



GRASS GIS 7

Network analysis

Siki Zoltán

Mottó:

Computers are like air conditioners -
they stop working properly when you open Windows.

OSM adatok

OSM adat letöltési lehetőségek:

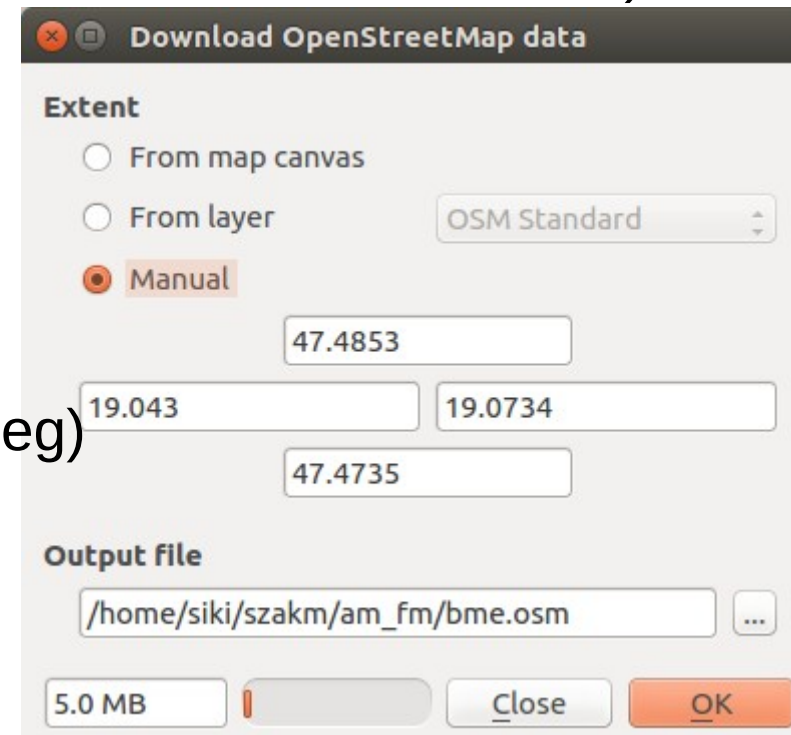
- <http://download.geofabrik.de/europe/hungary.html> shp, osm, pbf
- **QGIS 2.x OpenStreetMap Download modul**
- <http://www.openstreetmap.org/export#map=15/47.4748/19.0403>

Kapcsoljuk be a QGIS-ben QuickMapServices modult (QMS) és az OpenStreetMap Download modult (telepítsük ha szükséges)

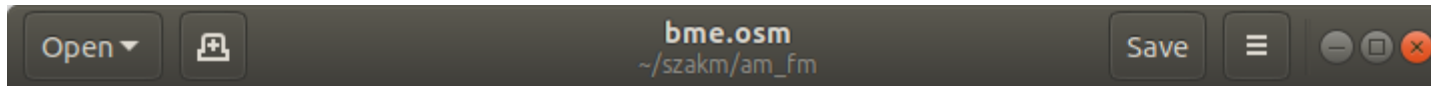
Kapcsoljuk be az OSM réteget (Web/QMS/OSM/Standard a menüből)
Nagyítsunk az egyetem környékére
Vector/OSM/Download

A párbeszéd ablakban adjuk meg az ábrán látható határokat

(Sajnos csak WGS84 koordináták adhatók meg)
19.0430, 47.4735
19.0734, 47.4853



OSM XML fájl



```
<?xml version="1.0" encoding="UTF-8"?>
<osm version="0.6" generator="Overpass API 0.7.54.12 054bb0bb">
<note>The data included in this document is from
www.openstreetmap.org. The data is made available under ODbL.</note>
<meta osm_base="2017-12-08T20:38:03Z"/>
```

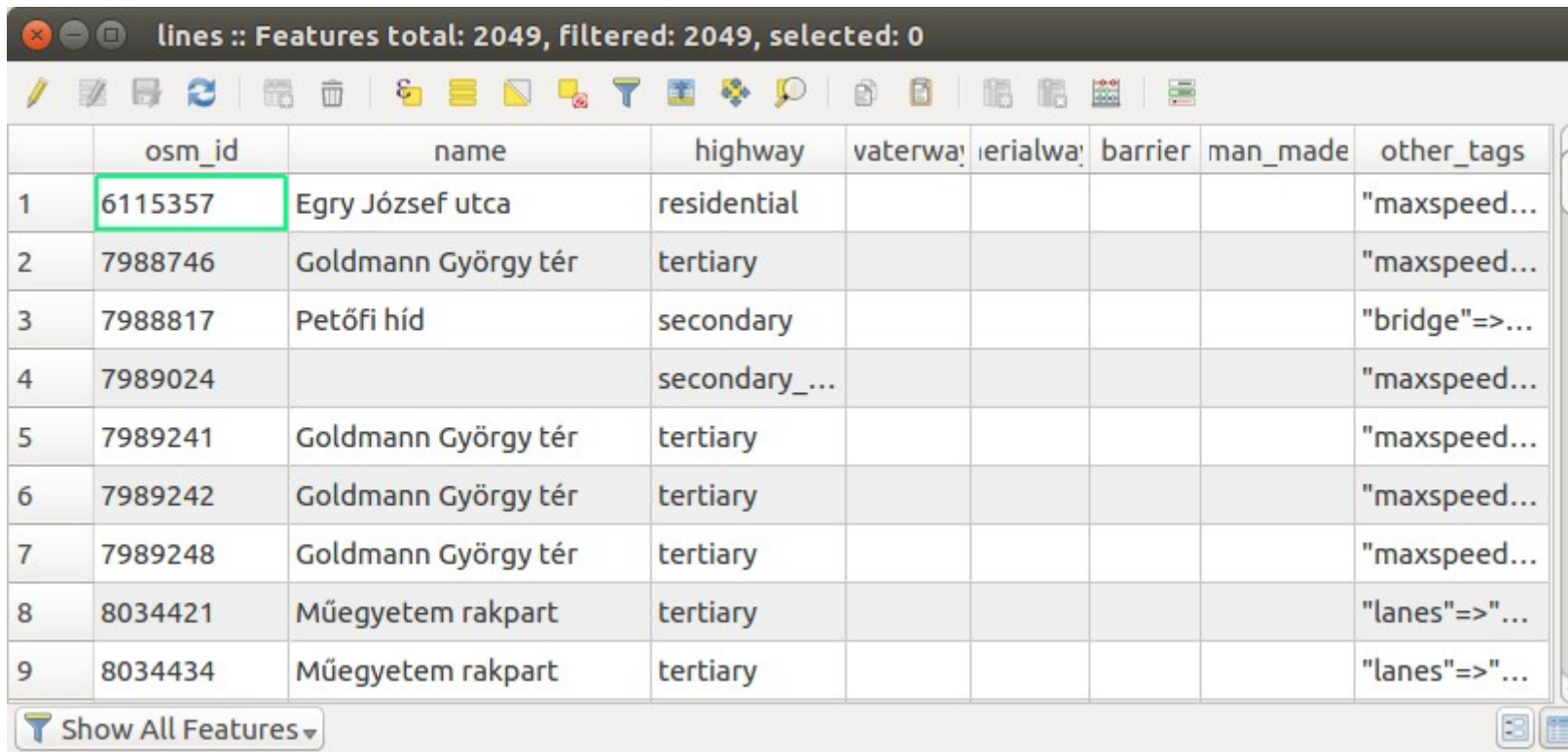
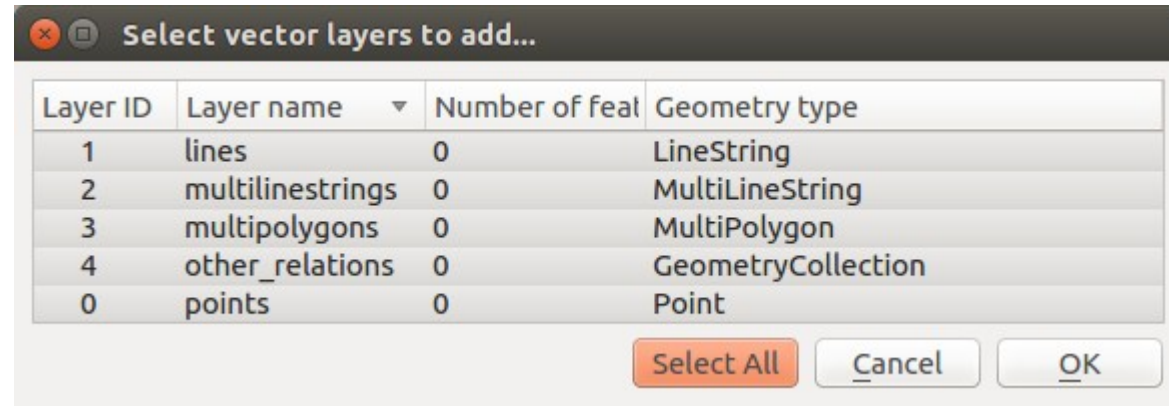
```
<node id="277464" lat="47.4833260" lon="19.0530019"/>
<node id="277465" lat="47.4820450" lon="19.0525080"/>
<node id="277466" lat="47.4809680" lon="19.0520464"/>
<node id="277472" lat="47.4778341" lon="19.0472997"/>
<node id="277474" lat="47.4764427" lon="19.0433393"/>
<node id="18590962" lat="47.4852176" lon="19.0523640"/>
<node id="21513910" lat="47.4738373" lon="19.0478685">
  <tag k="converted_by" v="Track2osm"/>
  <tag k="highway" v="traffic_signals"/>
</node>
<node id="33569723" lat="47.4849178" lon="19.0583750"/>
<node id="33569764" lat="47.4812500" lon="19.0637500"/>
<node id="33569765" lat="47.4797500" lon="19.0655000"/>
<node id="33569766" lat="47.4772225" lon="19.0674407"/>
<node id="35965702" lat="47.4849555" lon="19.0532747"/>
<node id="35965703" lat="47.4810136" lon="19.0577965"/>
<node id="35965704" lat="47.4785789" lon="19.0605641"/>
<node id="35965706" lat="47.4772621" lon="19.0619288"/>
<node id="35965707" lat="47.4758408" lon="19.0630188"/>
<node id="35965708" lat="47.4744021" lon="19.0637742"/>
<node id="41468950" lat="47.4799285" lon="19.0654732"/>
<node id="41468961" lat="47.4755114" lon="19.0555499"/>
<node id="41469018" lat="47.4761830" lon="19.0532333">
  <tag k="highway" v="traffic_signals"/>
</node>
<node id="48833414" lat="47.4811094" lon="19.0680041"/>
<node id="50572338" lat="47.4785404" lon="19.0600233">
  <tag k="crossing_ref" v="zebra"/>
```

