



Univerzitet u Beogradu – Građevinski  
fakultet [www.grf.bg.ac.rs](http://www.grf.bg.ac.rs)

Studijski program:

**GRAĐEVINARSTVO**

Modul:

**MASTER STUDIJE**

Godina/Semestar:

**1 godina / 1 semestar**

Naziv predmeta (šifra):

**Geoinformacioni sistemi u  
saobraćajnicama (M2S1GI)**

Nastavnik:

**Aleksandar Sekulić**

Naslov predavanja:

**GIS funkcionalnosti**

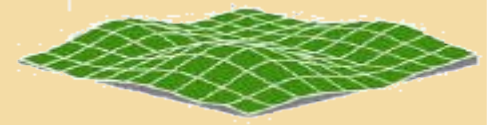
Datum :

01.12.2021.

*Beograd, 2021.*

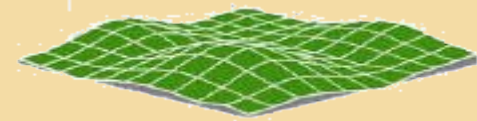
*Sva autorska prava autora prezentacije i/ili video snimaka su zaštićena. Snimak ili prezentacija se mogu koristiti samo za nastavu na daljinu studenta Građevinskog fakulteta Univerziteta u Beogradu u školskoj 2021/2022. i ne mogu se koristiti za druge svrhe bez pismene saglasnosti autora materijala.*

# Šta je to informacijski sistem?



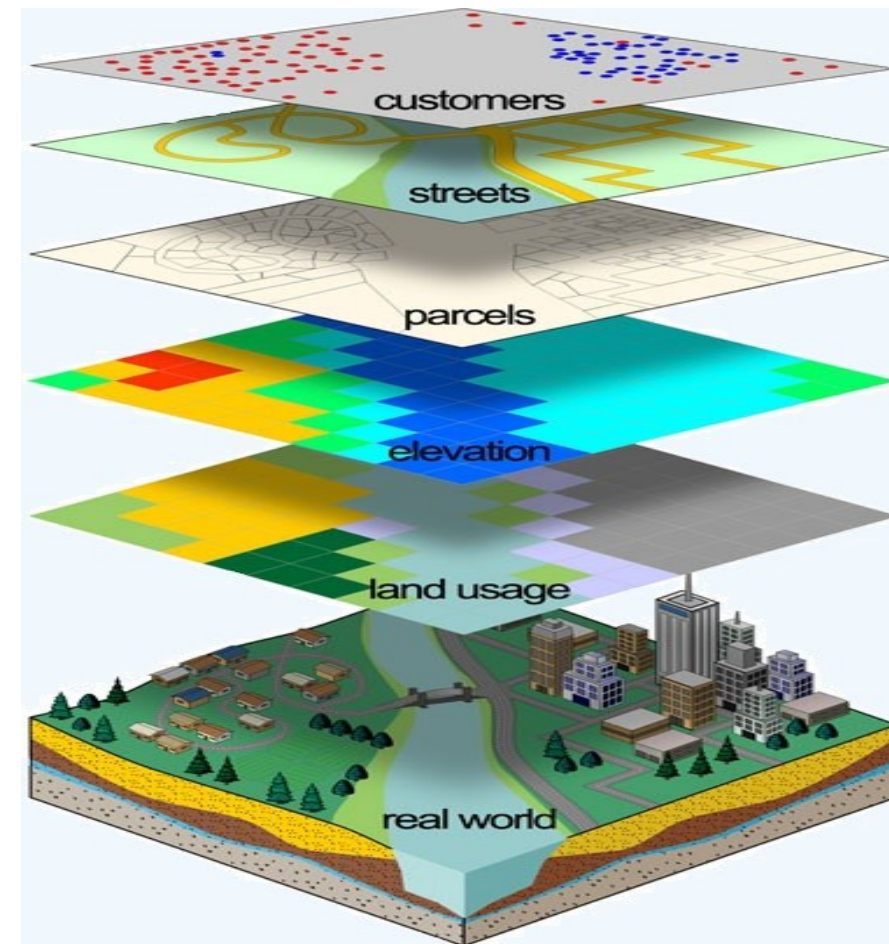
## Sistemi koji se koriste za:

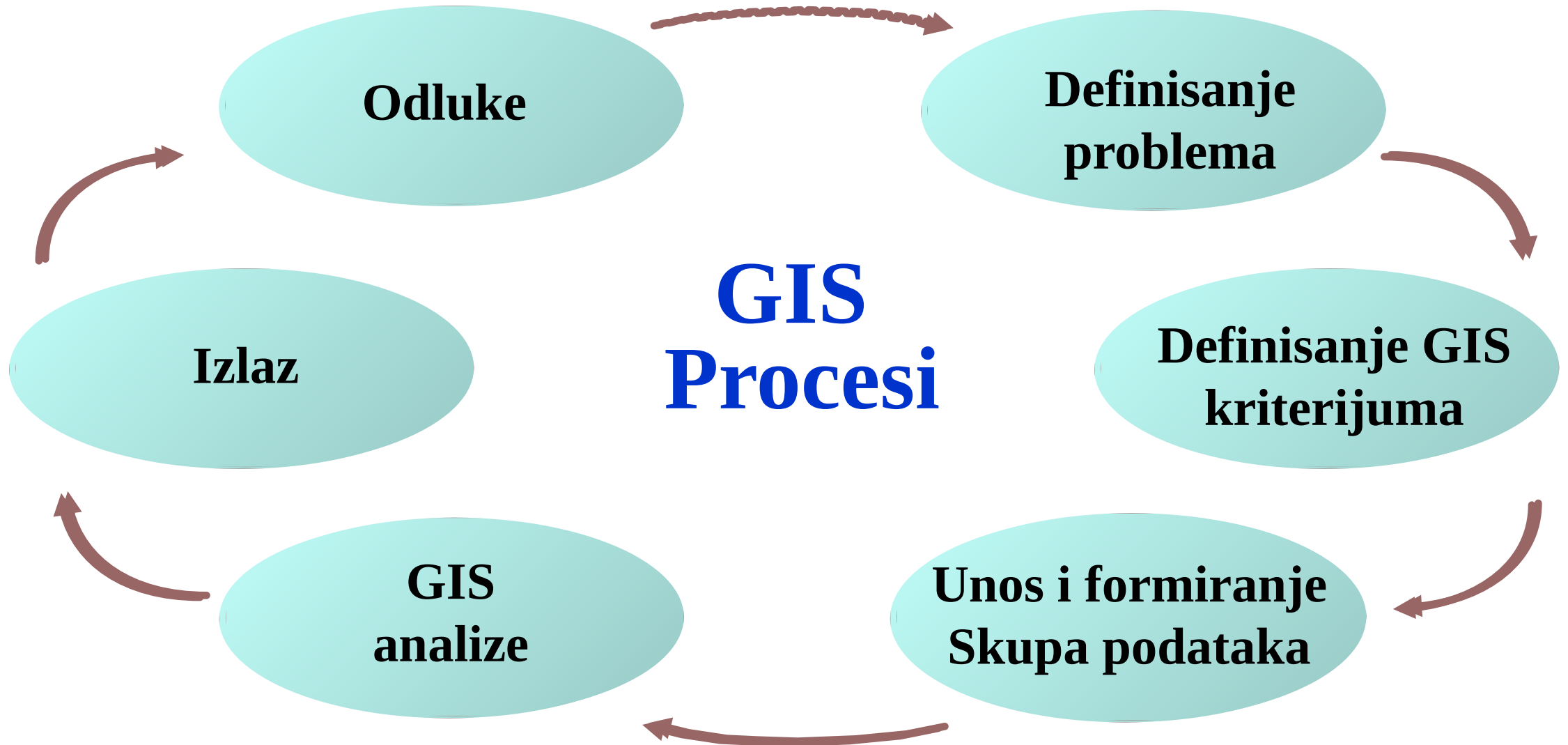
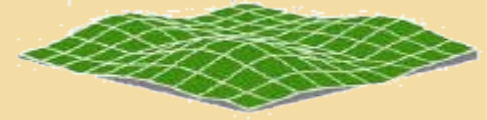
1. Prikupljanje podataka
2. Memorisanje podataka
3. Ažuriranje podataka
4. Rukovanje podataka
5. Analizu podataka

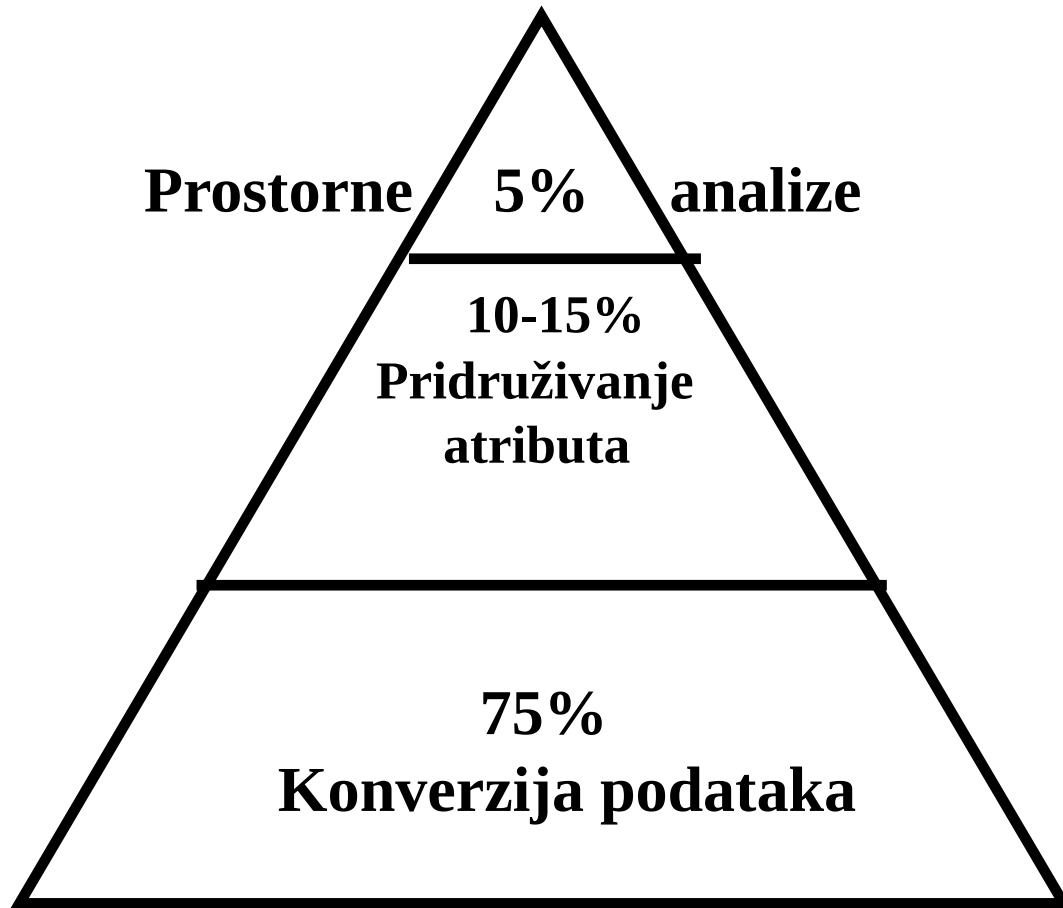
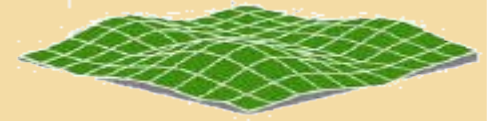


## Podaci se mogu:

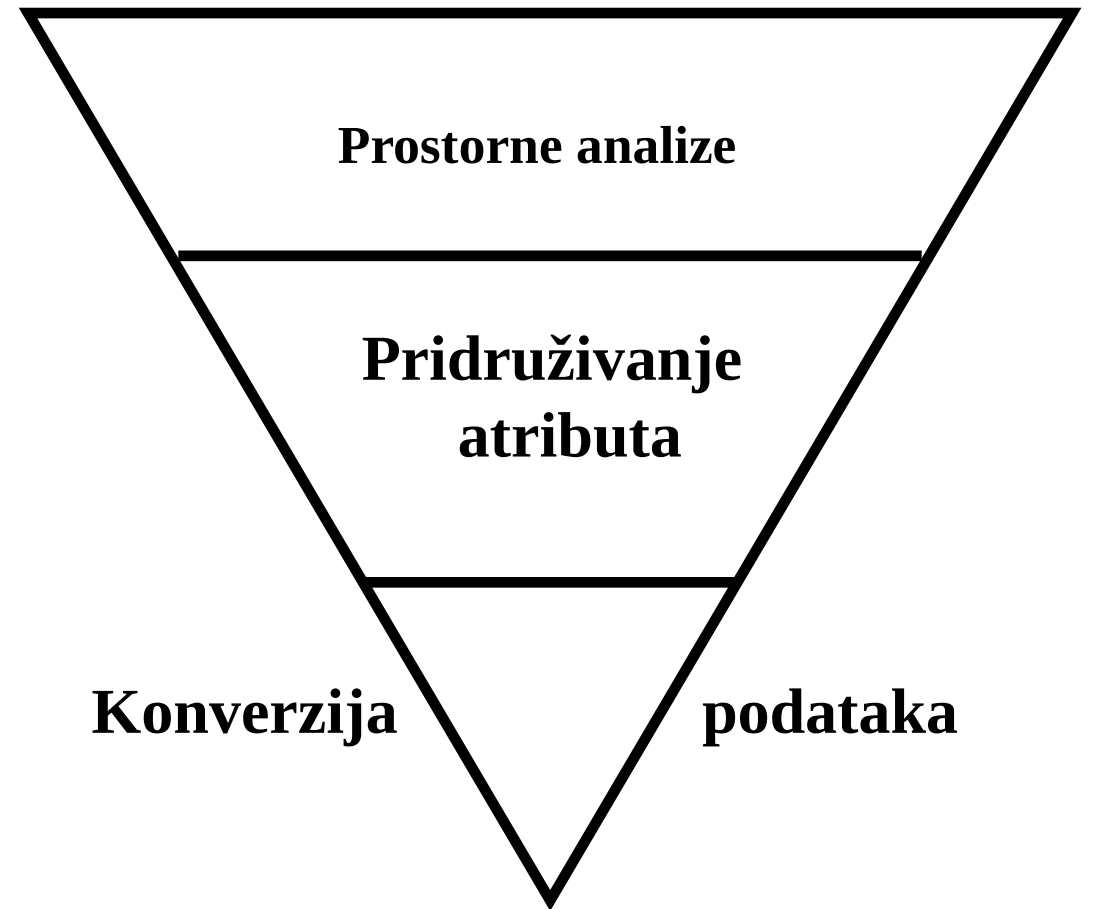
1. Pozicionirati prema prema koordinatama.
2. Uneti i organizovati (generalno u vidu **lejera**).
3. Memorisati i pretraživati.
4. Analizirati (obično preko relacionih DBMS).
5. Modifikovati i prikazati.



