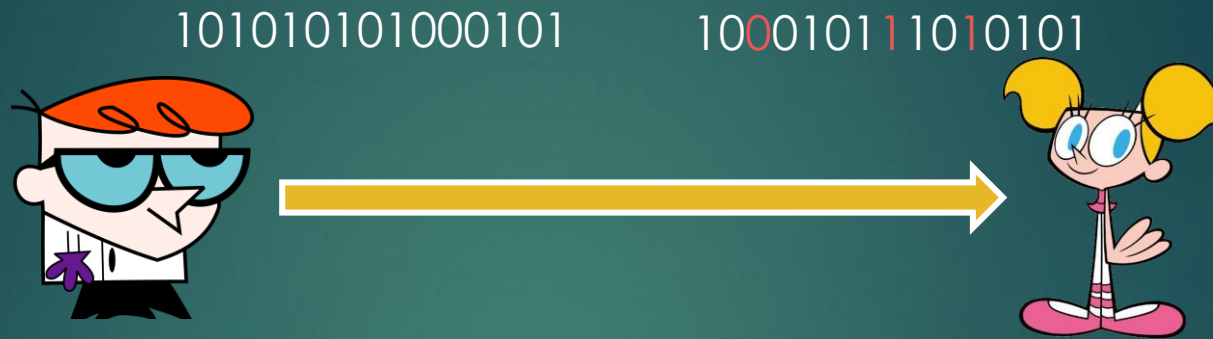
Name	Size	Packed ...	Modified			CRC	Meth...	Host OS	Version
 VIDEO0013.mp4	19 087 761	18 279 819	2013-12-16 10:12			23AF983D	Deflate	FAT	20
 1387042915835.jpg	339 269	336 808	2013-12-16 10:12			EAE40036	Deflate	FAT	20
 1387042920286.jpg	314 166	309 959	2013-12-16 10:12			47999B57	Deflate	FAT	20

Praktične realizacije

► JPEG:



Zaštita podataka



Kako detektovati / ispraviti ovakve greške?!?!?

Ilustrativni primer

Ne brisite ovu poruku zbog toga sto izgleda cudno. Verovali ili ne, mozete je procitati.

Nsiam vrevoao da zpavrao mgou rzmaueti ono sto ctaim. Zaavljhuujci nobniecoj mcoi ljdksuog mgzoa, pemra irtazsiavnjima nucainka sa Kmbreidza, njie vzano kjoim su roedsldoem npiasnaa slvoa u rcei, jdieno je btino da se pvro i psldeonje sovlo nlaaze na sovm msteu.

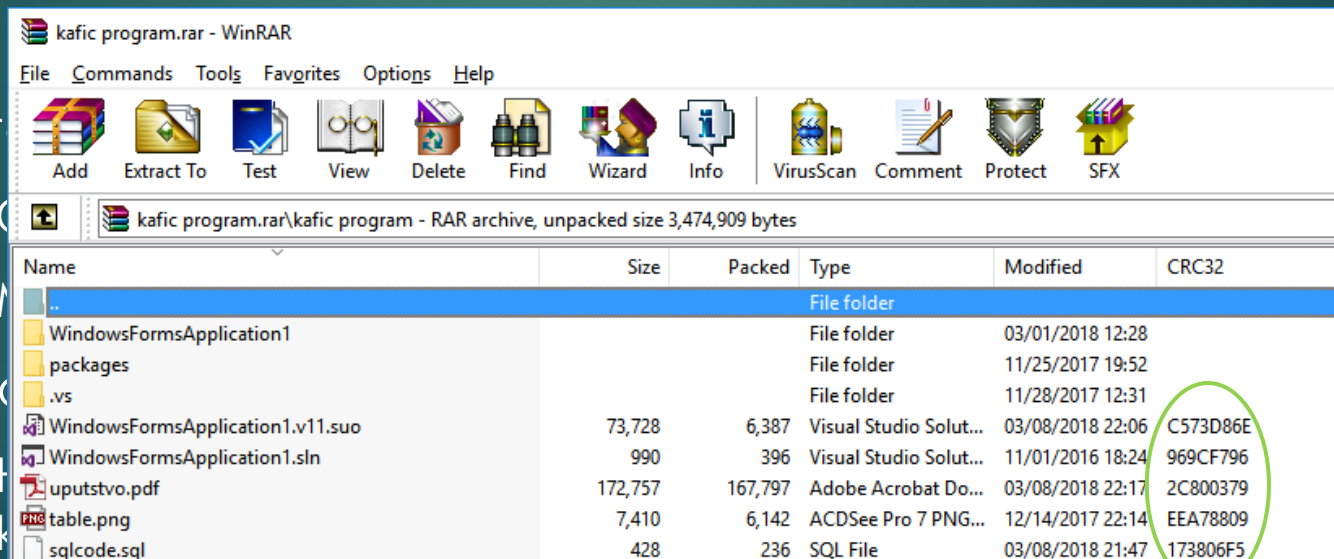
Otasla solva mgou btii u ptponuom nerdeu i bez ozibra na ovu oloknost, tkest mzeote ctati bez pobrelma. Ovo je zobg tgoa sto ljdkusi mzoak ne ctia savko slvoo pnaooosb, vec rcei psmraota kao cleniu. Oavj preomecaj je sljiavo nzavan tipoglikemija :-)

Zacudjujuce, zar ne? A uevk ste msilili da je pavrpois vzaan.

“Korisna” redundansa?!?!

- ▶ Redundansa pomaže da se detektuju i/ili isprave greške (oštećenje medijuma, greške pri prenosu, itd.)
- ▶ Svesno dodavanje “viška” informacija
- ▶ Cilj: Ispraviti što više grešaka sa minimalnom količinom unešene redundanse

▶ Det



▶ Ispr

▶ t

k

onovi

Hvala na pažnji!!!!

Programmer



what my parents think
I do



what my friends think
I do



what society thinks I
do

$$\frac{\partial}{\partial \alpha} \ln f_{\alpha, \sigma}(\xi_1) = \frac{(\xi_1 - \alpha)}{\sigma^2} f_{\alpha, \sigma}(\xi_1) - \frac{1}{2\sigma^2}$$
$$\int_{\mathcal{X}} T(x) \cdot \frac{\partial}{\partial \theta} f(x, \theta) dx = \psi\left(T(\xi) \cdot \frac{\partial}{\partial \theta} \ln f(\xi, \theta)\right) \int_{\mathcal{X}} f(x, \theta) dx$$
$$\int_{\mathcal{X}} T(x) \left(\frac{\partial}{\partial \theta} \ln f(x, \theta) \right) f(x, \theta) dx = \psi\left(\frac{\partial}{\partial \theta} \ln f(\xi, \theta) \right) \int_{\mathcal{X}} f(x, \theta) dx$$
$$\frac{\partial}{\partial \alpha} M T(\xi) = \frac{\partial}{\partial \theta} \int_{\mathcal{X}} T(x) f(x, \theta) dx = \int_{\mathcal{X}} T(x) \frac{\partial}{\partial \theta} f(x, \theta) dx$$

What our professors
envisioned we could
do...



what I think I do

```
1 public class Demo {
2     private static final String CONSTANT = "Spring";
3     private Object o;
4
5     /*
6      * Create a new Demo.
7      * @param o the object to demonstrate.
8      */
9     public Demo(Object o) {
10         this.o = o;
11         String s = CONSTANT;
12         int i = 1;
13     }
14
15     public static void main(String[] args) {
16         Demo demo = new Demo();
17     }
18 }
```

what I really do