WGS84 koordináták

OSM → shape (EOV)

Töltsük be a bme.osm fájlt a QGIS-be
Nyissuk meg az attribútum táblát

Mentsük el SHP fájlba
EOV vetületbe
lines.shp névvel



Ha az ékezetes betűk rosszul jelennek meg, akkor UTF-8-ra állítsuk a kódlapot

OSM → shape (EOV)

Töltsük be a bme.osm fájlt a QGIS
Nyissuk meg az attribútum táblát

Mentsük el SHP fájlba
EOV vetületbe
lines.shp névvel

	osm_id	name	highway	va
1	6115357	Egry József utca	residential	
2	7988746	Goldmann György tér	tertiary	
3	7988817	Petőfi híd	secondary	
4	7989024		secondary_...	
5	7989241	Goldmann György tér	tertiary	
6	7989242	Goldmann György tér	tertiary	
7	7989248	Goldmann György tér	tertiary	
8	8034421	Műegyetem rakpart	tertiary	
9	8034434	Műegyetem rakpart	tertiary	

Show All Features ▾

Save vector layer as...

Format: ESRI Shapefile

File name: /home/siki/szakm/am_fm/lines.shp

Layer name:

CRS: Selected CRS (EPSG:23700, HD72 / EOV)

Encoding: UTF-8

Save only selected features

Select fields to export and their export options

Add saved file to map

Symbology export: No symbology

Scale: 1:50000

▼ Geometry

Geometry type: Automatic

Force multi-type

Include z-dimension

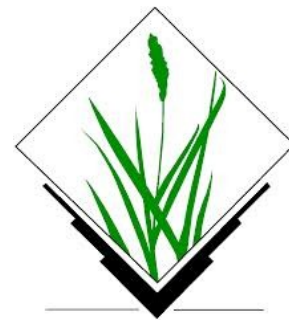
Extent (current: layer)

▼ Layer Options

RESIZE: NO

SHPT: <Default>

GRASS adatmodell



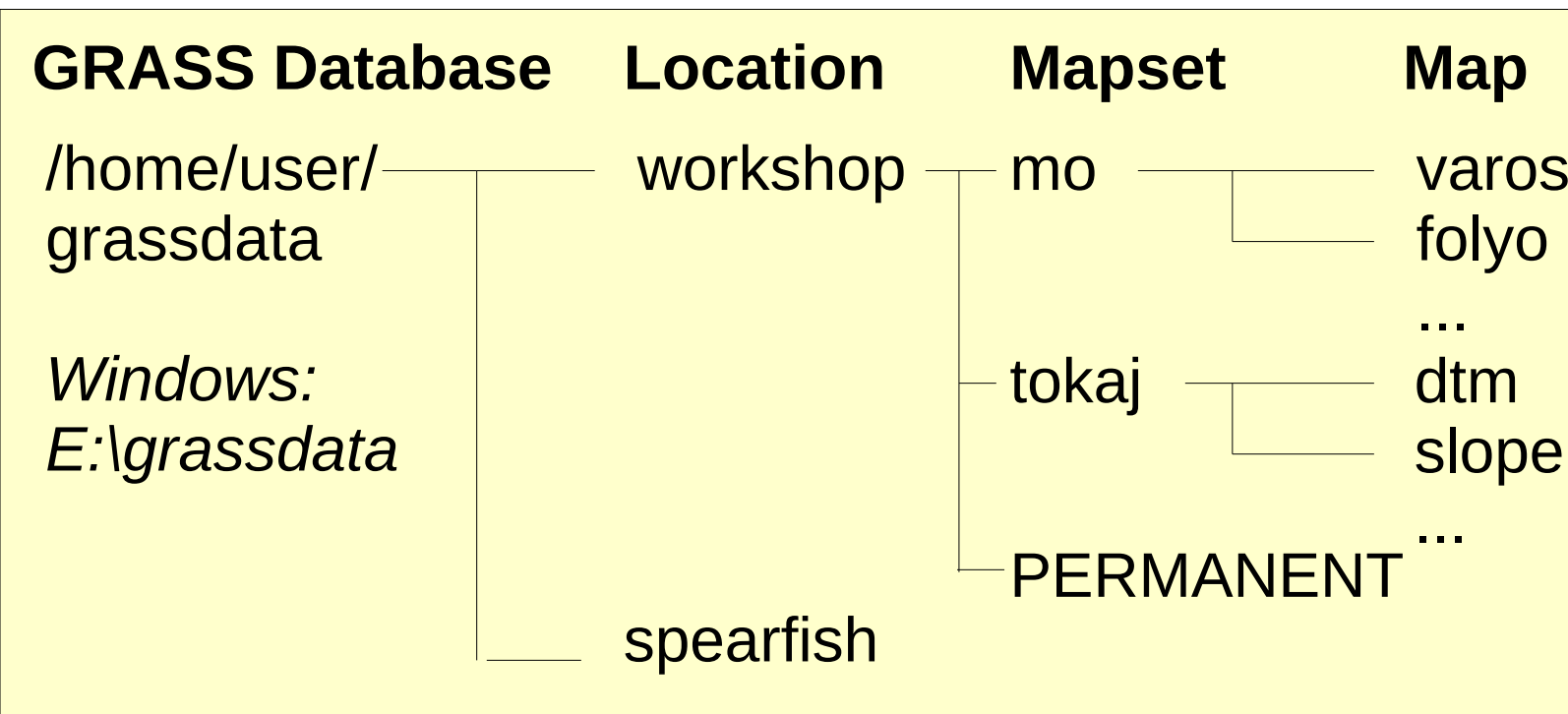
Saját topologikus vektor és raszter adatformátum

GRASS Database – GRASS adatok gyökérkönyvtára, neve általában **grassdata**

Location (munkaterület) – azonos, lehatárolt területre eső, azonos vetületben ábrázolt térképek együttese

Mapset (térképhalmaz) – egy felhasználóhoz tartozó térképek (térkép csoport) a munkaterületen belül

Map (térkép) – azonos típusú, összetartozó vektor adatok vagy raszter



Kategória érték
cat oszlop

Nézzük meg
a **home**
könyvtárunkban
lévő grassdata
könyvtár
tartalmát!

GRASS program szerkezet

A GRASS parancsonként önálló programokból áll
A parancsokat modulokba sorolják
A parancsok neve a modul rövidítésével kezdődik

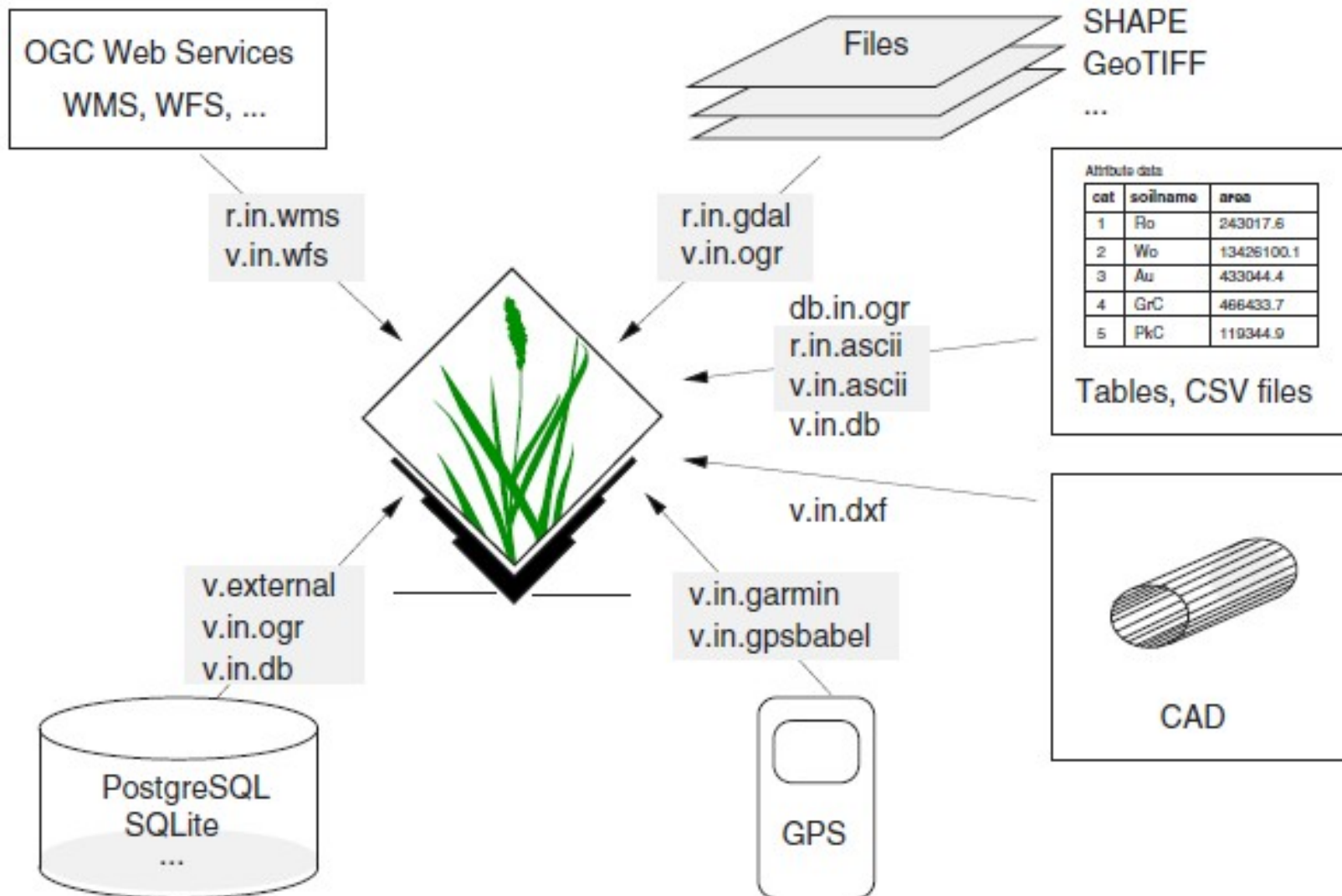
Nézze meg a GRASS bin könyvtárának tartalmát!
`/usr/lib/grass70/bin`