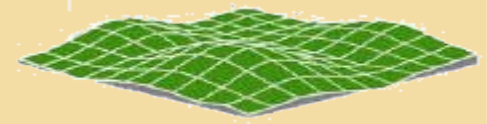




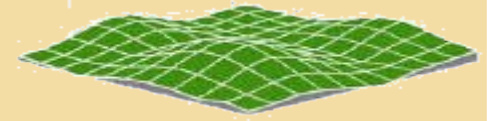
Prošlost



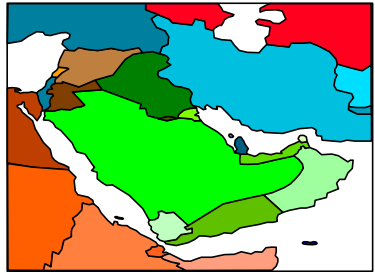
Budućnost



- Objedinjavanje podataka
- Memorisanje podataka
- Prostorne analize i manipulacije podacima
- Prikazi prostornih podataka

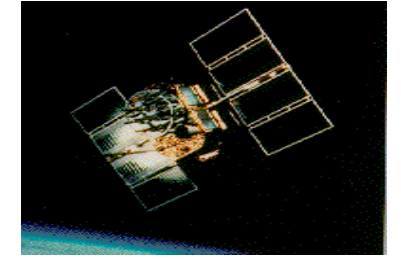


## Objedinjavanje podataka



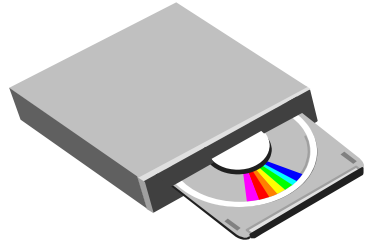
Karte

Ručna Digitalizacija  
Skeniranje



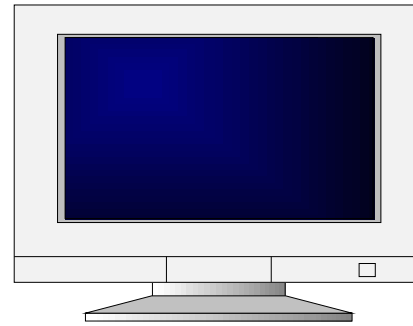
RSI

Ručna Digitalizacija  
Snimanje



Digitalne baze

Transfer podataka

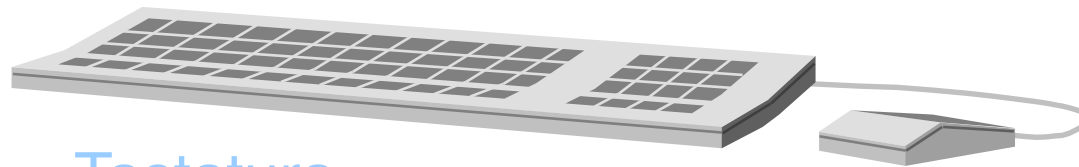


Transfer podataka



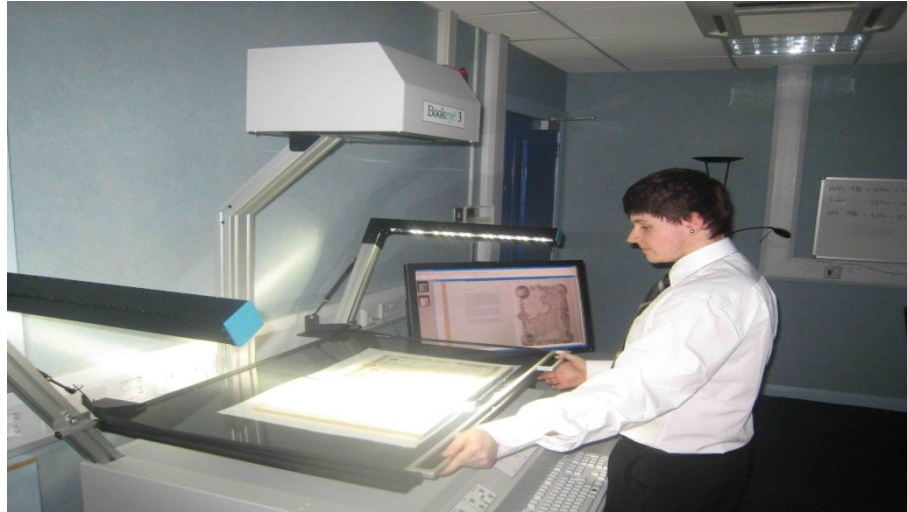
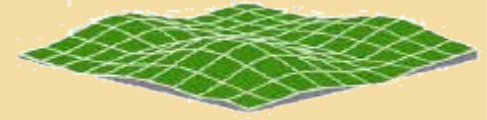
GPS

Direktni Unos



Tastatura

# Unos/kreiranje podataka



**KEY FEATURES**

- MULTI MODE SAR PAYLOAD:
  - SPOT
  - STRIP
  - MOSAIC
  - WIDE COVERAGE
- ELECTRONIC STEERING
- HIGH COVERAGE RATE
- MRT ABOUT 2 TIMES PER DAY.
- S/C WEIGHT 300 Kg
- PAYLOAD WEIGHT 100 Kg
- HIGH IMAGING CAPABILITY
- HIGH DATA LINK RATE
- MEMORY SIZE - 240 Gbit

SPOT MODE

STRIP MODE



ArcView GIS Version 3.1

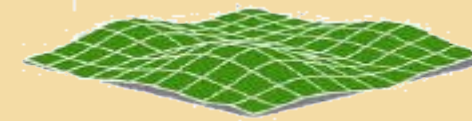
File Edit View Theme Analysis Surface Image Analysis Graphics Window Help

Scale 1: 590,933.41  
4,927,647.45

View1

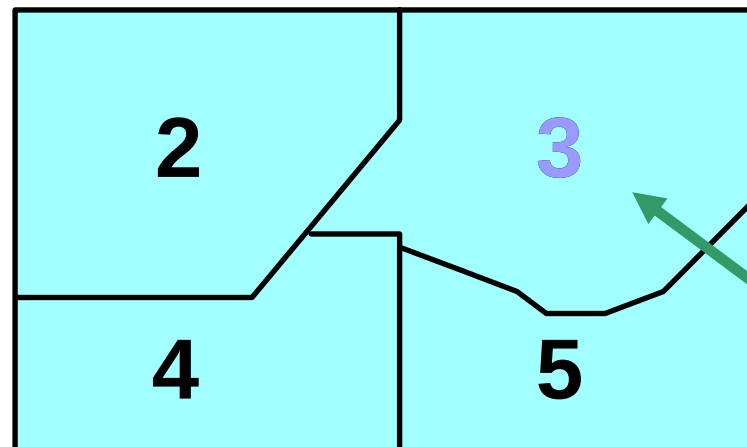
- New features.shp
- Roads.shp
  - Major Roads
  - Secondary Ro
  - Minor Roads
- Spottif
- Soil10
- Linf10
- Land10
- Veg10
- Elev
  - 1000 - 1100
  - 1101 - 1200
  - 1201 - 1300
  - 1301 - 1400
  - 1401 - 1500
  - 1501 - 1600
  - 1601 - 1700
  - 1701 - 1800
  - 1801 - 1900
  - No Data
- Elevrcl
- Hillsh
- Res: 3.1:1
- :Layer\_1





## GIS Memorisanje

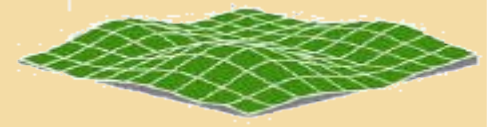
**1** (Poligon)



← *Prostorni podaci*  
(ARC funkcije)

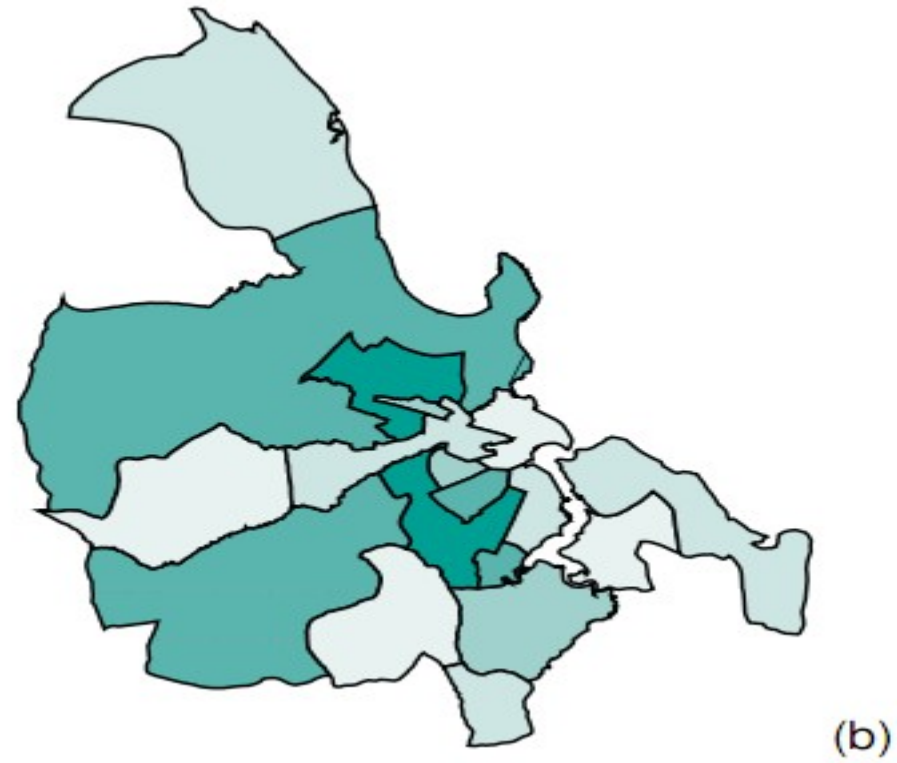
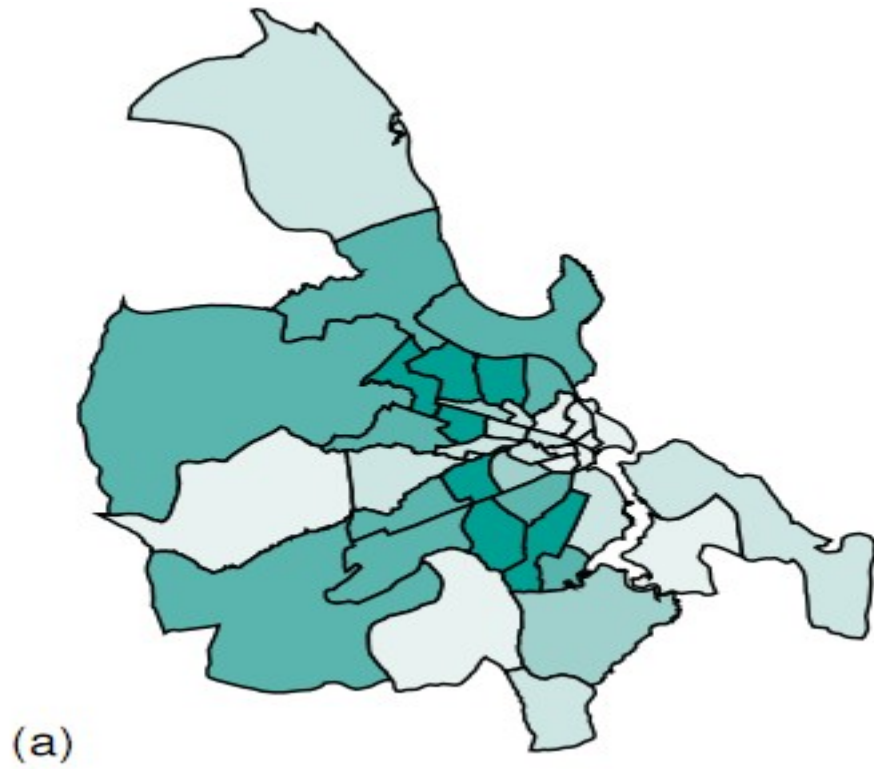
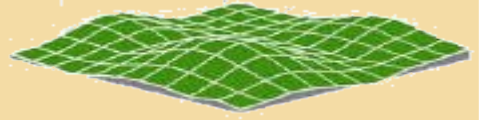
*Podaci o atributima*  
(INFO ili TABELARNE funkcije)

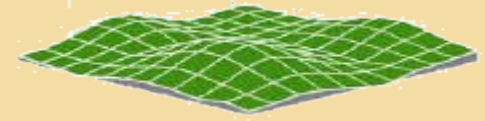
COV#	ZONE	ZIP
1		0
2	C-19	22060
3	A-4	22061
4	C-22	22060
5	A-5	22057



## Prostorne analize i manipulacije podacima

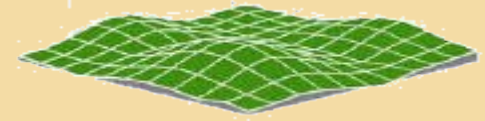
- Standardne manipulacije
  - Reklasifikacija
  - Promena projekcionih parametara
- Standardne Analize
  - Overlay (preklapanje)
  - Buffering (zone uticaja)
  - Networking (mreže)





## **Atributske operacije:**

- Operacije na jednom ili više atributa jednog entiteta
- Operacije na jednom ili više atributa više entiteta koji se preklapaju u prostoru
- Operacije na jednom ili više atributa koji su povezani usmerenim pokazivačima (orijentacija objekta)
- Operacije na atributima entiteta koji su sadržani u drugim entitetima (tačka u poligonu)



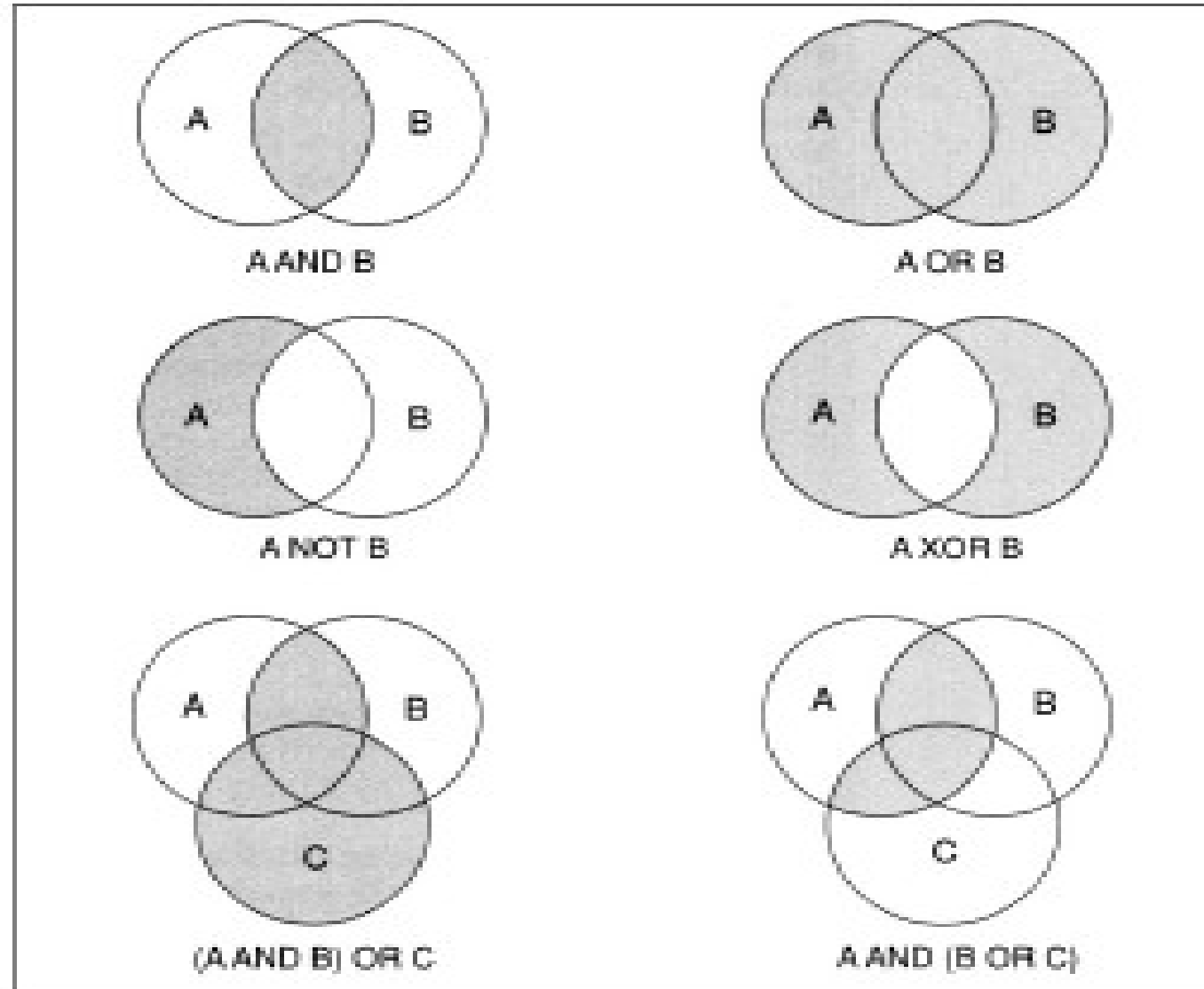
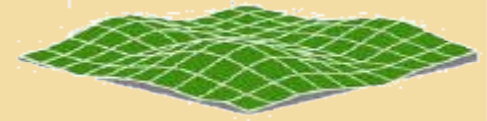
- Za proizvoljnu zadatu lokaciju  $x$ , vrednost izvedenog atributa  $U_i$  data je sa:

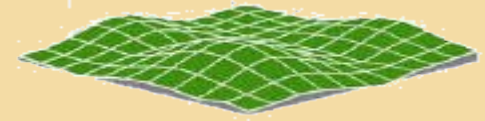
$$U_i = f(A, B, C, D, \dots)$$

gde su  $A, B, C, \dots$  vrednosti atributa korišćenih za ocenu  $U_i$ . Funkcija  $f(\ )$  može biti jedna od:

- (a) Logičke (Bulove) operacije
- (b) Jednostavne i kompleksne aritmetičke operacije, kao i numerički modeli
- (c) Jednodimenzionalna statistička analiza
- (d) Višedimenzionalne statističke metode ili Bajesova statistika za klasifikaciju i diskriminaciju
- (e) Višekriterijumske metode, metode zasnovane na veštačkoj inteligenciji, neuronske mreže.

# Bool-ova Algebra

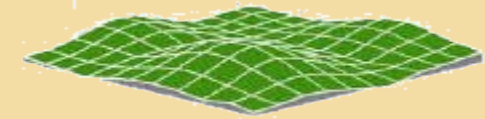




## Lokacione operacije

- Operacije lociranja entiteta s obzirom na jednostavna Euklidska rastojanja ili lokacione kriterijume
- Operacije kreiranja bafer zona oko entiteta
- Operacije sa ugrađenom prostornom topologijom
- Operacije modeliranja prostornih interakcija u okviru povezane mreže

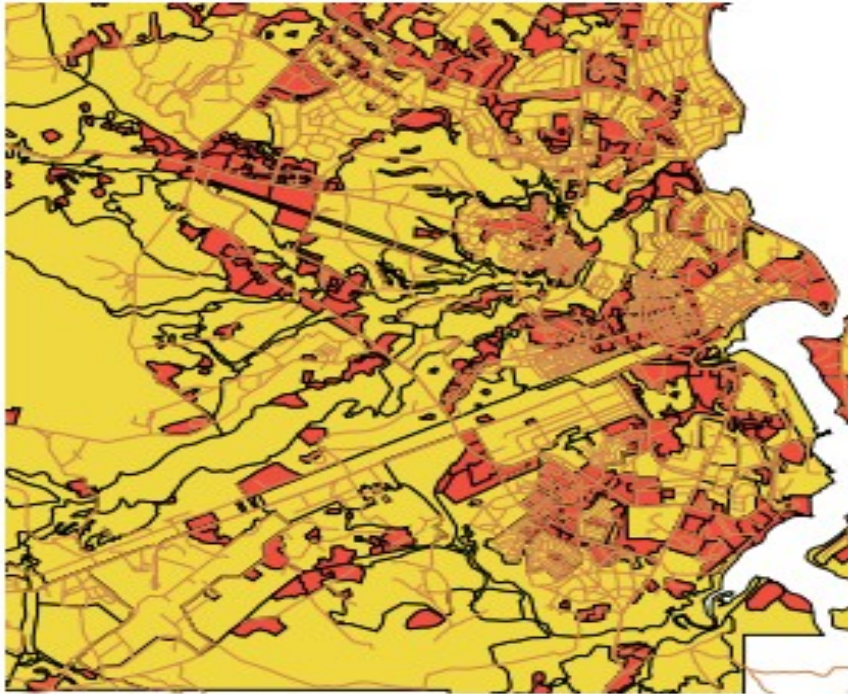
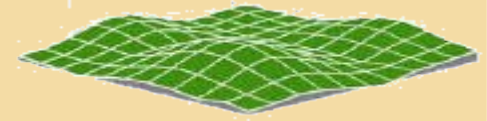
# Selektovanje entiteta



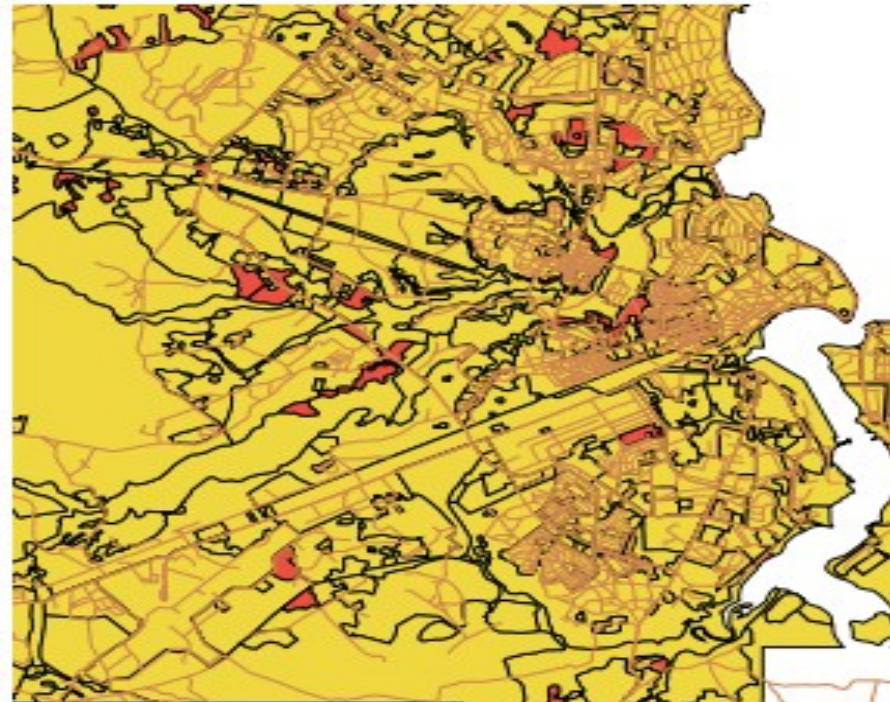
Area	Perimeter	Wland_id	Wland_nam	District	Pop88	Pop92
65 420 390.00 00	4 16 54 940 000	1	KUNDU CHI	Ki non dari	221 08	272 12.00
24 813 620.00 00	307 55 620 000	2	KRAME	Ki non dari	328 54	404 43.00
12 698 900.00 00	264 03 580 000	3	MBASANI	Ki non dari	512 25	630 58.00
81 849 210.00 00	492 45 180 000	4	USJUNG O	Ki non dari	472 21	582 03.00
44 635 45 000 00	124 50 130 000	5	NA NZESE	Ki non dari	394 57	732 24.00
49 925 92.000 00	103 58 850 000	6	TANDAL E	Ki non dari	583 57	718 37.00
41 022 18.000 00	8 251. 02 800 0	7	KWANANYAMALA	Ki non dari	722 58	828 09.00
37 499 40.000 00	9 447. 42 000 0	8	HINDINDONI	Ki non dari	423 01	520 73.00
20 875 02.000 00	7 502. 25 000 0	9	URANGA WEST	Ita la	9 852	11 428.0 0
22 885 13.000 00	9 028. 78 800 0	10	KIVUKONI	Ita la	8 321	8 254.00
14 000 24.000 00	8 893. 28 800 0	11	NDUGUMBI	Ki non dari	325 48	400 27.00
88 898. 9 000 00	4 589. 110 000	12	IRAGOMBI	Ki non dari	189 38	208 51.00
14 483 70.000 00	8 851. 05 800 0	13	URANGA EAST	Ita la	11019	127 82.00
52 143 78.000 00	145 52 050 000	14	MABI SO	Ki non dari	433 21	534 02.00
24 955 22.000 00	7 121 25 500 0	15	MAKURUNDA	Ki non dari	541 41	655 45.00
12 820 28.000 00	4 885 79 300 0	16	MZIMUNI	Ki non dari	239 82	295 30.00
35 382 240.00 00	229 78 090 000	17	KINYERESI	Ita la	3 044	3 531.00
10 108 13.000 00	5 323 77 100 0	18	JANGIRANI	Ita la	152 97	177 45.00
47 5745. 5 000 00	3 043 08 800 0	19	KISUTU	Ita la	8 392	9 743.00
17 840 43.000 00	7 743. 18 700 0	20	KSO SO	Ki non dari	213 87	281 80.00
29 294 250.00 00	352 64 000 000	21	KGAMBONI	Ta maka	232 03	278 58.00
12 914 72.000 00	5 187. 69 000 0	22	MCHIKICHINI	Ita la	148 52	172 28.00
72 0322. 1 000 00	4 342 73 200 0	23	MCHAFUKOGE	Ita la	8 439	9 789.00
62 667 37.000 00	153 21 330 000	24	TRATA	Ita la	184 24	234 27.00
48 3820. 7 000 00	3 304 07 200 0	25	KARAKO O	Ita la	125 08	145 07.00
35 848 53.000 00	9 588 78 100 0	26	BUGURUNI	Ita la	482 88	580 12.00
28 325 75.000 00	8 970. 18 800 0	27	L ALA	Ita la	383 72	410 32.00
91 2452. 8 000 00	4 021. 93 700 0	28	GEREZANI	Ita la	7 490	8 888.00
87 351 35.000 00	135 79 590 000	29	KURASINI	Ta maka	287 37	318 71.00



# Selektovanje po atributima

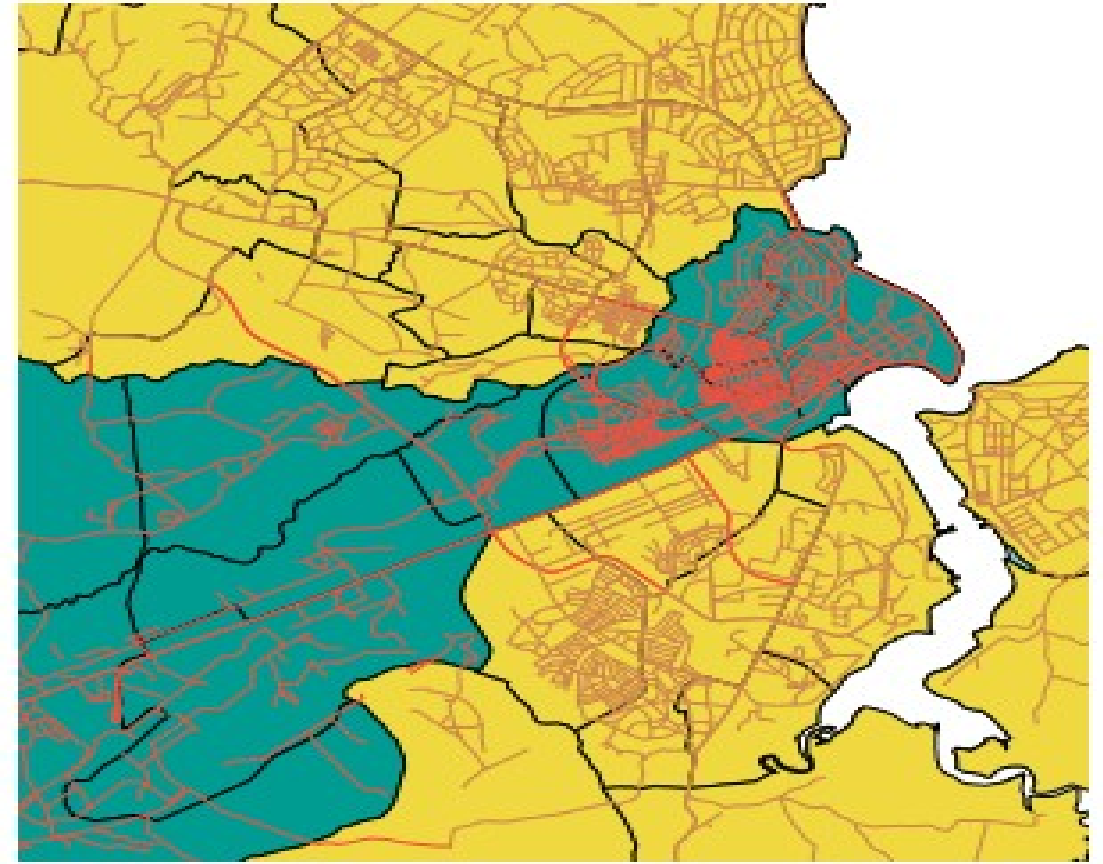
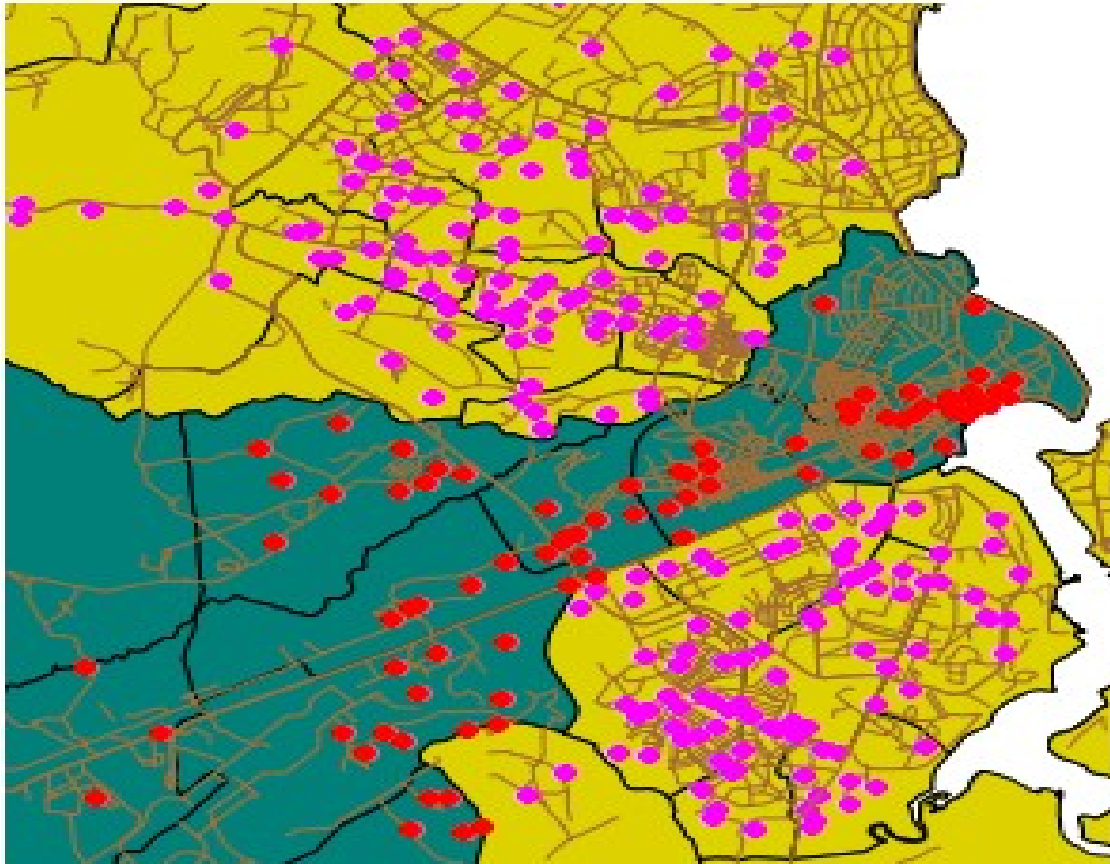
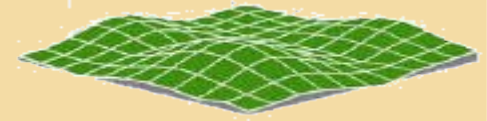