Előtag	Osztály	Parancs típus
d.*	megjelenítés	grafikus megjelenítés
db.*	adatbázis	adatbázis kezelés
g.*	általános	általános fájl műveletek
i.*	képek	képfeldolgozás
m.*	egyéb	egyéb parancsok
ps.*	postscript	Postscript formátumú térképek készítése
r.*	raszter	2D raszter feldolgozás
r3.*	3D raszter	3D raszter feldolgozás
v.*	vektor	2D és 3D vektor feldolgozás

Miért előnyös ez?

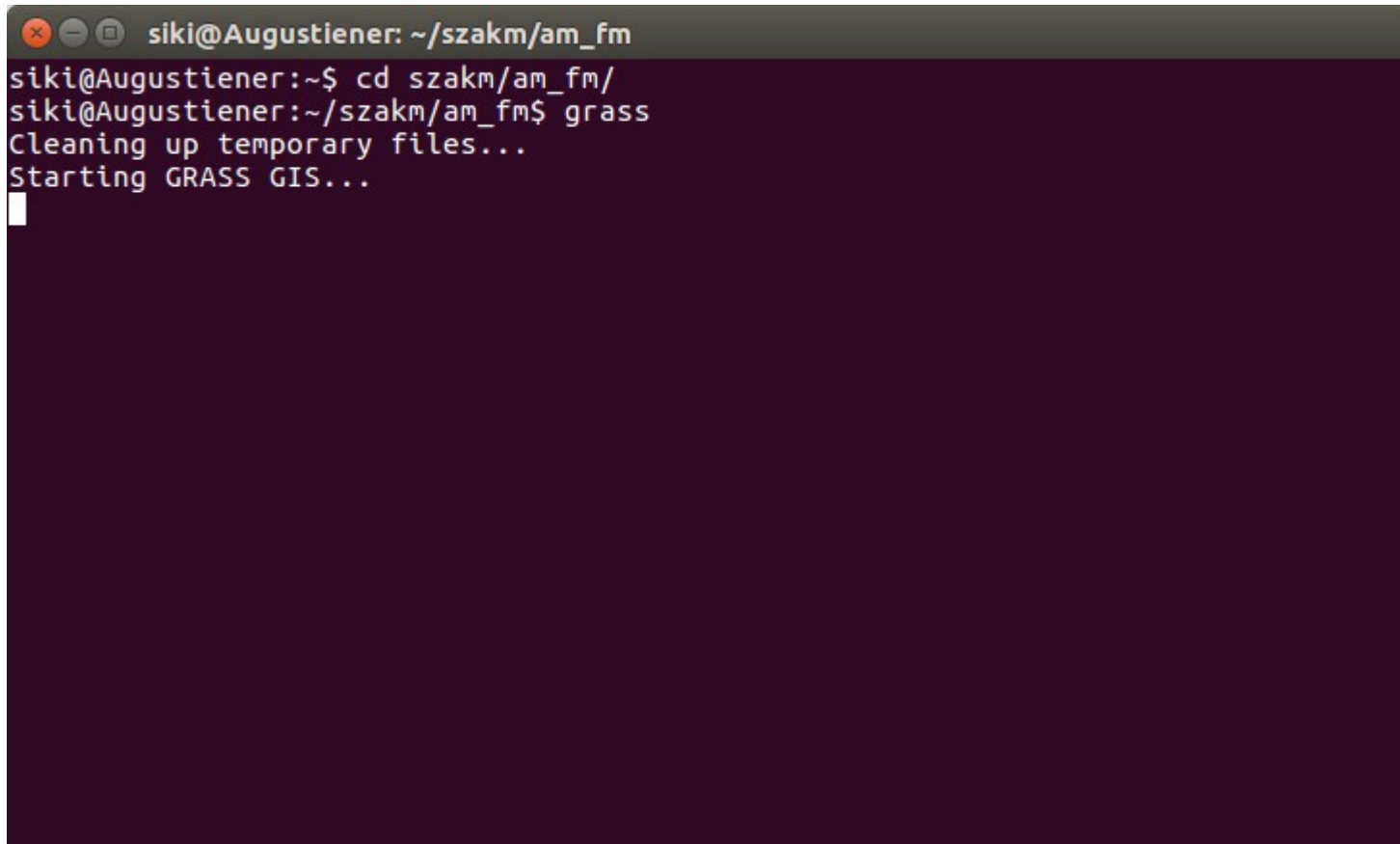
GRASS import

A GRASS saját vektor és raszter formátumot használ, erre kell átalakítani valamennyi adatunkat.



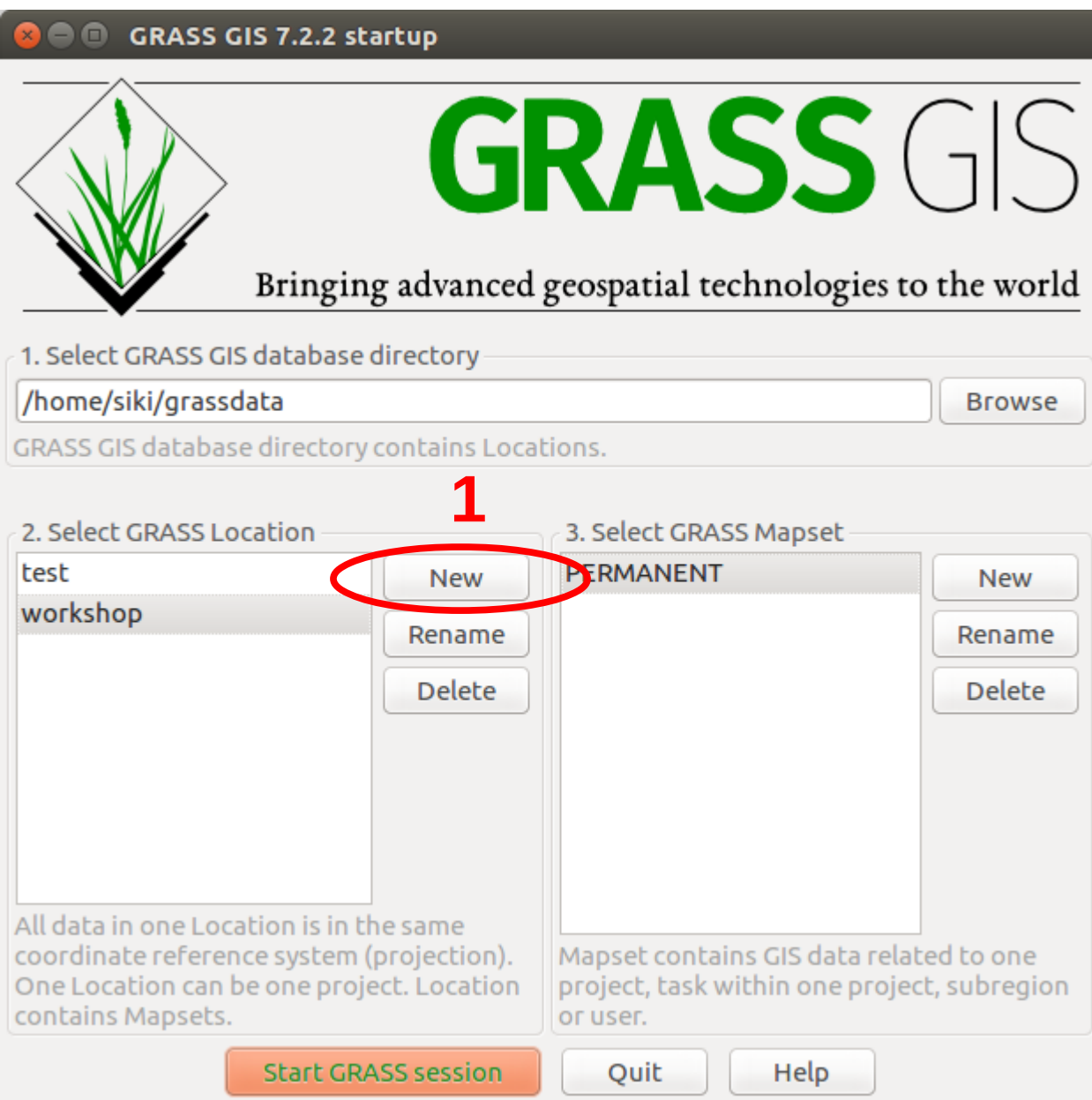
GRASS indítása

Nyissunk meg egy parancs ablakot,
Lépünk be a lines.shp fájlt tartalmazó könyvtárba
vagy keressük meg a GRASS indító ikonját

A terminal window with a dark purple background and white text. The window title is 'siki@Augustiener: ~/szakm/am_fm'. The terminal shows the following commands and output:

```
siki@Augustiener:~$ cd szakm/am_fm/  
siki@Augustiener:~/szakm/am_fm$ grass  
Cleaning up temporary files...  
Starting GRASS GIS...  
█
```

GRASS munkaterület létrehozása



A GRASS első indításánál lehet, hogy hibaüzenetet kapunk a GRASS adatbázis hibás/hiányzó beállítása miatt.

A “Windows” felhasználók általában ennél nem jutnak tovább :(

A **GIS Data Directory** sorba írjuk be egy létező (üres) könyvtár elérési útját vagy a Browse megnyomása után válasszuk ki.

GRASS munkaterület létrehozása

GRASS GIS 7.2.2 startup

Define new GRASS Location

Define GRASS Database and Location Name

GIS Data Directory: /home/siki/grassdata

Project Location: bme

Location Title:

Set default region extent and resolution

Create user mapset

Help < Back Next > Cancel

1. Select GRASS GIS data location
/home/siki/grassdata
GRASS GIS database directory

2. Select GRASS Location
test
workshop

All data in one Location is in the same coordinate reference system (projection). One Location can be one project. Location contains Mapsets.

Mapset contains GIS data related to one project, task within one project, subregion or user.

Start GRASS session Quit Help

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gnyomása

után válasszuk ki.

GRASS munkaterület létrehozása

The screenshot displays the GRASS GIS 7.2.2 startup window. The main window title is "GRASS GIS 7.2.2 startup". On the left, there is a logo of a green plant in a diamond shape. Below it, the text "Bring" is partially visible. The main area is divided into two sections:

- 1. Select GRASS GIS data location:** A text input field contains the path `/home/siki/grassdata`. Below it, the text "GRASS GIS database directory" is partially visible.
- 2. Select GRASS Location:** A list box contains the items "test" and "workshop".

At the bottom left, there is a text box with the following text: "All data in one Location is in the same coordinate reference system. One Location can be one project. Location contains Mapsets." Below this text are three buttons: "Start GRASS session", "Quit", and "Help".

The "Define new GRASS Location" dialog box is open, showing a world map on the left. The title of the dialog is "Define new GRASS Location". The main heading is "Choose method for creating a new location".

Simple methods:

- Select EPSG code of spatial reference system
- Read projection and datum terms from a georeferenced data file
- Read projection and datum terms from a Well Known Text (WKT) .prj file
- Create a generic Cartesian coordinate system (XY)

Advanced methods:

- Select coordinate system parameters from a list
- Specify projection and datum terms using custom PROJ.4 parameters

At the bottom of the dialog, there are four buttons: "Help", "< Back", "Next >", and "Cancel".

On the right side of the image, there is a vertical column of text in Hungarian: "sánál", "tet", "atbázis", "sa", "álok", "utnak", "ező", "si útját", "yomása".

GRASS munkaterület létrehozása

GRASS GIS 7.2.2 startup

Define new GRASS Location

Define new GRASS Location

Define new GRASS Location

Choose EPSG Code

Path to the EPSG-codes file:

EPSG code:

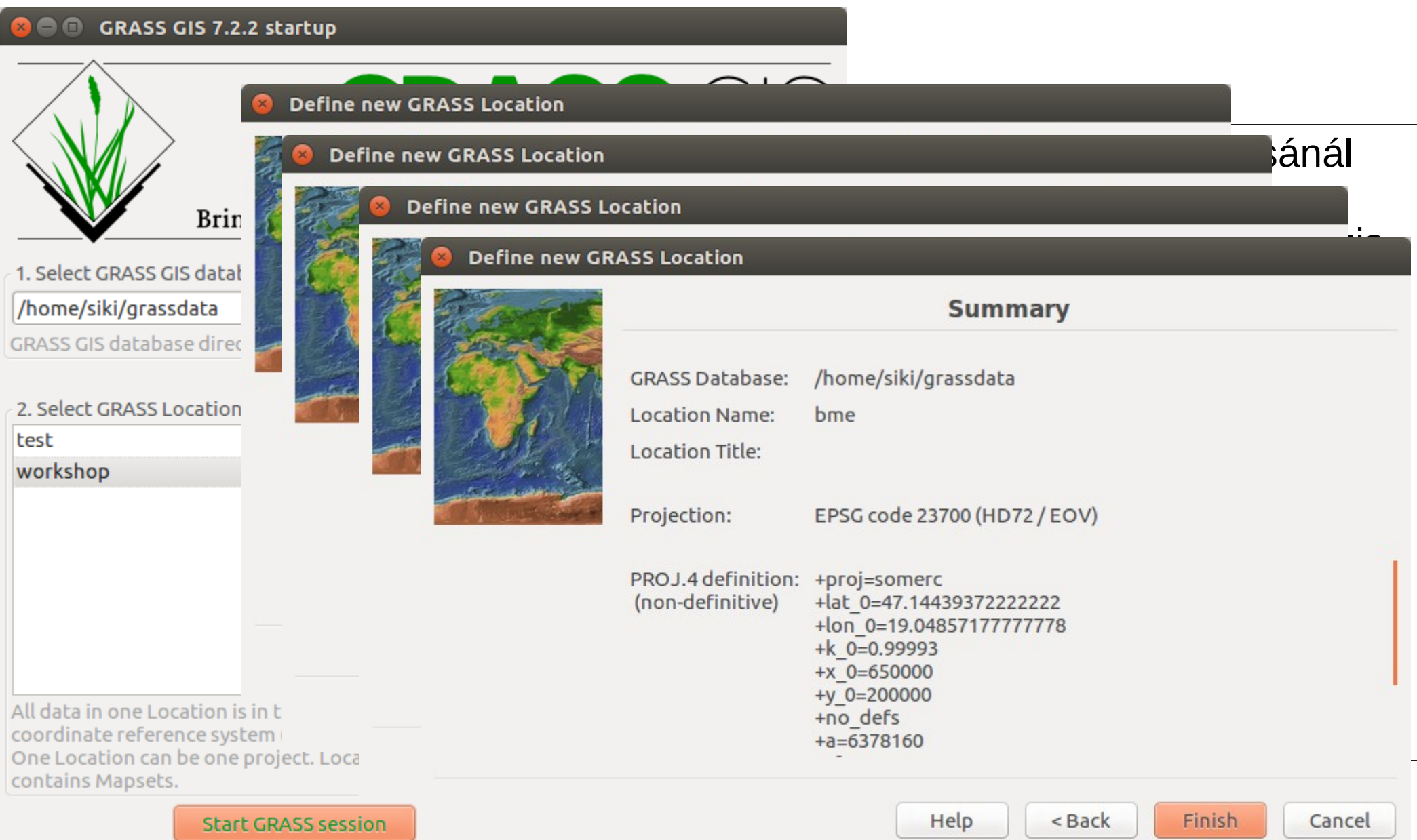
Code	Description	Parameters
2000	Anguilla 1957 / British West Indies Grid	+proj=tmerc +lat_0=...
2001	Antigua 1943 / British West Indies Grid	+proj=tmerc +lat_0=...
2002	Dominica 1945 / British West Indies Grid	+proj=tmerc +lat_0=...
2003	Grenada 1953 / British West Indies Grid	+proj=tmerc +lat_0=...
2004	Montserrat 1958 / British West Indies Grid	+proj=tmerc +lat_0=...
2005	St. Kitts 1955 / British West Indies Grid	+proj=tmerc +lat_0=...
2006	St. Lucia 1955 / British West Indies Grid	+proj=tmerc +lat_0=...

Help

Start GRASS session

sánál
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ása

GRASS munkaterület létrehozása



GRASS GIS 7.2.2 startup

Define new GRASS Location

Define new GRASS Location

Define new GRASS Location

Define new GRASS Location

Define new GRASS Location

1. Select GRASS GIS data
/home/siki/grassdata
GRASS GIS database direc

2. Select GRASS Location
test
workshop

All data in one Location is in t coordinate reference system | One Location can be one project. Loca contains Mapsets.

Summary

GRASS Database: /home/siki/grassdata
Location Name: bme
Location Title:
Projection: EPSG code 23700 (HD72 / EOV)
PROJ.4 definition: +proj=somerc
(non-definitive) +lat_0=47.14439372222222
+lon_0=19.04857177777778
+k_0=0.99993
+x_0=650000
+y_0=200000
+no_defs
+a=6378160

Start GRASS session Help < Back Finish Cancel

GRASS munkaterület létrehozása

GRASS GIS 7.2.2 startup

Define new GRASS Location

Define new GRASS Location

Define new GRASS Location

Define new GRASS Location

Summary

GRASS Database: /home/siki/grassdata

Location Name: bme

Location Name: munka

Project: munka

PROJ.4 (non-d

+x_0=650000
+y_0=200000
+no_defs
+a=6378160

1. Select GRASS GIS data location
/home/siki/grassdata
GRASS GIS database directory

2. Select GRASS Location
test
workshop

All data in one Location is in the same coordinate reference system
One Location can be one project. A Location contains Mapsets.

Start GRASS session

Help < Back Finish Cancel

GRASS munkaterület létrehozása

GRASS GIS 7.2.2 startup

GRASS GIS

Bringing advanced geospatial technologies to the world

1. Select GRASS GIS database directory

GRASS GIS database directory contains Locations.

2. Select GRASS Location

bme	<input type="button" value="New"/>
test	<input type="button" value="Rename"/>
workshop	<input type="button" value="Delete"/>

All data in one Location is in the same coordinate reference system (projection). One Location can be one project. Location contains Mapsets.