Area	IDs	LandUse
174308.70	2	30
2066475.00	3	70
214582.50	4	80
29313.86	5	80
73328.08	6	80
53303.30	7	80
614530.10	8	20
1637161.00	9	80
156357.40	10	70
59202.20	11	20

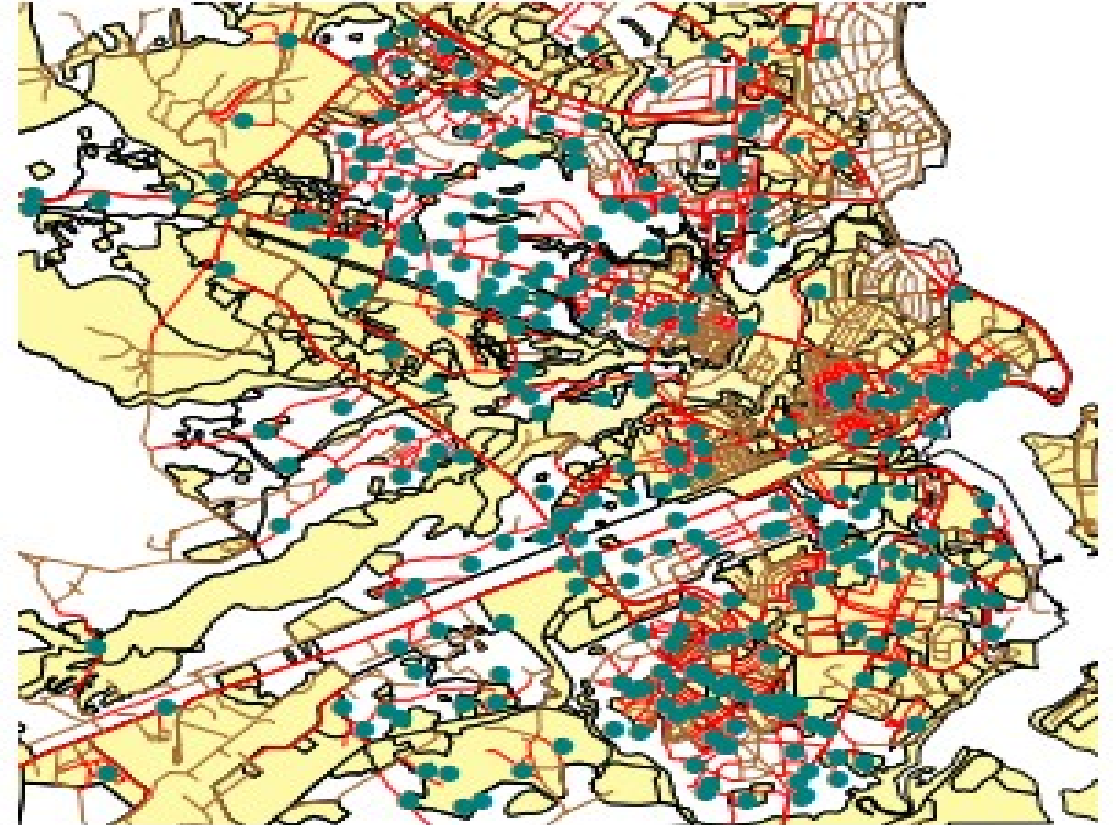
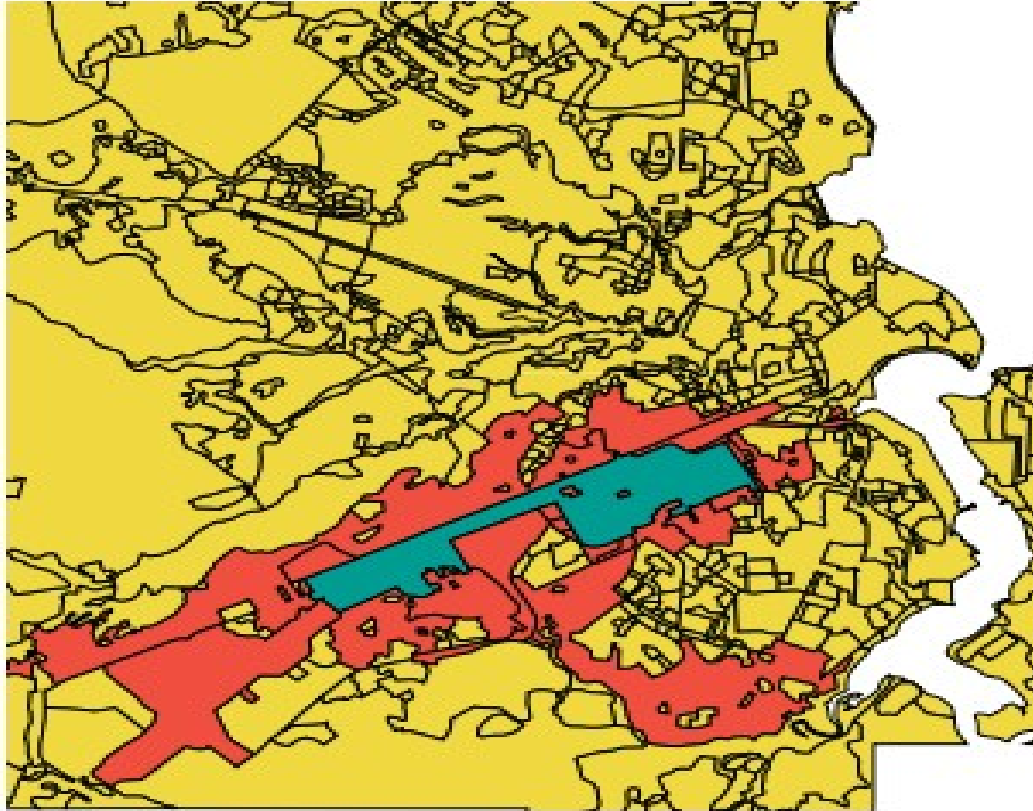
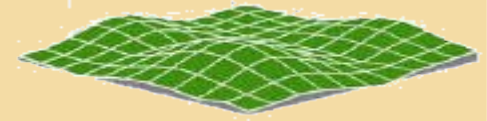


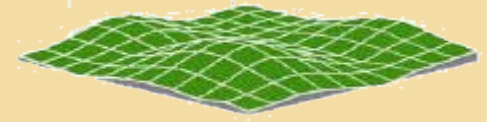
Area	IDs	LandUse
174308.70	2	30
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53303.30	7	80
614530.10	8	20
1637161.00	9	80
156357.40	10	70
59202.20	11	20
83289.59	12	80
225642.20	13	20
28377.33	14	40
228930.30	15	30
986242.30	16	70

# Selektovanje na osnovu topoloških relacija

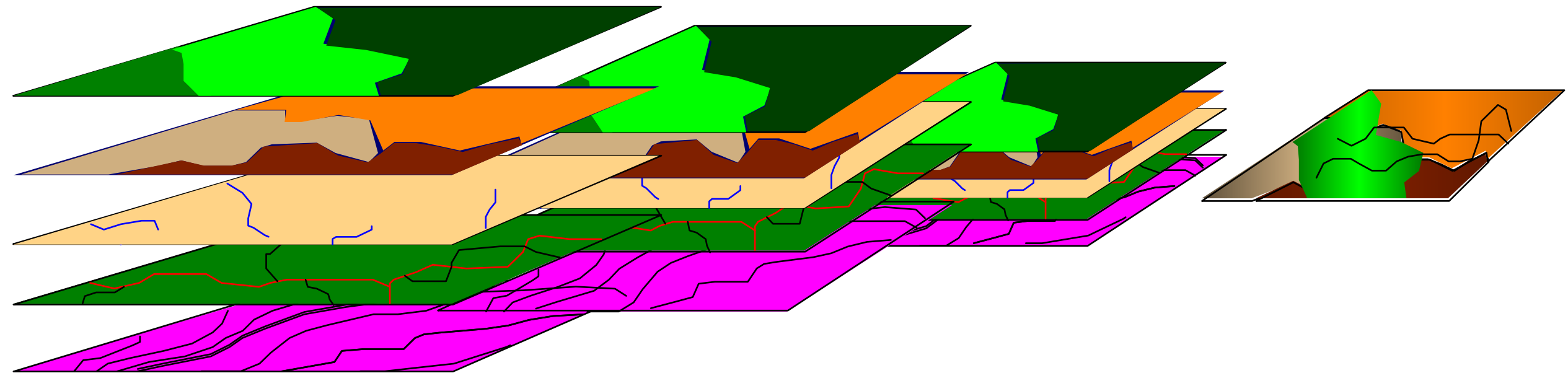


# Selektovanje na osnovu topoloških relacija

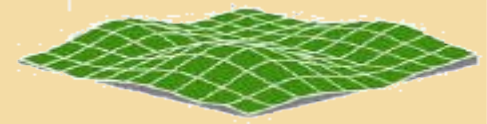




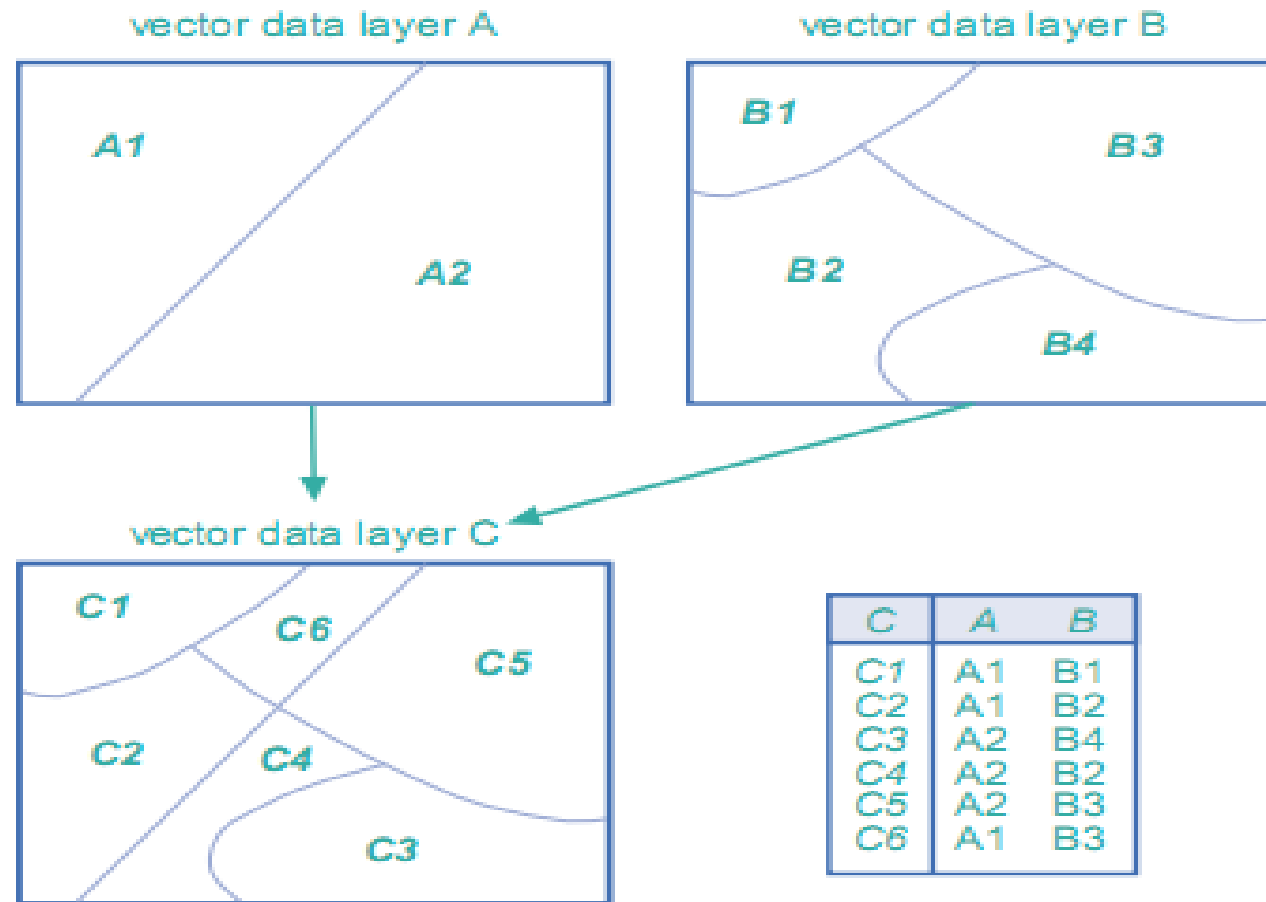
- *Overlay* funkcija kreira nove “lejere” u cilju rešavanja konkretnih zadataka



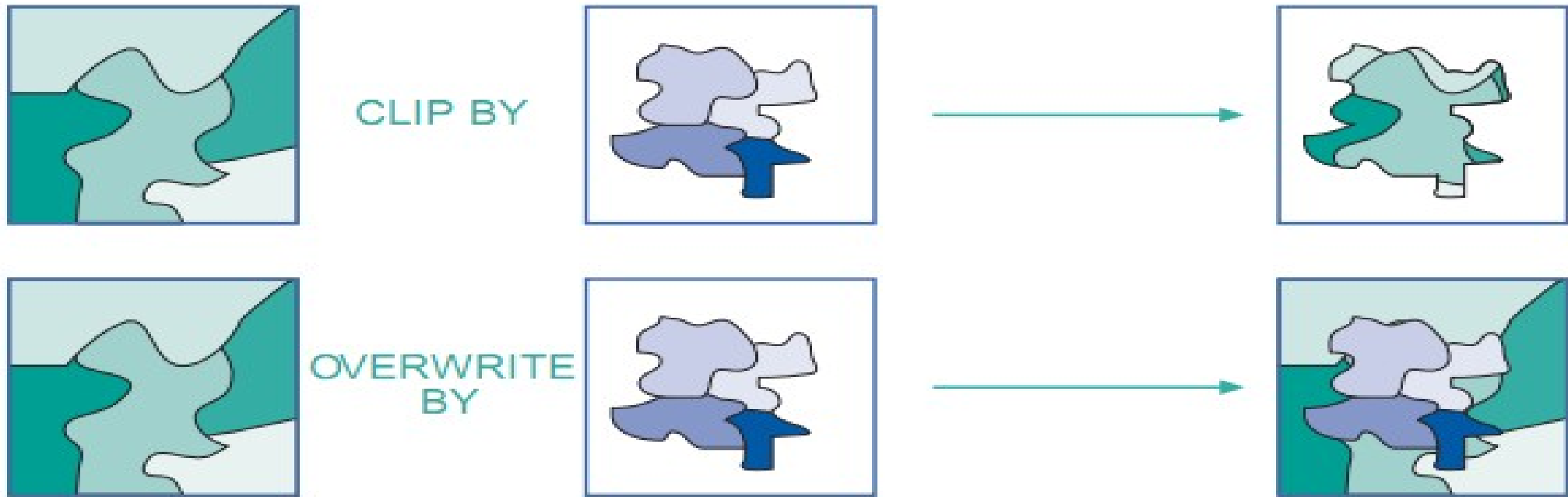
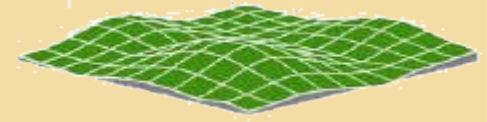
# Overlay (preklapanje)