3. Select GRASS Mapset

munka	<input type="button" value="New"/>
PERMANENT	<input type="button" value="Rename"/>
	<input type="button" value="Delete"/>

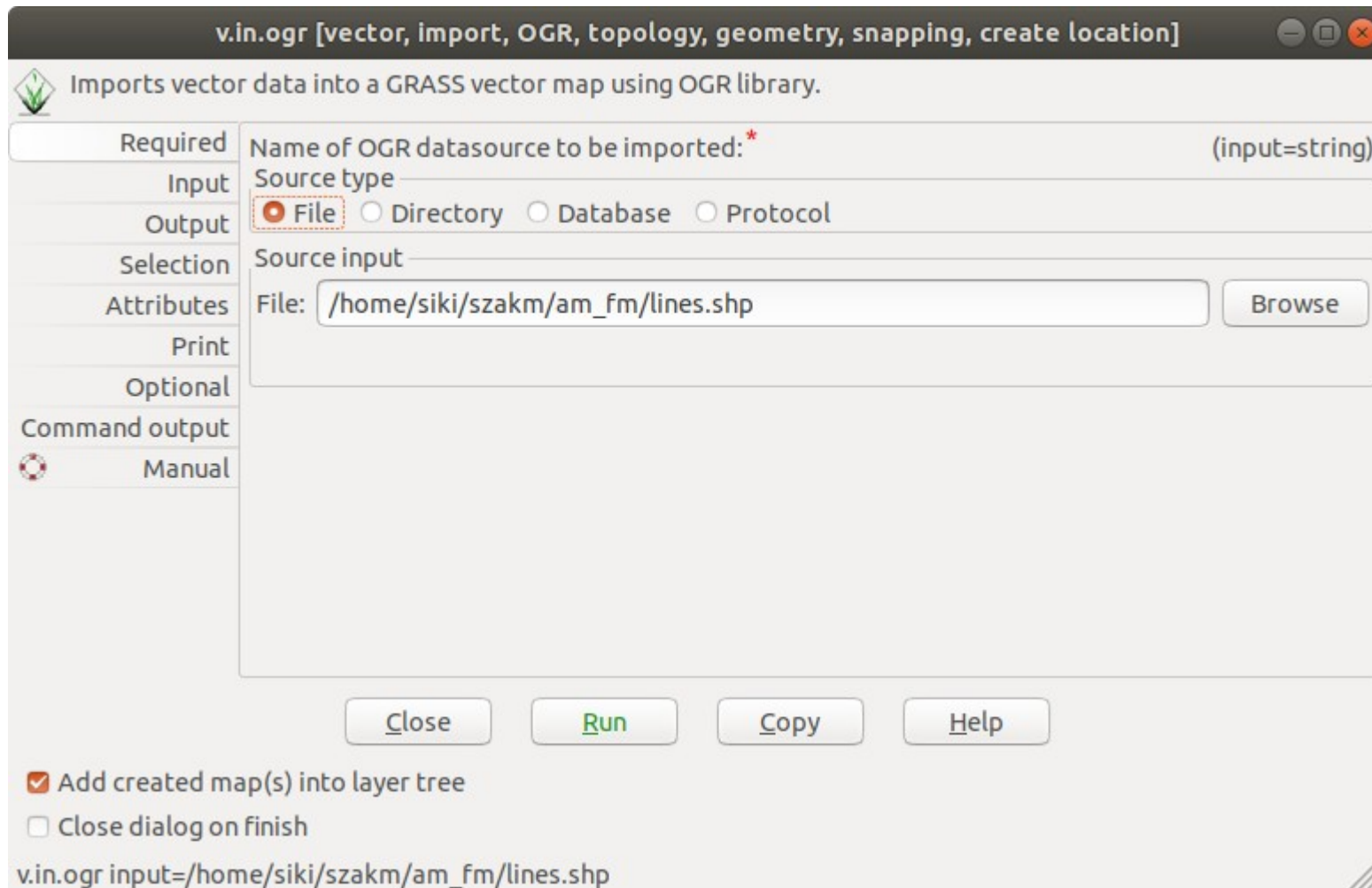
Mapset contains GIS data related to one project, task within one project, subregion or user.

OSM adatok betöltése

Vektor import (minden vonal)

```
v.in.ogr input=lines.shp layer=lines output=lines -o
```

vagy **File/Import vector data/Import of common vector formats**

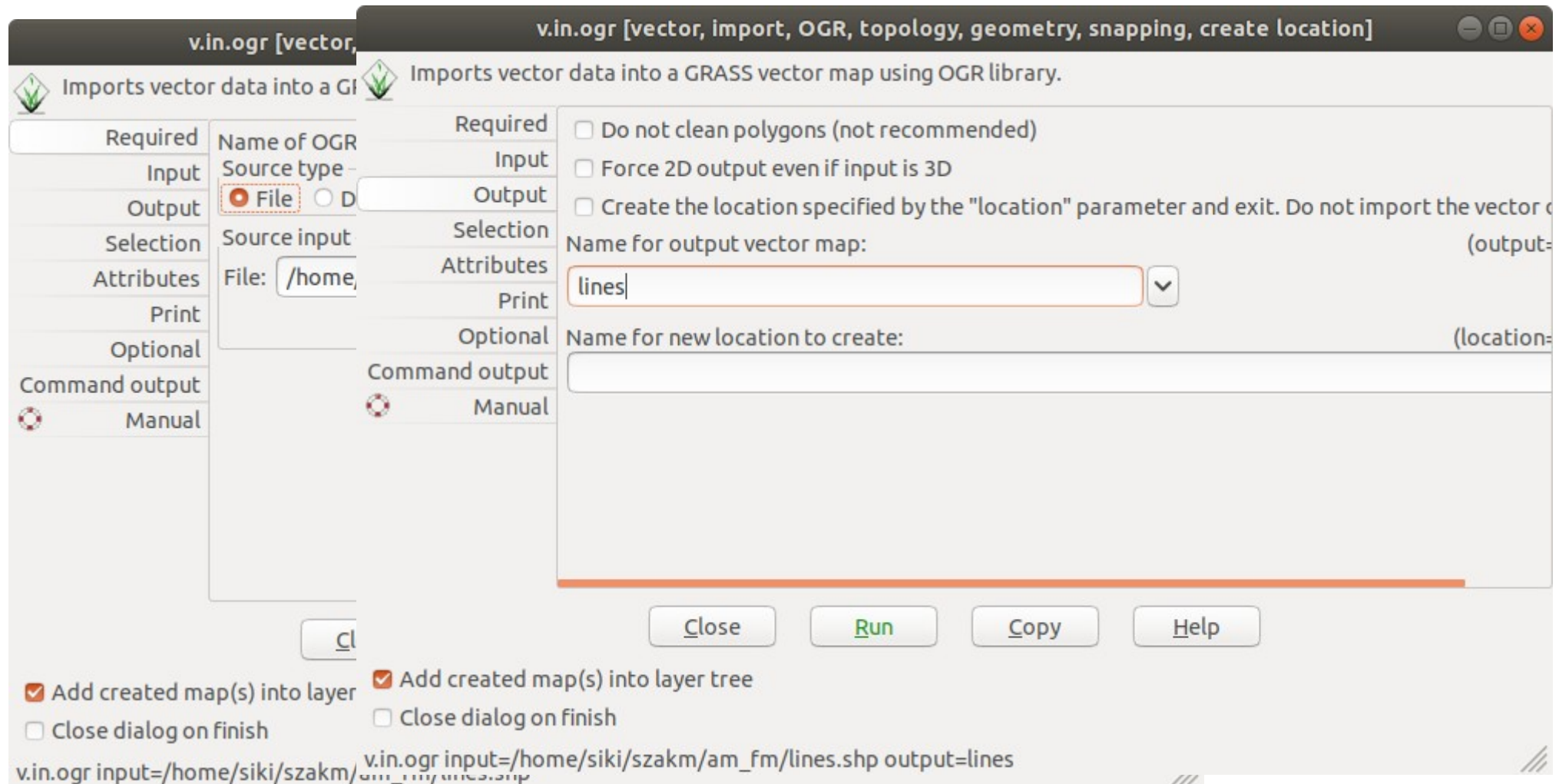


OSM adatok betöltése

Vektor import (minden vonal)

```
v.in.ogr input=lines.shp layer=lines output=lines -o
```

vagy **File/Import vector data/Import of common vector formats**



Hálózat készítés

Csak az utak az OSM-ből

```
v.extract --verbose input=lines@munka output=utak@munka
```

```
where="highway='primary' or highway='primary_link' or
```

```
highway='secondary' or highway='secondary_link' or
```

```
highway='tertiary' or highway='tertiary_link' or highway='residential' "
```

vagy **Vector/Feature selection/Select by attributes** a menüből

v.extract [vector, extract, select, dissolve, random]

Selects vector features from an existing vector map and creates a new vector map containing only the select features.

Required: Name of input vector map: * (input=name)
Selection: utak@munka

Optional: Name for output vector map: * (output=name)
Command output: utak

Manual

Close Run Copy Help

Add created map(s) into layer tree
 Close dialog on finish

v.extract input=utak@munka output=utak

Hálózat készítés

Csak az utak az OSM-ből

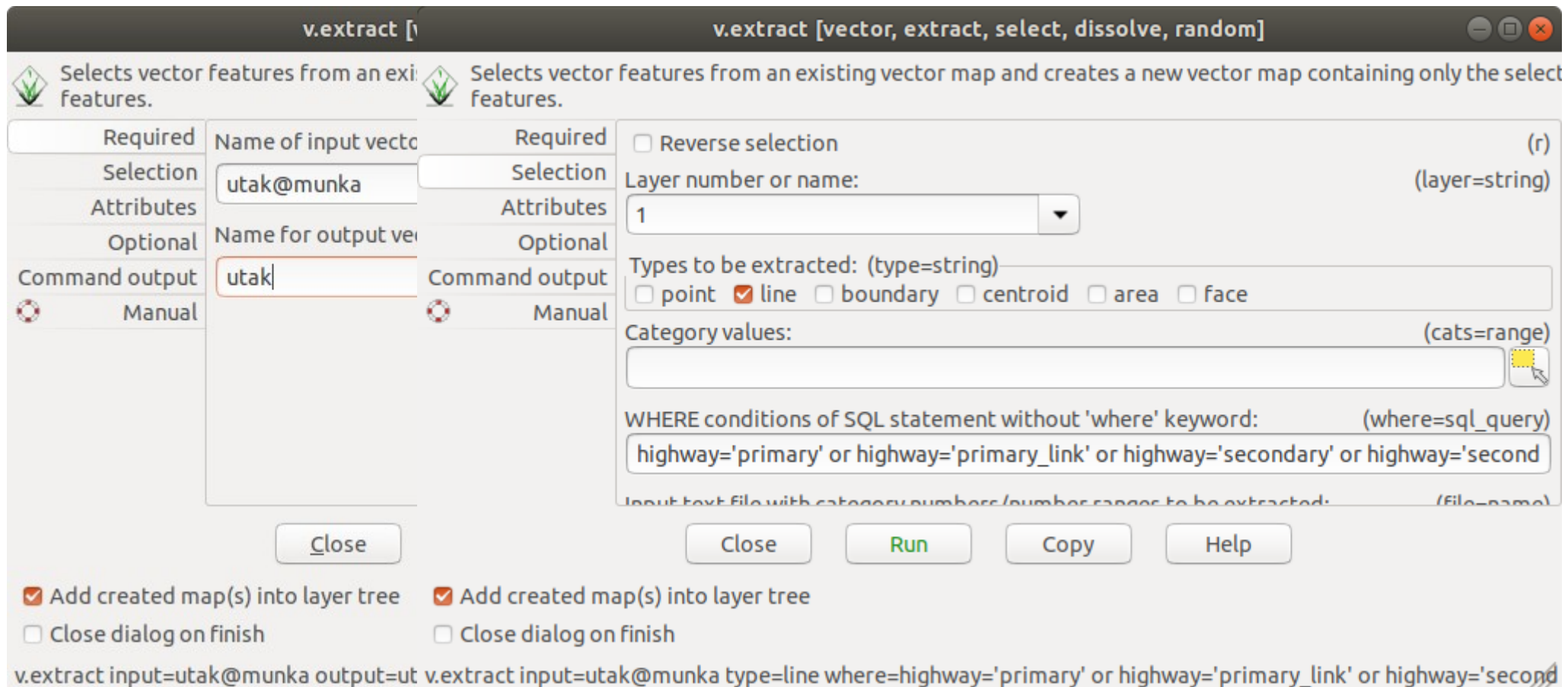
```
v.extract -verbose input=lines@munka output=utak@munka
```

```
where="highway='primary' or highway='primary_link' or
```

```
highway='secondary' or highway='secondary_link' or
```

```
highway='tertiary' or highway='tertiary_link' or highway='residential' "
```

vagy **Vector/Feature selection/Select by attributes** a menüből

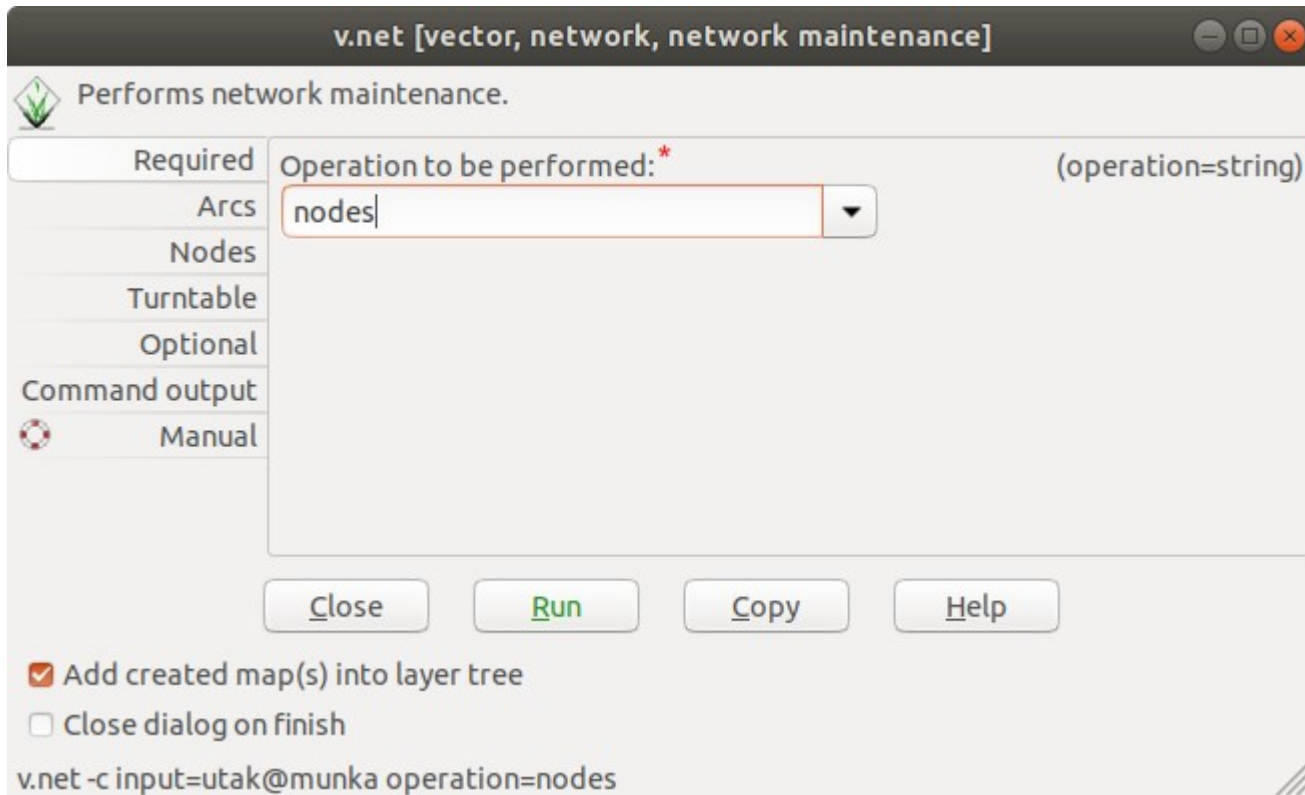


v.extract input=utak@munka output=ut v.extract input=utak@munka type=line where=highway='primary' or highway='primary_link' or highway='second

Hálózat készítés

Csomópontok létrehozása

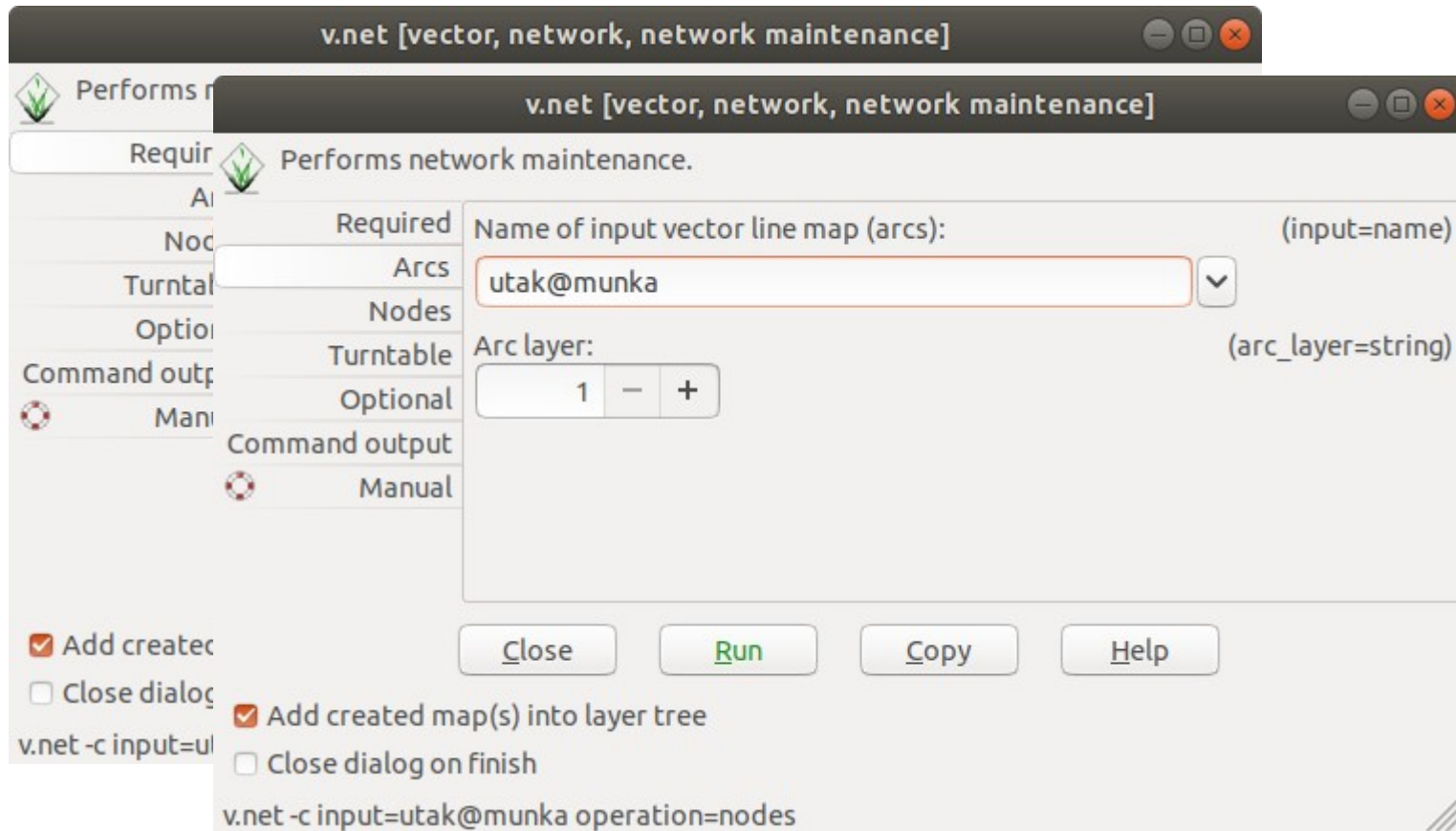
v.net -c input=utak@munka operation=nodes [output=halozat@munka](#)
vagy **Vector/Network analysis/Network preparation** a menüből