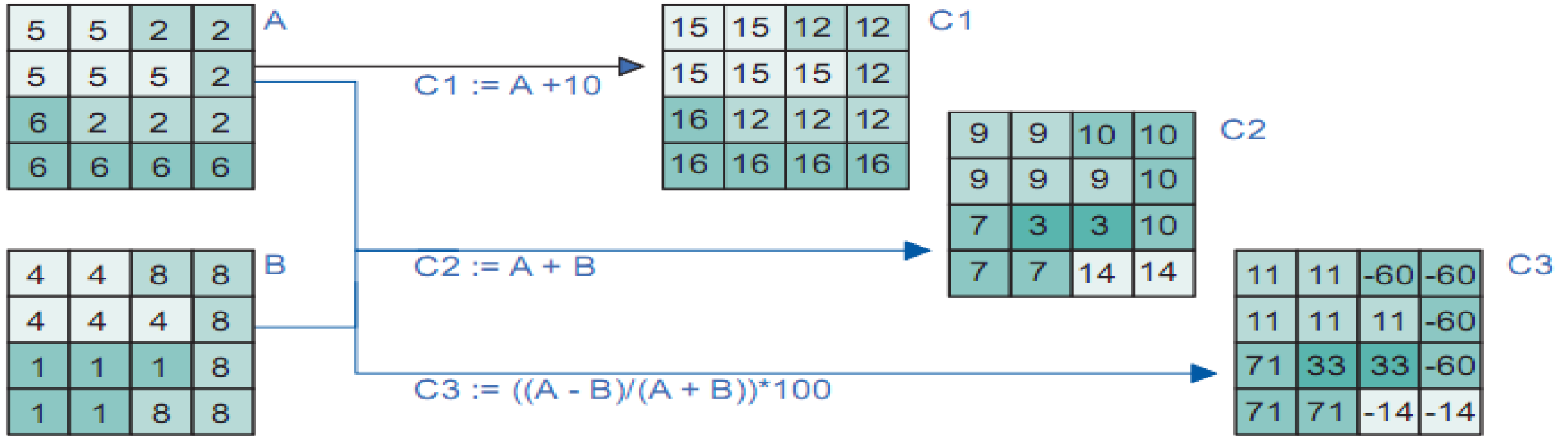
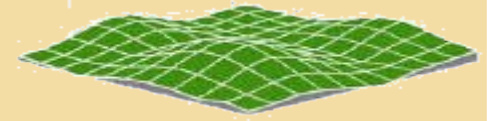
## Presecanje poligona



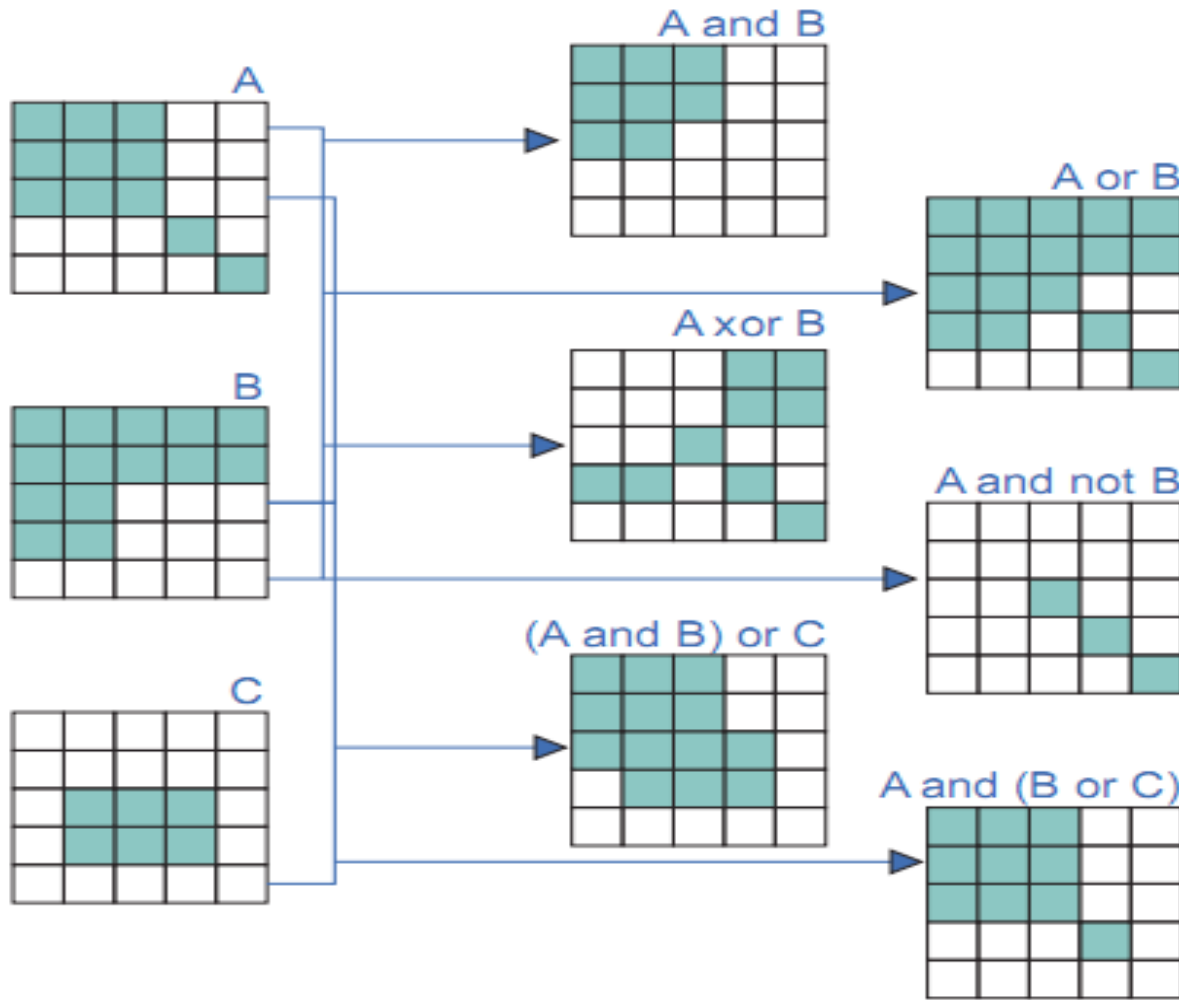
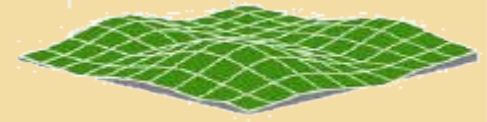
# Overlay (preklapanje)



# Operacije sa rasterima (map algebra)



# Operacije sa rasterima (map algebra)



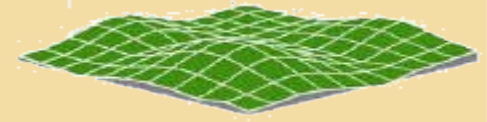
- Bulova algebra

■ TRUE

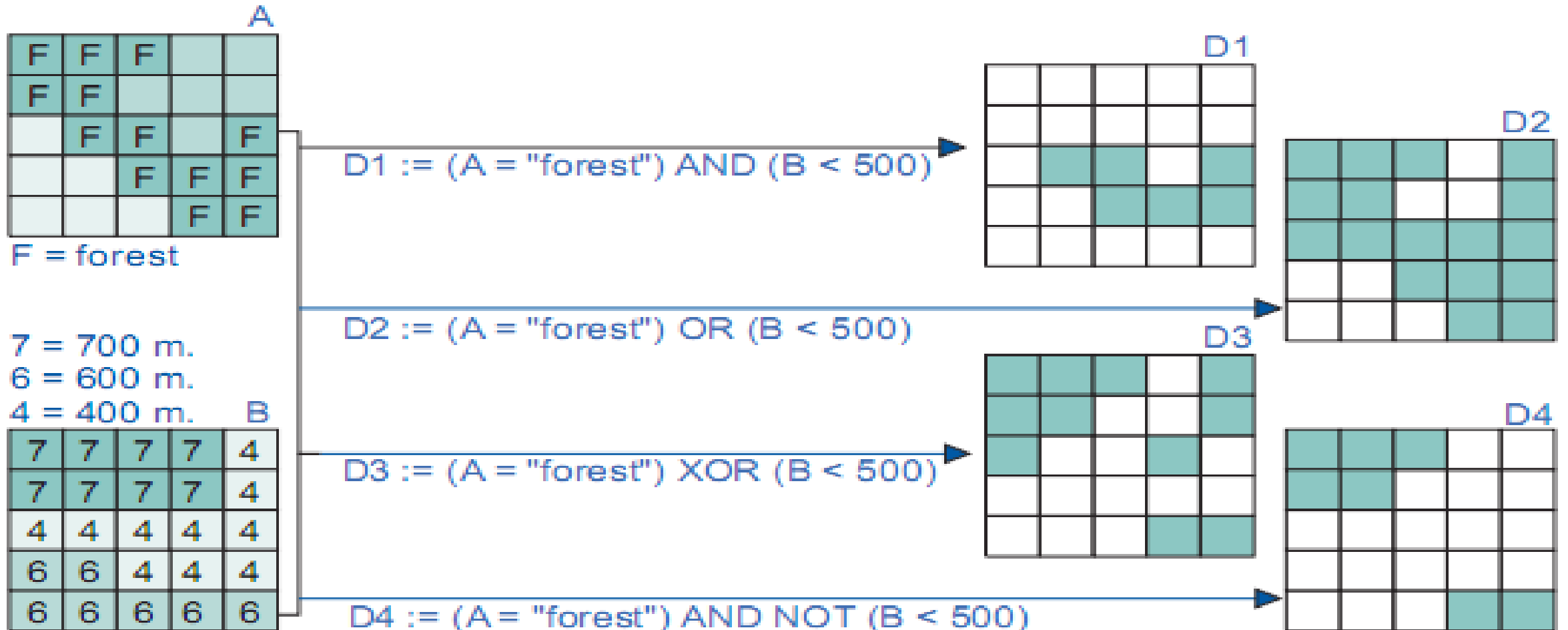
□ FALSE



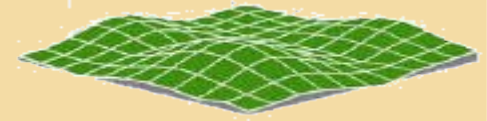
# Operacije sa rasterima (map algebra)



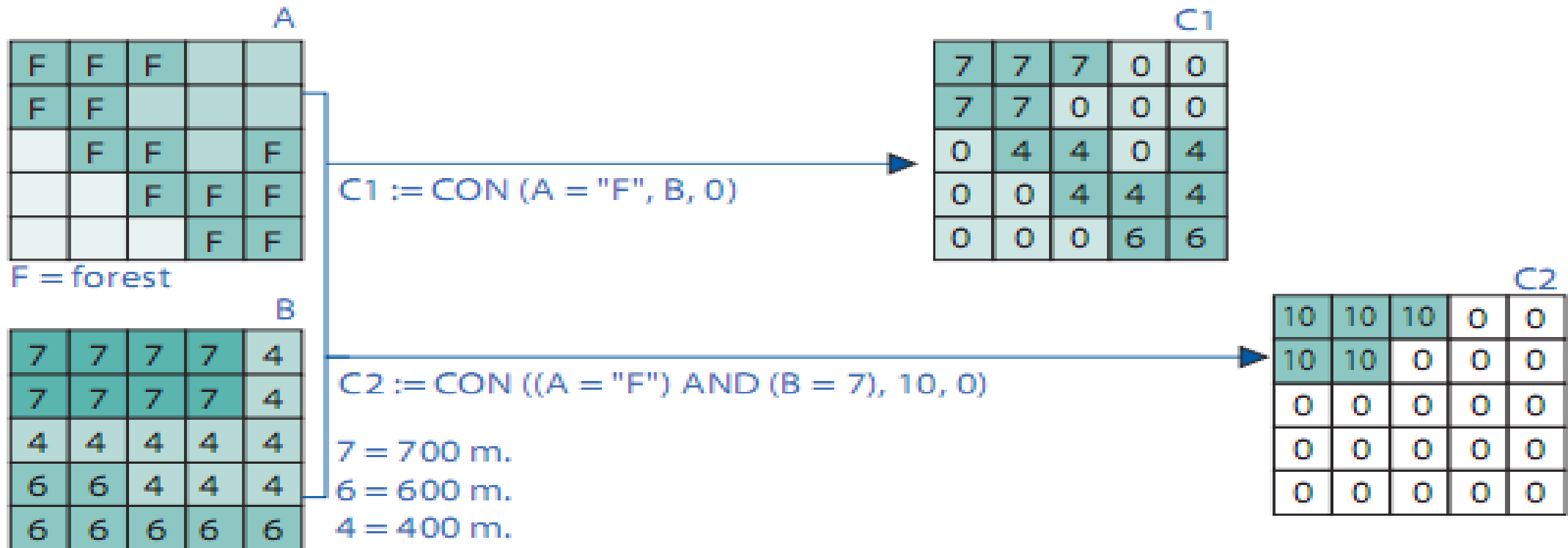
- Logičke operacije



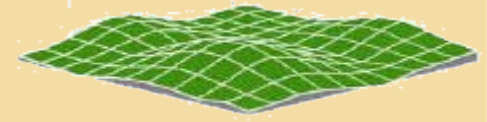
# Operacije sa rasterima (map algebra)