Hálózat készítés

Csomópontok létrehozása

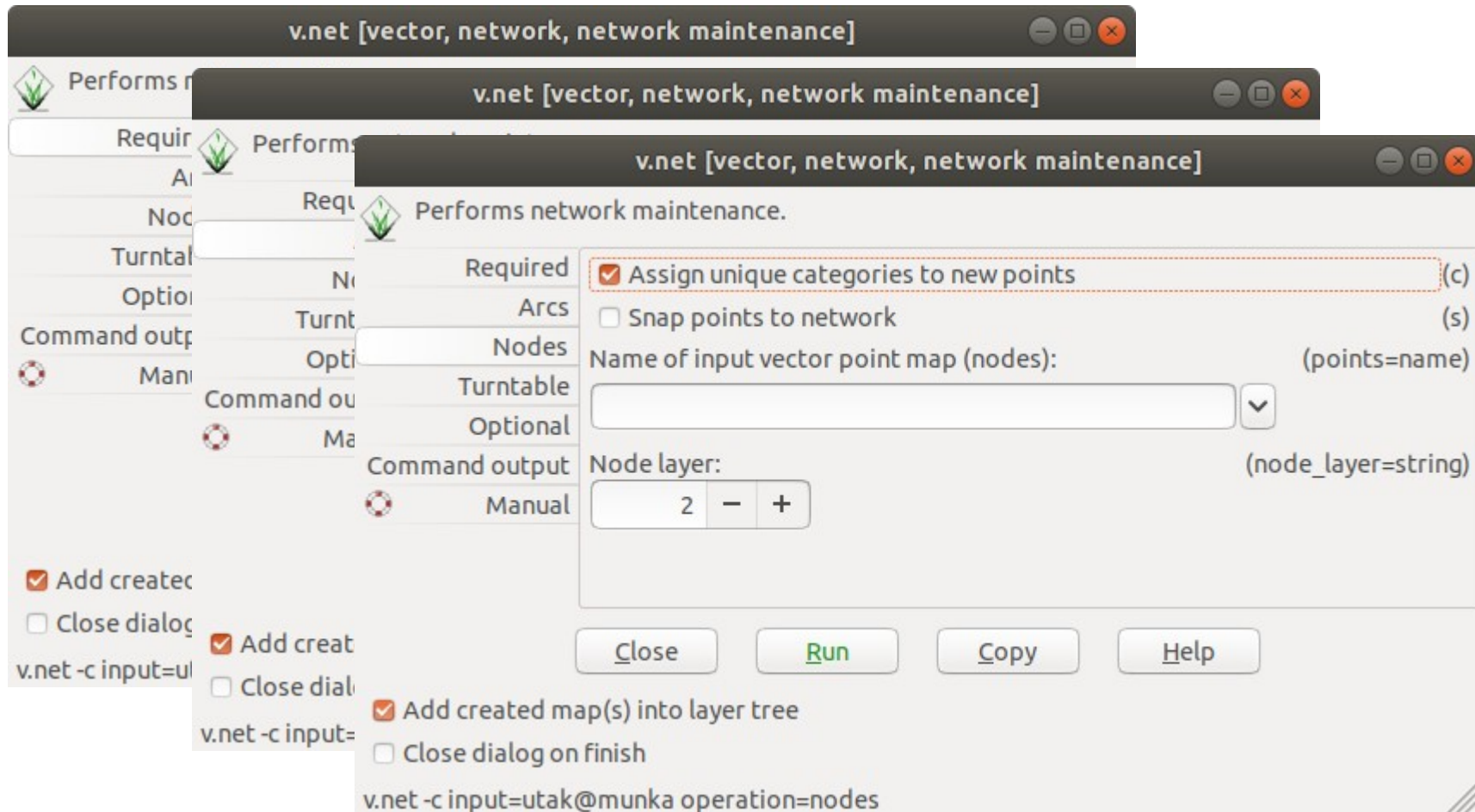
v.net -c input=utak@munka operation=nodes **output=halozat@munka**
vagy **Vector/Network analysis/Network preparation** a menüből



Hálózat készítés

Csomópontok létrehozása

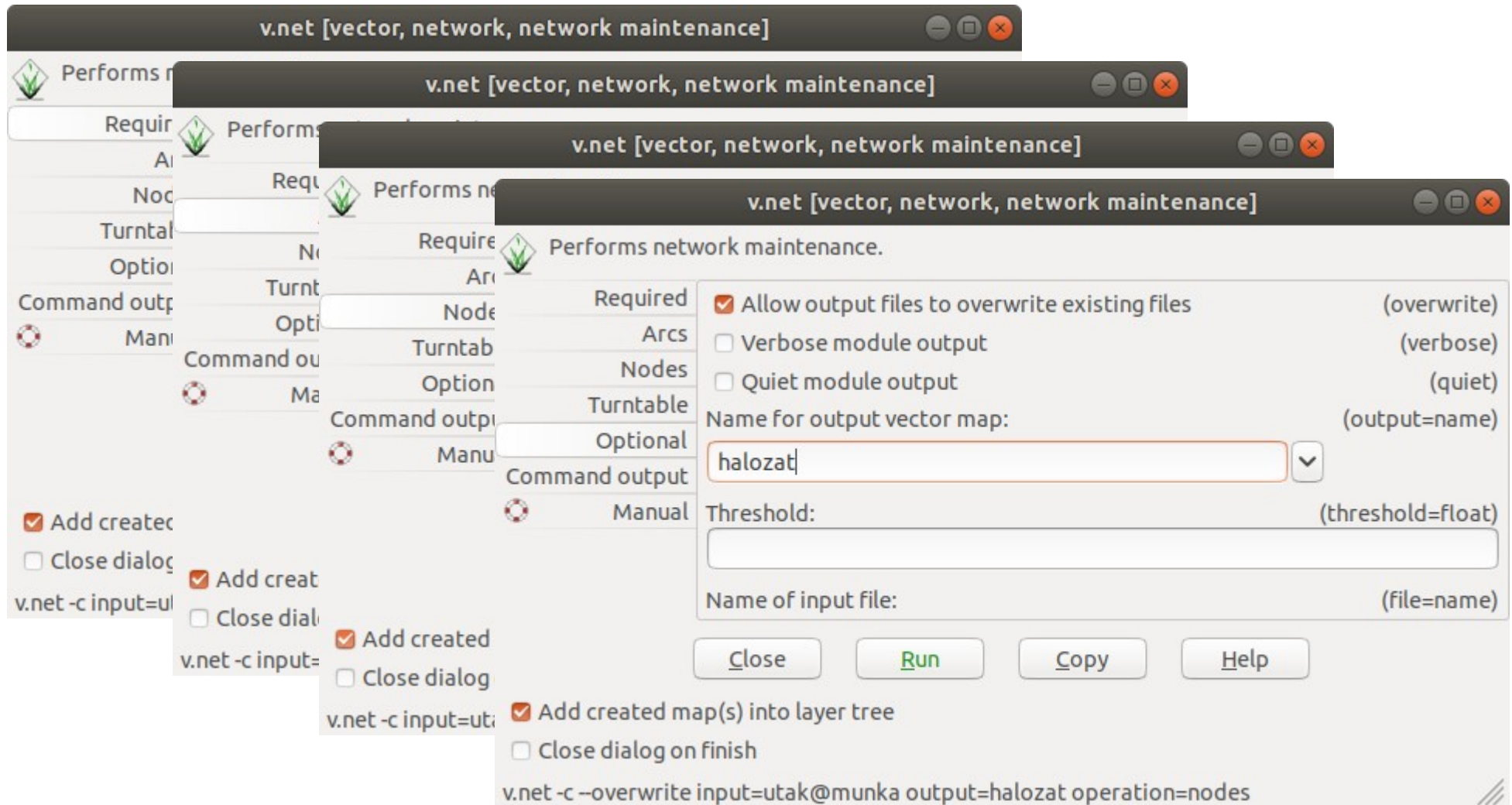
v.net -c input=utak@munka operation=nodes output=halozat@munka
vagy **Vector/Network analysis/Network preparation** a menüből



Hálózat készítés


Csomópontok létrehozása

v.net -c input=utak@munka operation=nodes output=halozat@munka
vagy **Vector/Network analysis/Network preparation** a menüből