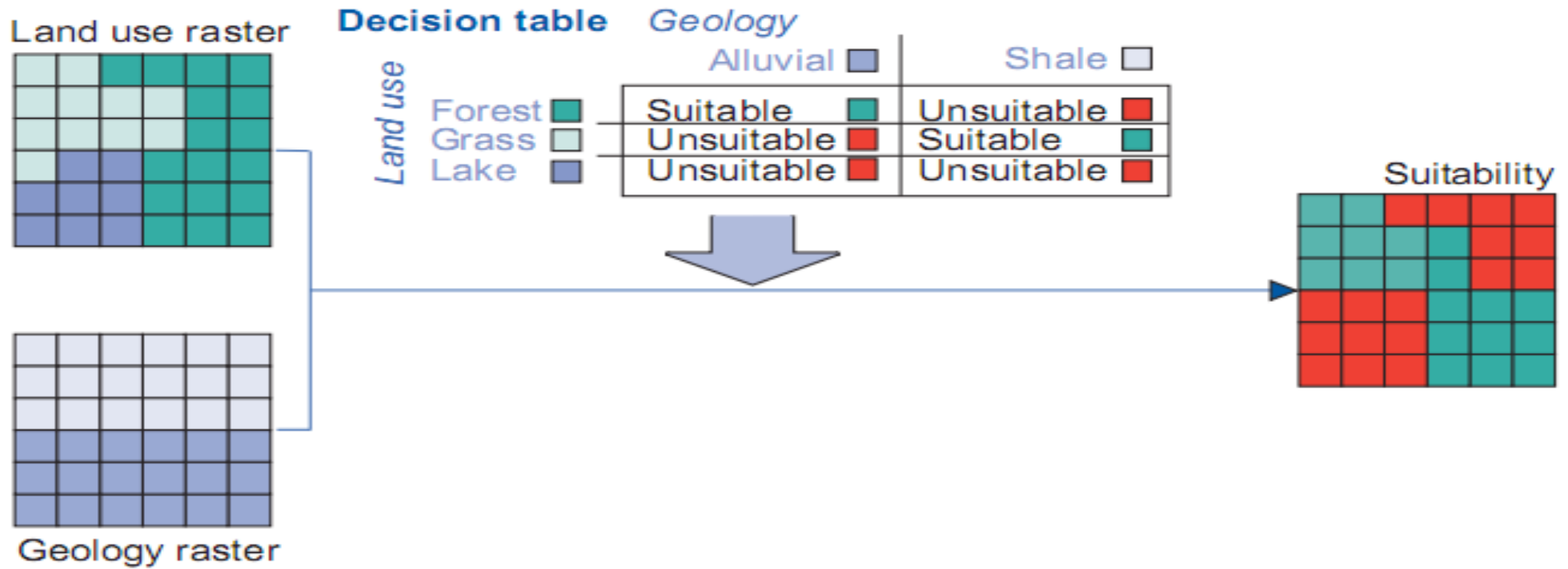
- Kondicionalni izrazi



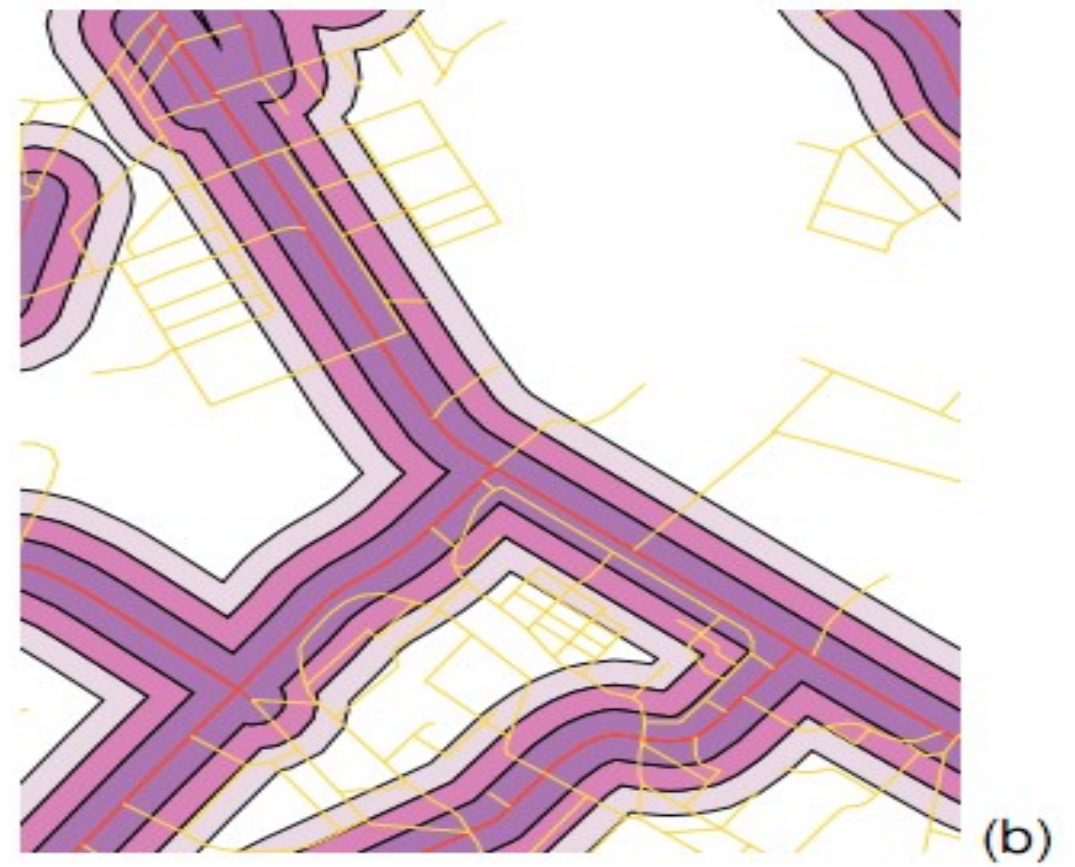
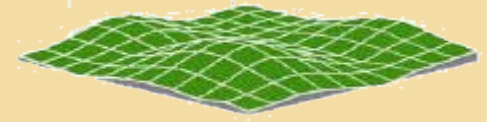
# Operacije sa rasterima

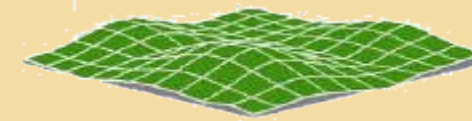


- *Overlay* na osnovu odluke

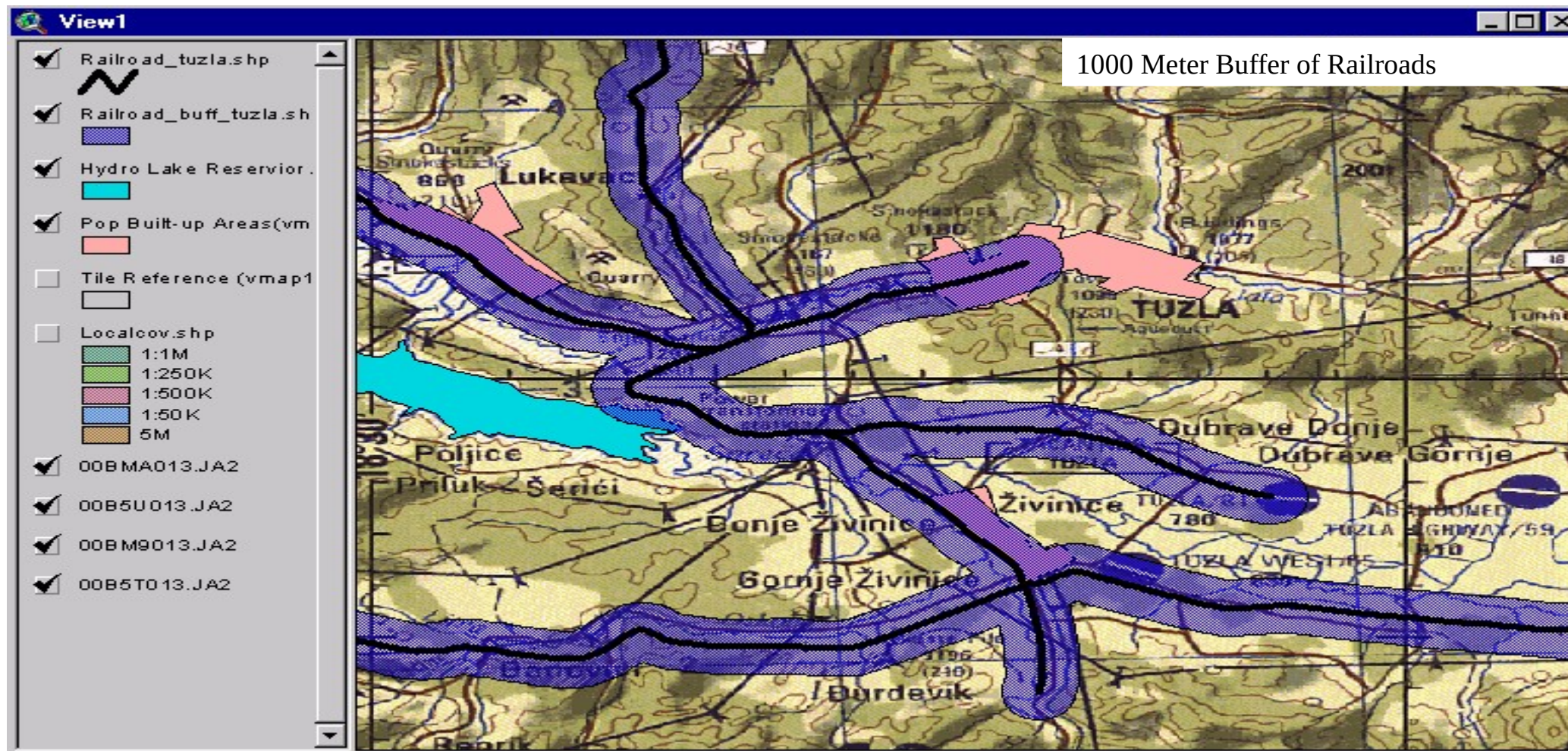


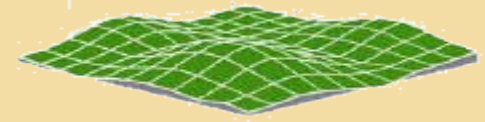
# Buffering (zone uticaja)





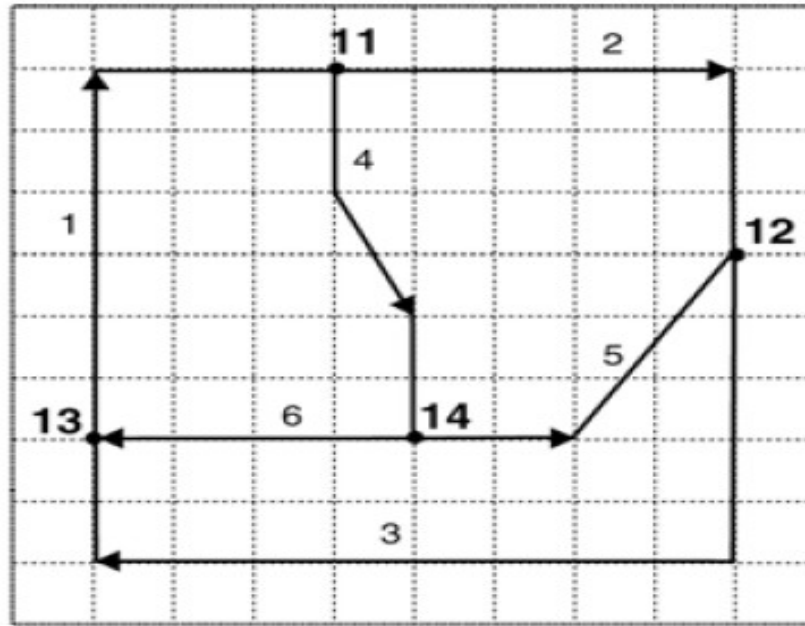
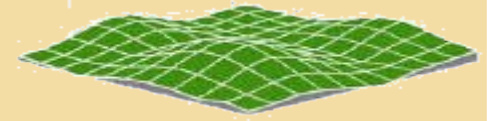
## Analize udaljenosti (Buffers)





- Optimizacija servisnih usluga (*Location-allocation Problems*)  
Minimizacija ukupne distance putanja, maksimizacija profita, minimizacija putnih i servisnih troškova
- Utvrđivajne putanja (*Routing Problems*)  
Pronalaženje najkraće (najjeftinije) putanje od polazišta do odredišta
- Utvrđivanje lokacija (*Optimizing Point Locations*)  
Utvrđivajne novih lokacija za servisene usluge, odbacivaje postojećih
- Optimalne putanje (*Optimum Paths*)  
Pronalazak optimalne putanje na kontinulanoj površi

# Networking (topologija)



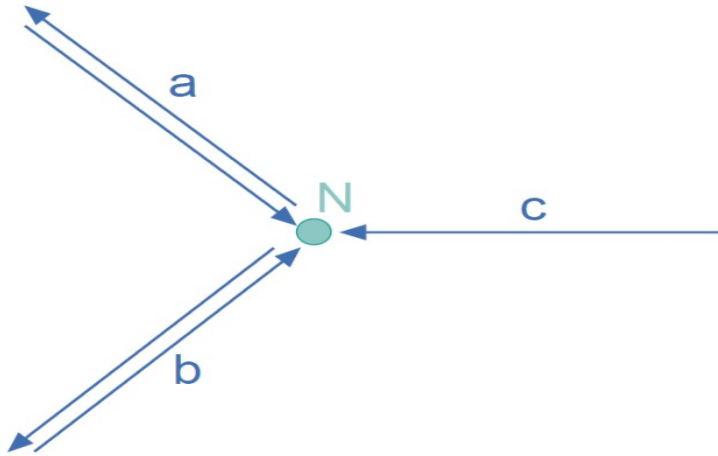
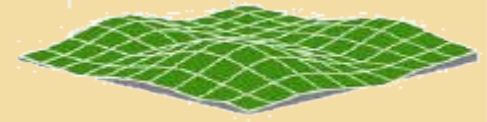
Matrica graničenja (adjacency)

	11	12	13	14
11	0	1	0	1
12	0	0	1	0
13	1	0	0	0
14	0	1	1	0

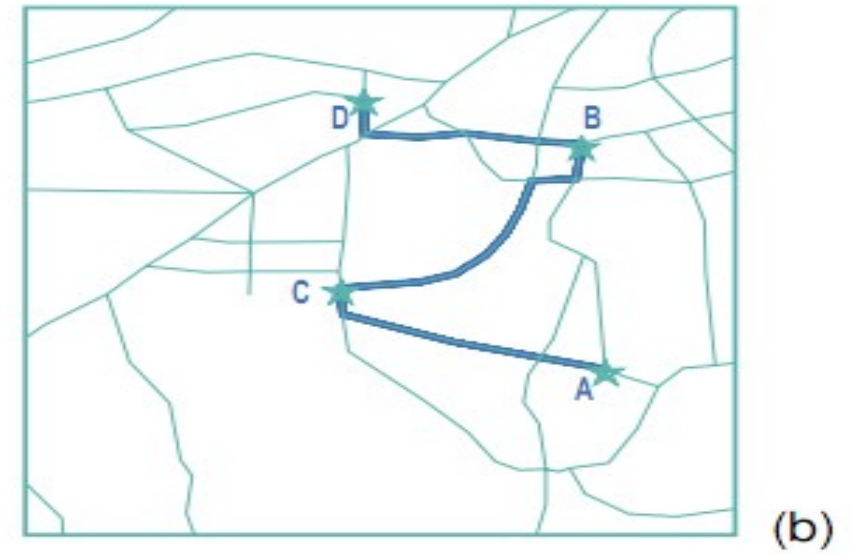
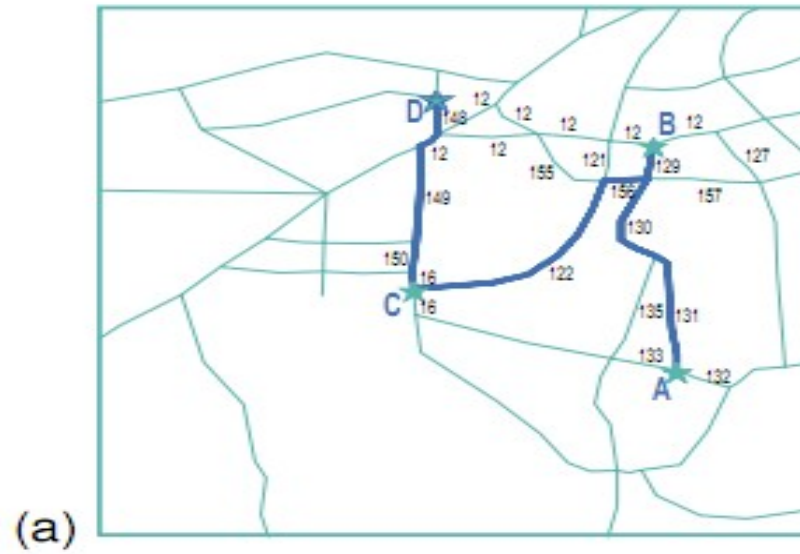
Matrica ishodišta (incidence)

	1	2	3	4	5	6
11	-1	1	0	1	0	0
12	0	-1	1	0	-1	0
13	1	0	-1	0	0	-1
14	0	0	0	-1	1	1

# Networking (mrežne analize)

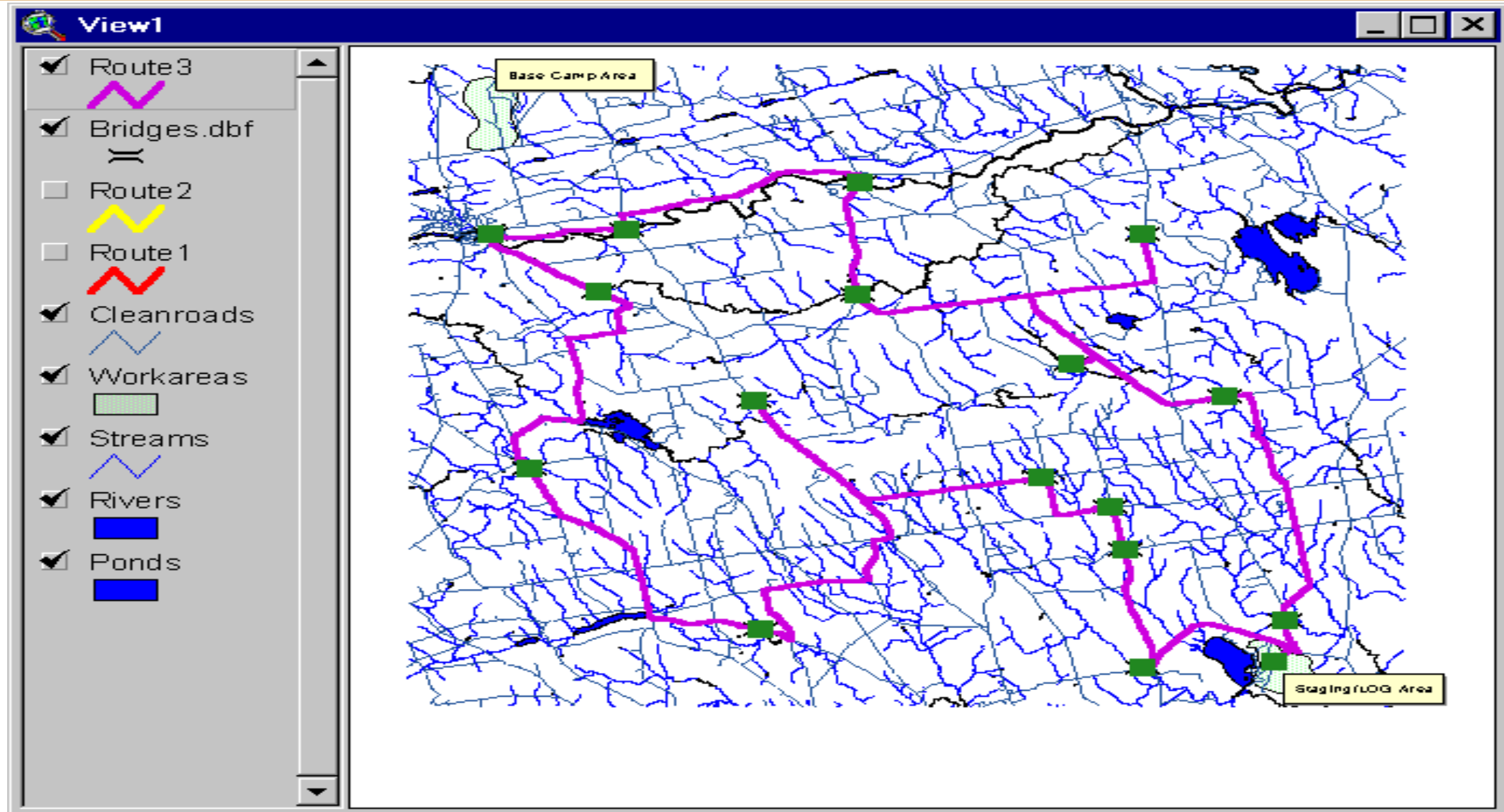
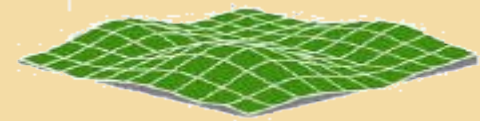


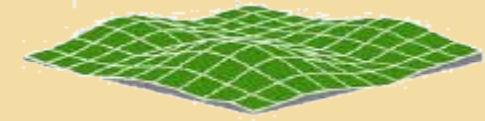
<i>from</i>	<i>onto</i>	<i>cost</i>
a	a	×
a	b	5
b	a	8
b	b	15
c	a	3
c	b	6





# Mrežne analize

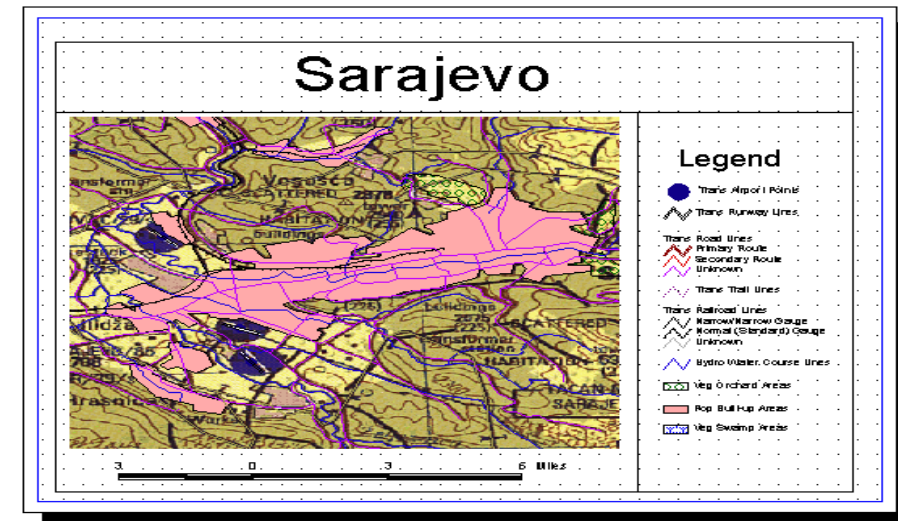
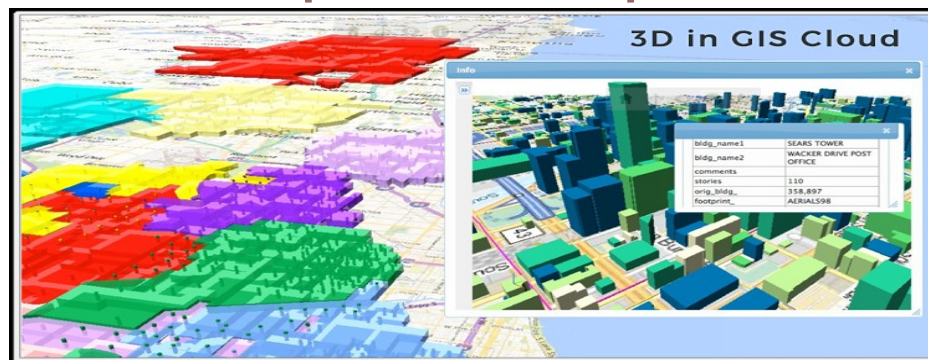




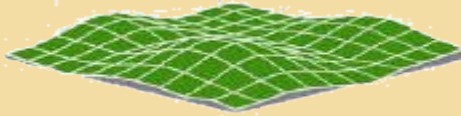
## Prikazi prostornih podataka

- Tabele
- Karte
- Interaktivni prikazi
- 3-D Perspektivni prikazi

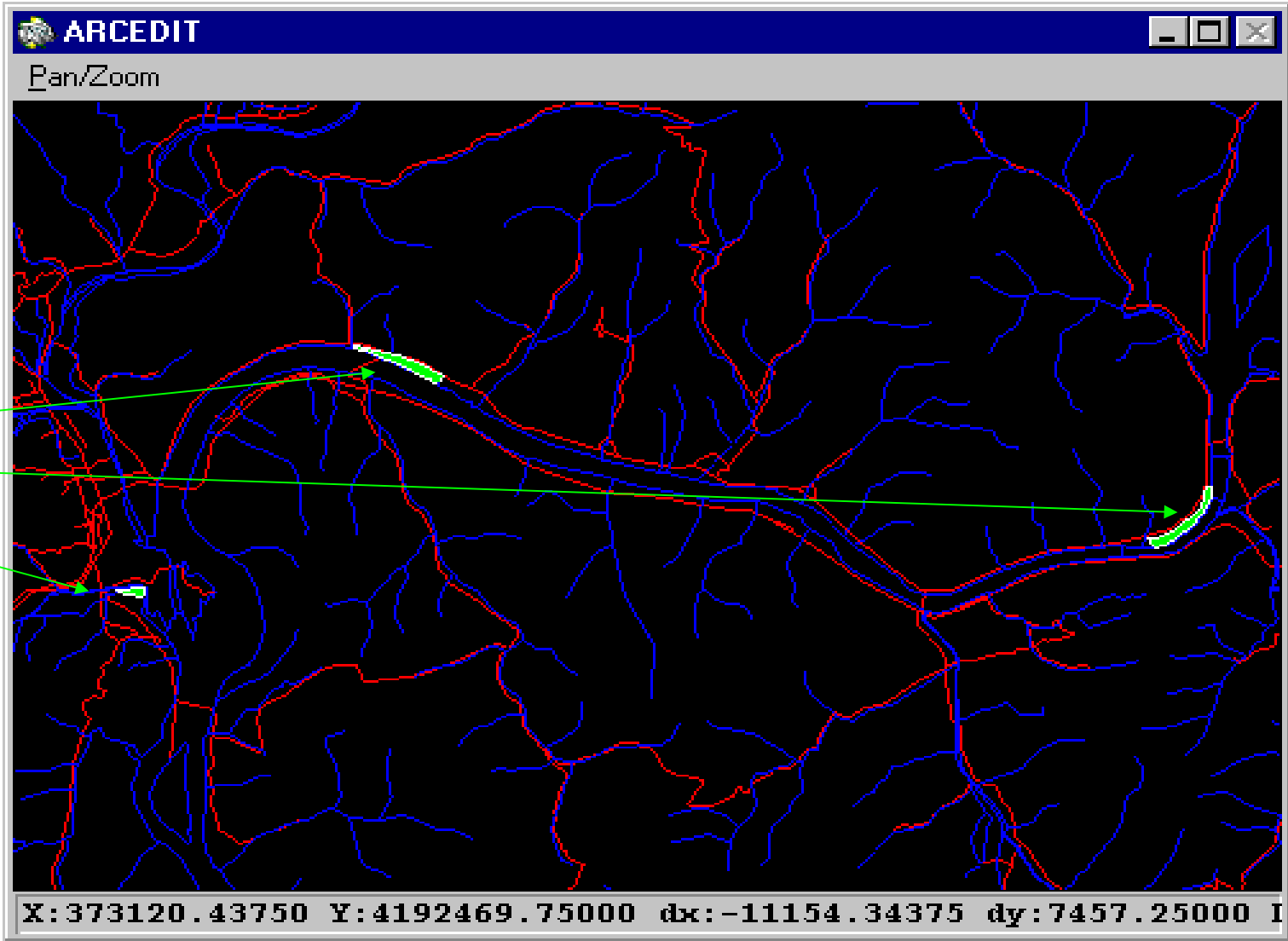
Shape	id	f_code	f_code description	are	are description	nam
Polygon	1	AL020	Built-Up Area	999	Other	Vinkovci
Polygon	2	AL020	Built-Up Area	999	Other	Nustar
Polygon	3	AL020	Built-Up Area	999	Other	Bobota
Polygon	4	AL020	Built-Up Area	999	Other	Otok
Polygon	5	AL020	Built-Up Area	999	Other	Bijelo Brdo
Polygon	6	AL020	Built-Up Area	999	Other	Trpinja
Polygon	7	AL020	Built-Up Area	999	Other	Komletinci
Polygon	8	AL020	Built-Up Area	999	Other	UNK
Polygon	9	AL020	Built-Up Area	999	Other	Backi Monostor
Polygon	10	AL020	Built-Up Area	999	Other	Hercegszanto



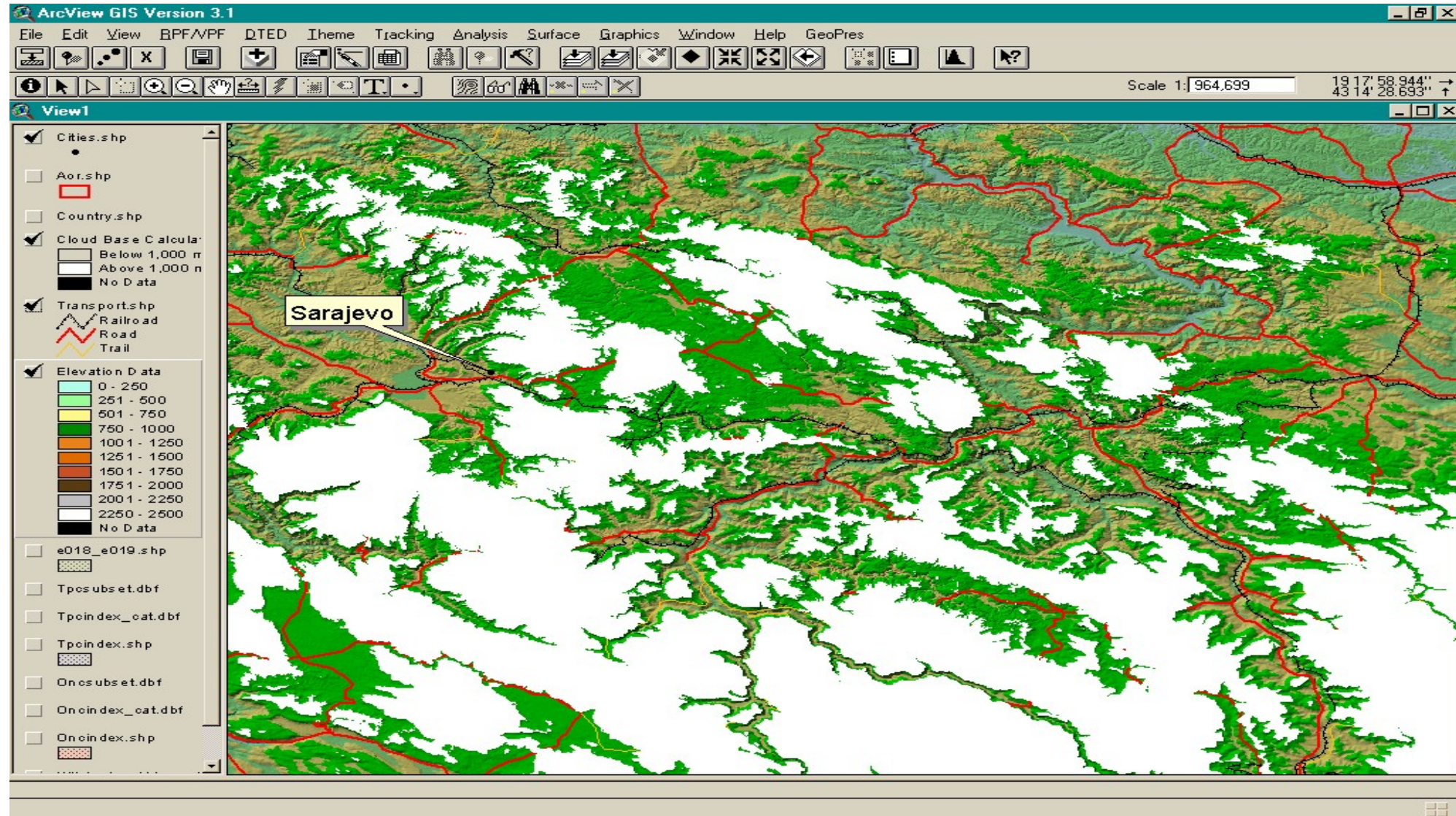
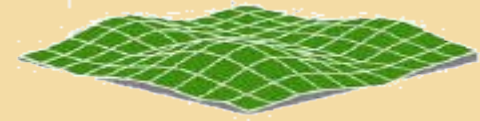
# Zone za spuštanje helikoptera



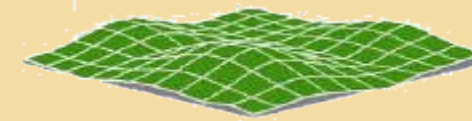
HLZ sites



# Planiranje leta



# Planiranje leta - simulacije



ArcView GIS Version 3.1

File Edit 3D Scene Theme Surface Graphics Window Help

3D Scene1-Viewer1

3D Scene1

- Flinez1.shp
- Roads.shp
  - Major Roads
  - Secondary Roads
  - Minor Roads
- Spot.tif
- Elev
  - 1000 - 1100
  - 1101 - 1200
  - 1201 - 1300
  - 1301 - 1400
  - 1401 - 1500
  - 1501 - 1600
  - 1601 - 1700
  - 1701 - 1800
  - 1801 - 1900
  - No Data

Fly-By Controls

THEME  GRAPHIC  FILE

GO START

PLAY

Line Theme: Flinez1.shp

SAVE to File: [ ]

CAMERA

HEIGHT

Value: 3000

Use as CONSTANT height.  
OR  
 ADD to theme's height.

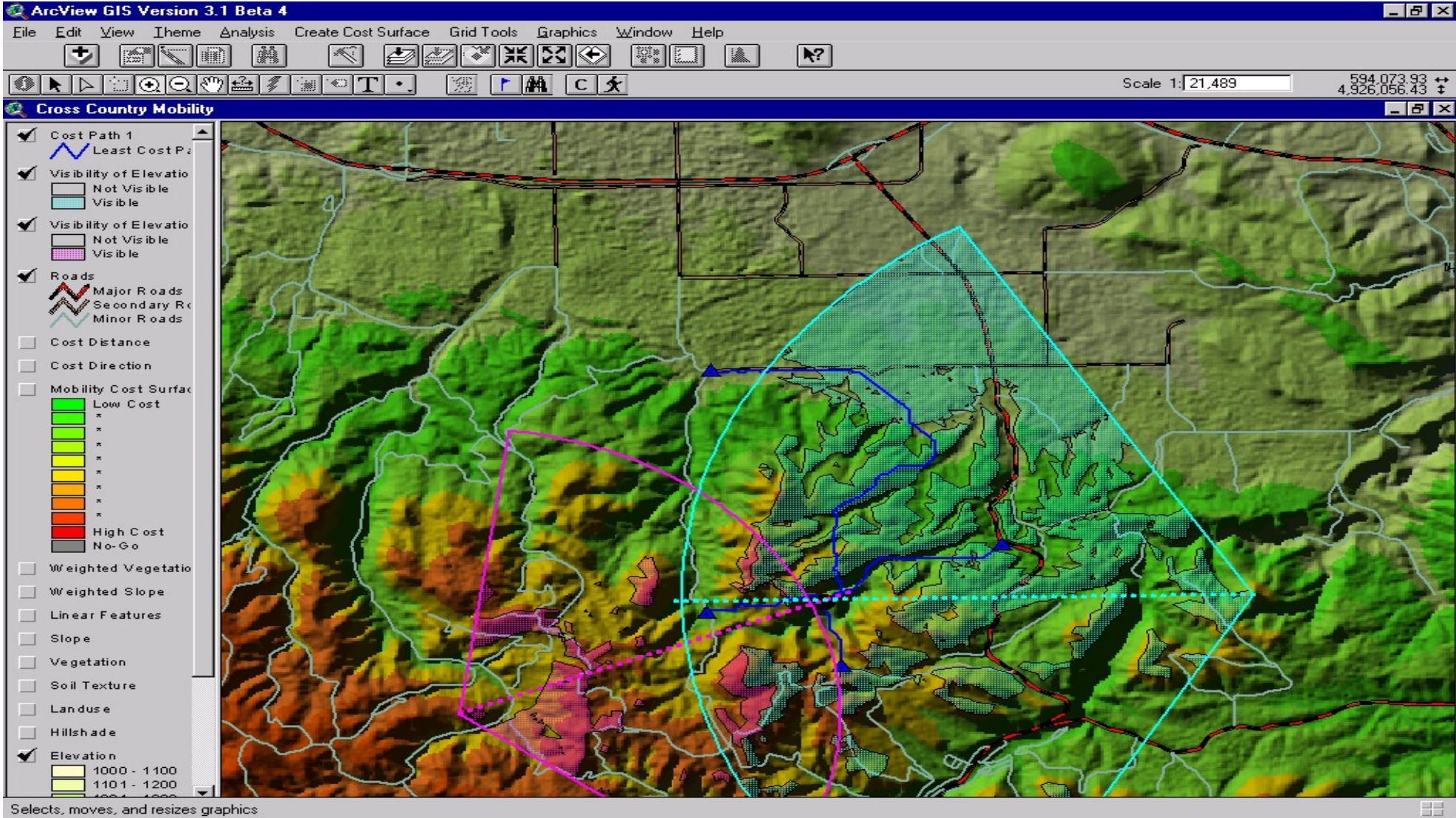
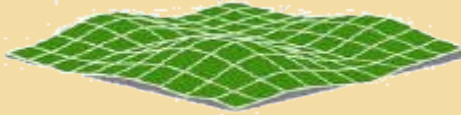
PITCH

SPLINE

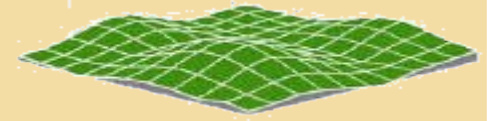
SPEED

Slower Faster

# Analiza dogledanja



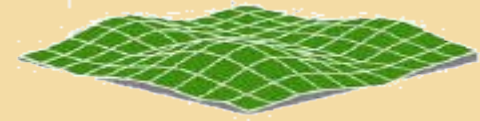
# Upravljanje komunalnim sistemima



The collage displays four different views of the ArcView GIS interface:

- Top Left:** A 'Tax Map' view showing assessed values for a property at 11848 N 90TH WAY. A 'Neighborhood Analysis' window displays a bar chart comparing assessed values across different streets. A 'Property Photograph' window shows a house.
- Top Right:** An 'Incidents near address' view showing a 1/2 mile radius circle around a location. It displays various incident types like 'Firearms', 'Narcotics', and 'Gang Territory' on a map.
- Bottom Left:** A 'Public Works' view showing a detailed utility network with various pipes and valves. It includes several data tables for 'Attributes of Street Lines' and 'Attributes of Water Lines'.
- Bottom Right:** A detailed view of a utility network intersection, showing a complex arrangement of pipes and valves.

# Sletno poletne staze



ArcView GIS Version 3.1

File Edit View Theme Create Cost Surface Tracking Analysis Surface Graphics Network Window Help Military

Scale 1: 1,316,684 30.29 -1.14

**A Key Point Dossiers**

- Region AOI
- Rwanda AOI
- Runway Outline
- Rwandan Cities
  - Kigali
  - Urbanized Ar
  - Other Populat
- Rwandan Airports
- Neighboring Airport
- Rwandan Runways
- Military Bases
- Mine Buffers
- Land Mines
- Roads
- Rwanda
- Rwandan Lakes
- Rwandan Streams
- Urbanized Areas

**Identify Results**

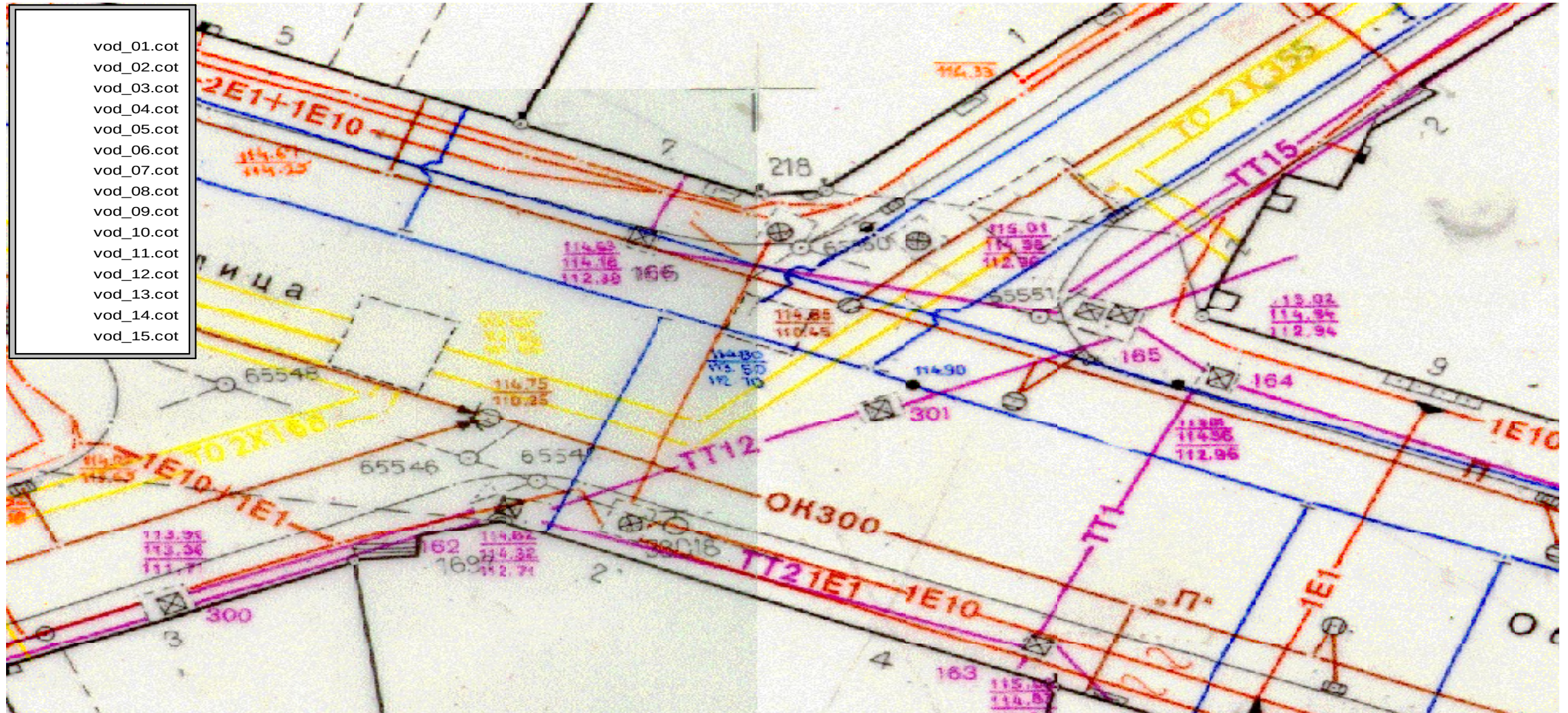
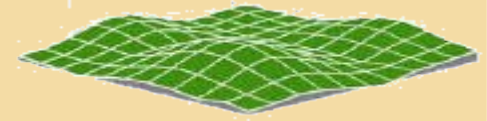
1: Rwandan Airports - KIGALI

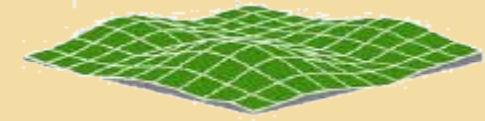
Shape	Point
Name	KIGALI
Ident	RW45746
Prov	
Icao	HRYR
Faa_ident	N
Lat	S0158073/
Long	E03008221/
Loc_datum	WGE
Wgs_datum	WGE
Wgs_lat	S0158073/
Wgs_long	E03008221/
Elevation	04891
Type	A
Mag_var	W000285 1297
Wac	0933






















**Image4**

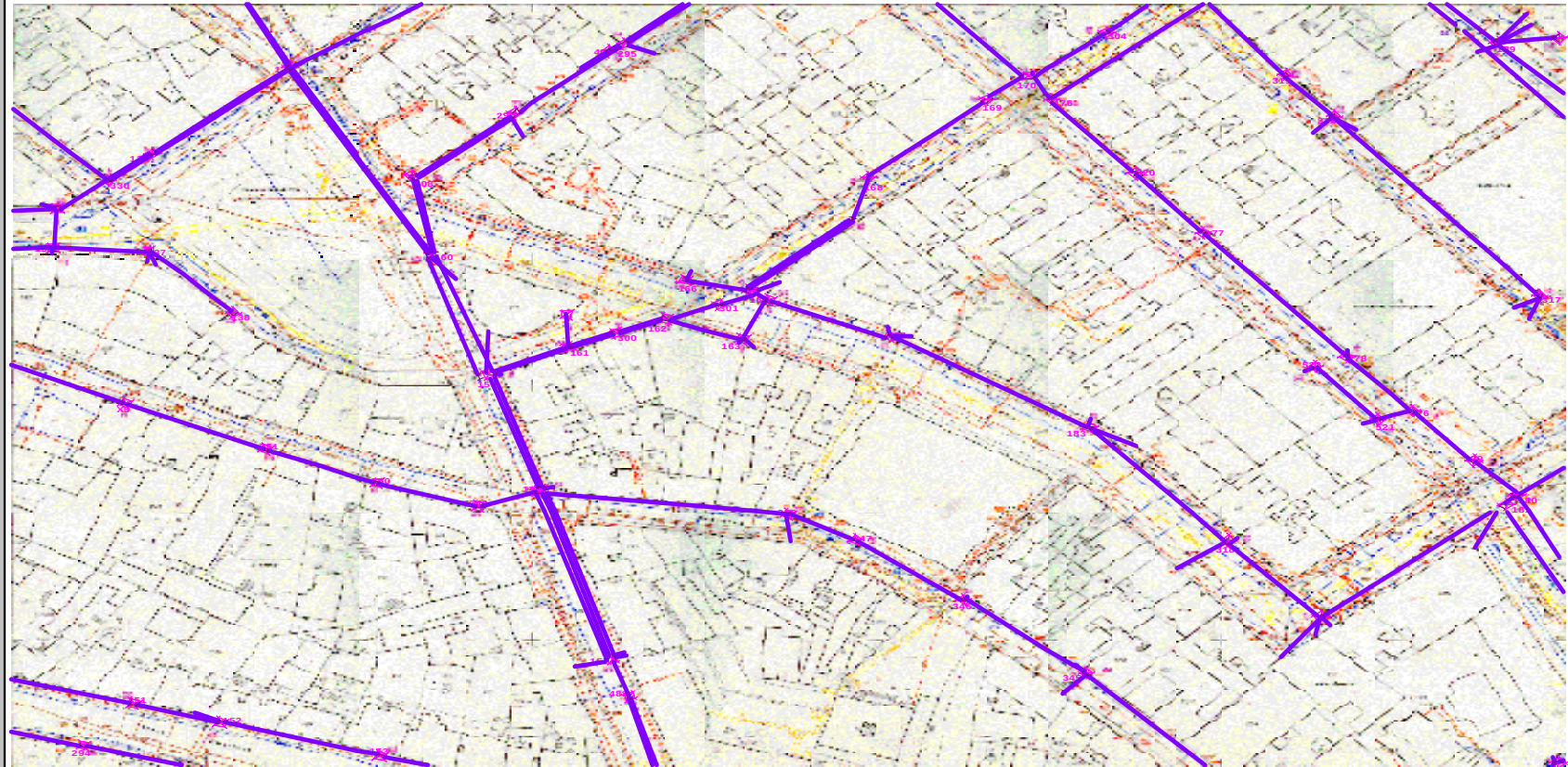


# DETALJ SKENIRANOG LISTA KATASTRA VODOVA R=1:500

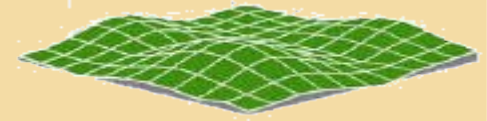




-  Antenski TT stub
-  Alarmni telefon
-  Objekti Telekomunikacije
-  Kablovska Kanalizacija
-  Kablovska TTKno
-  Broj TTKna
-  Armirani Kablovi
-  Kablovska Kucica
-  Kablovski Nastavak
-  Kablovski Razdelnik
-  Konzola
-  Krovni Nosac Za Vazdusne Vodove
-  Nastavak ITT Stubic
-  Podzemno Gasno Kuciste
-  Podzemno Pojacivacko Kuciste
-  Pojacivacka Kucica
-  Prelaz Sa Kablovske Na Vazdusni Vod TT
-  Telefon Na Taxi Stanici
-  Telefonska Govornica
-  TT Stub
-  Znak Za Radio iTV Uredjaje I Stanice
- List 46-1
- List 46-2
- List 46-3
- List 46-4
- List 46-5
- List 46-6
- List 46-7
- List 46-8
- List 46-9
- List 46-10
- List 46-11
- List 46-12



# Antenski prijemi



ArcView GIS Version 3.1 Beta 3

File Edit View Theme Analysis Surface PCS Graphics Window Help

Scale 1: 203,068 562,860.37 4,191,124.59

San Francisco - Propagation Data

Antennae Utilities

Antennae Properties

General

Site Id#: ABC001

Broadcast Sweep

From: 315

To: 225

Scan Limits

Upper: 45

Lower: -90

Broadcast Range and Elevation Offset

Offset: 0 meters

Range: 10000 meters

Origin: [543,696.06, 4,162,309.45] m Extent: [17.07, 20.00] km Area: 341.42 sq km

# Perspektivni prikazi