Hálózat készítés

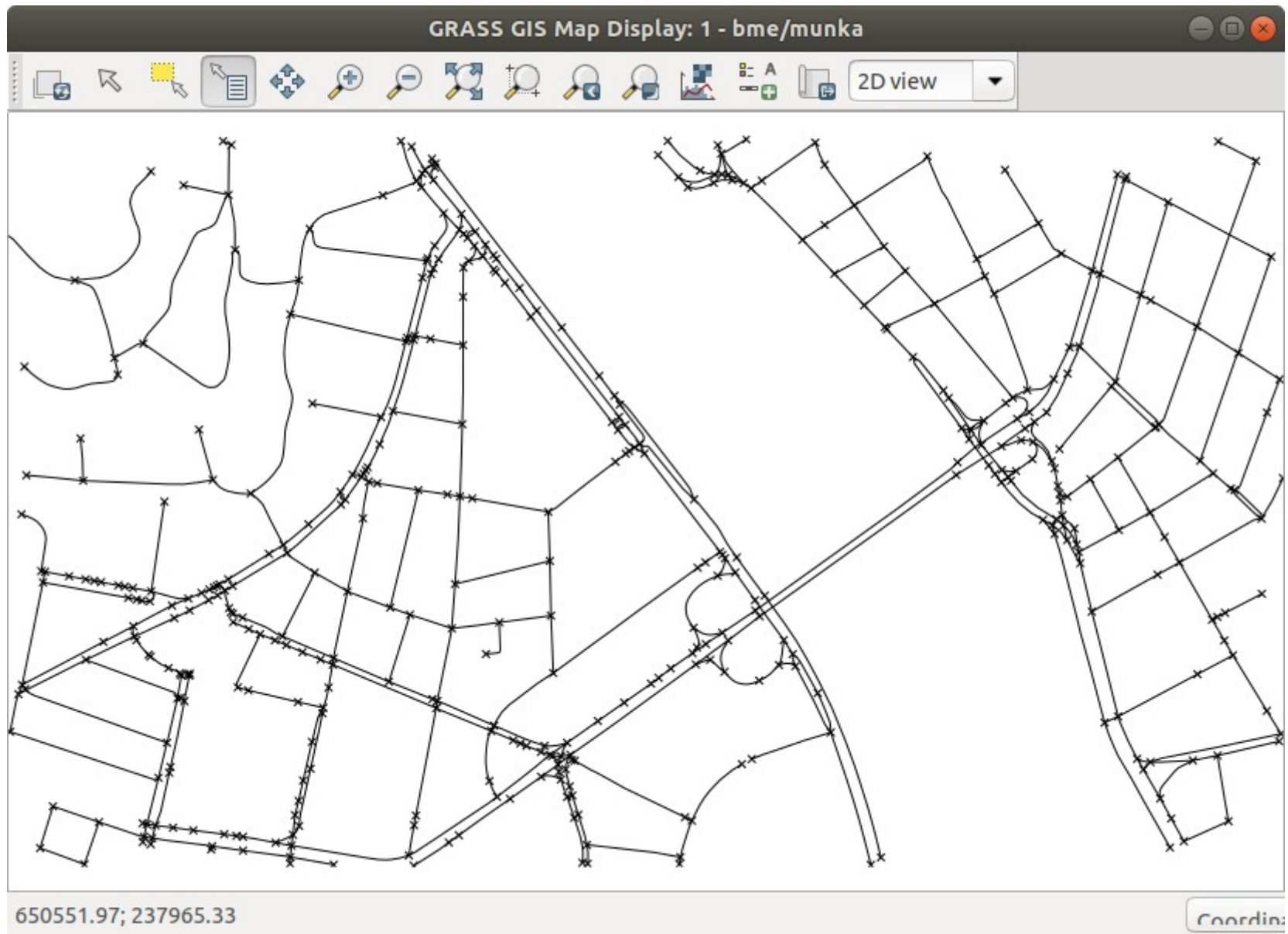
d.vect [display, graphics, vector, level1]

 Displays user-specified vector map in the active graphics frame.

Required	<input type="checkbox"/> Use values from 'cats' option as feature id (i)
Selection	Layer number or name ('-1' for all layers): (layer=string)
Colors	-1
Lines	
Symbols	Input feature type: (type=string)
Legend	<input checked="" type="checkbox"/> point <input checked="" type="checkbox"/> line <input type="checkbox"/> boundary <input type="checkbox"/> centroid <input type="checkbox"/> area <input type="checkbox"/> face
Labels	Category values: (cats=range)
Optional	
Manual	WHERE conditions of SQL statement without 'where' keyword: (where=sql_query)

d.vect map=halozat@munka layer=-1 type=point,line

Hálózat készítés



Hálózat készítés

Bővítsük ki a hálózat éleinek tábláját az élek hosszát tartalmazó oszloppal.

```
v.db.addcolumn map=halozat columns='fimp double'
```

```
v.db.addcolumn map=halozat columns='timp double'
```

vagy nyissuk meg a réteg attribútum tábláját

GRASS GIS Attribute Table Manager - <halozat@munka>

1 / Table halozat 2 / Table halozat

Database connection
Driver: sqlite
Database: /home/siki/grassdata/bme/munka/sqlite/sqlite.db
Table: halozat
Key: cat

Table <halozat> - right-click to delete column(s)

Column name	Data type	Data length
cat	integer	20
osm_id	text	1000
name	text	1000
highway	text	1000
waterway	text	1000

Add column

Column: Type: Length:

Rename column

Column: To:

Browse data Manage layers

Number of loaded records: 757

Hálózat készítés

Bővítsük ki a hálózat éleinek tábláját az élek hosszát tartalmazó oszloppal.

```
v.db.addcolumn map=halozat columns='fimp double'
```

```
v.db.addcolumn map=halozat columns='timp double'
```

vagy nyissuk meg a réteg attribútum tábláját

The screenshot shows the GRASS GIS Attribute Table Manager interface. The window title is "GRASS GIS Attribute Table Manager - <halozat@munka>". The interface is split into two panes, both showing the same table information for the 'halozat' table.

Table <halozat> - right-click to delete column(s)

Column name	Data type	Data length
cat	integer	20
osm_id	text	1000
name	text	1000
highway	text	1000
waterway	text	1000

Add column

Column: Type: Length:

Rename column

Column: To:

Number of loaded records: 757

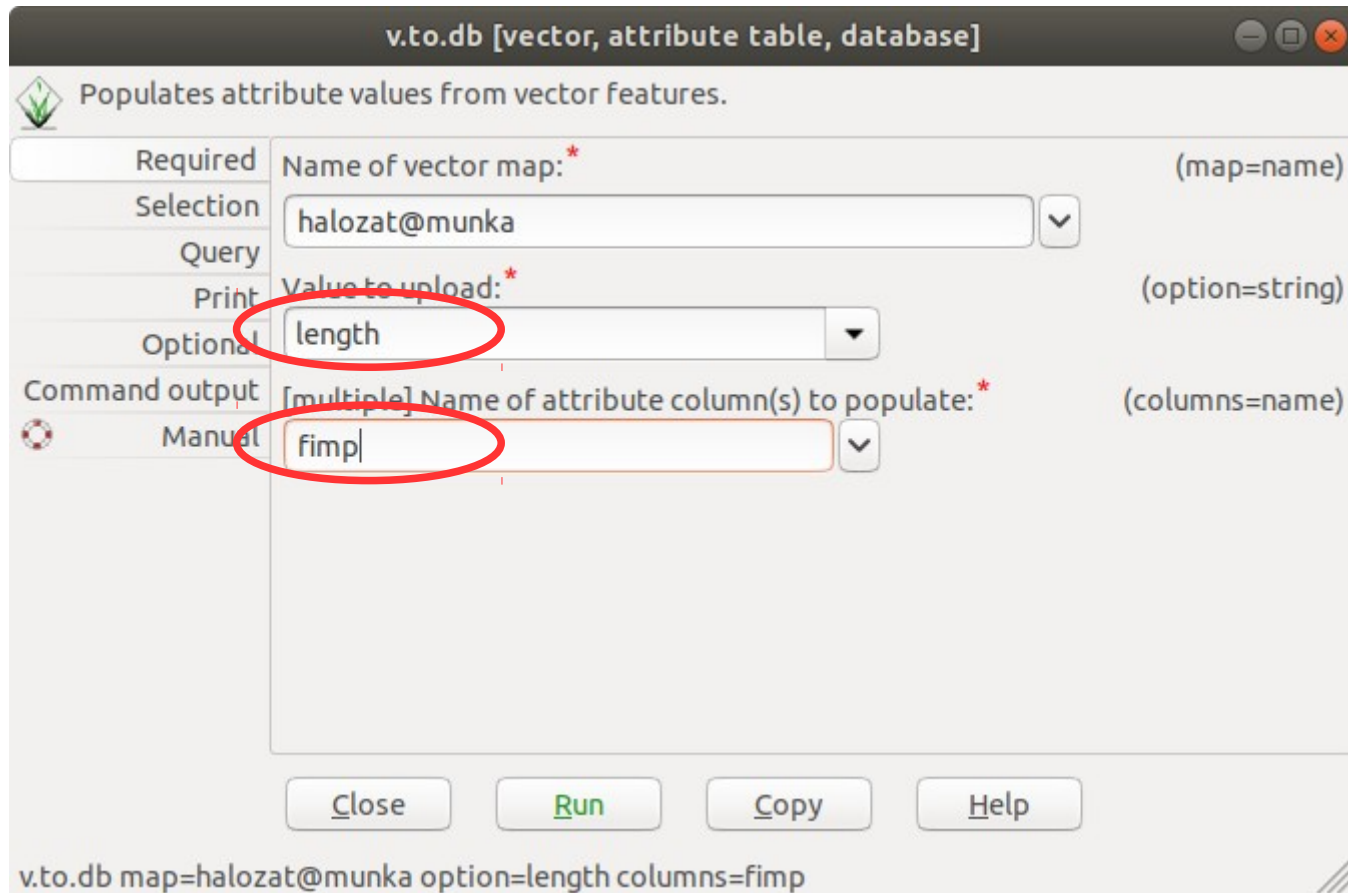
Hálózat készítés

Töltsük fel az új oszlopokat a hosszakkal:

```
v.to.db map=halozat option=length columns=fimp
```

```
v.to.db map=halozat option=length columns=timp
```

vagy Vector/Update attributes/Update database value from vector



Hálózat készítés

Töltsük fel az új oszlopokat a hosszakkal:

v.to.db map=halozat option=length columns=fimp

v.to.db map=halozat option=length columns= timp

vagy Vector/Update attributes/Update database value from vector

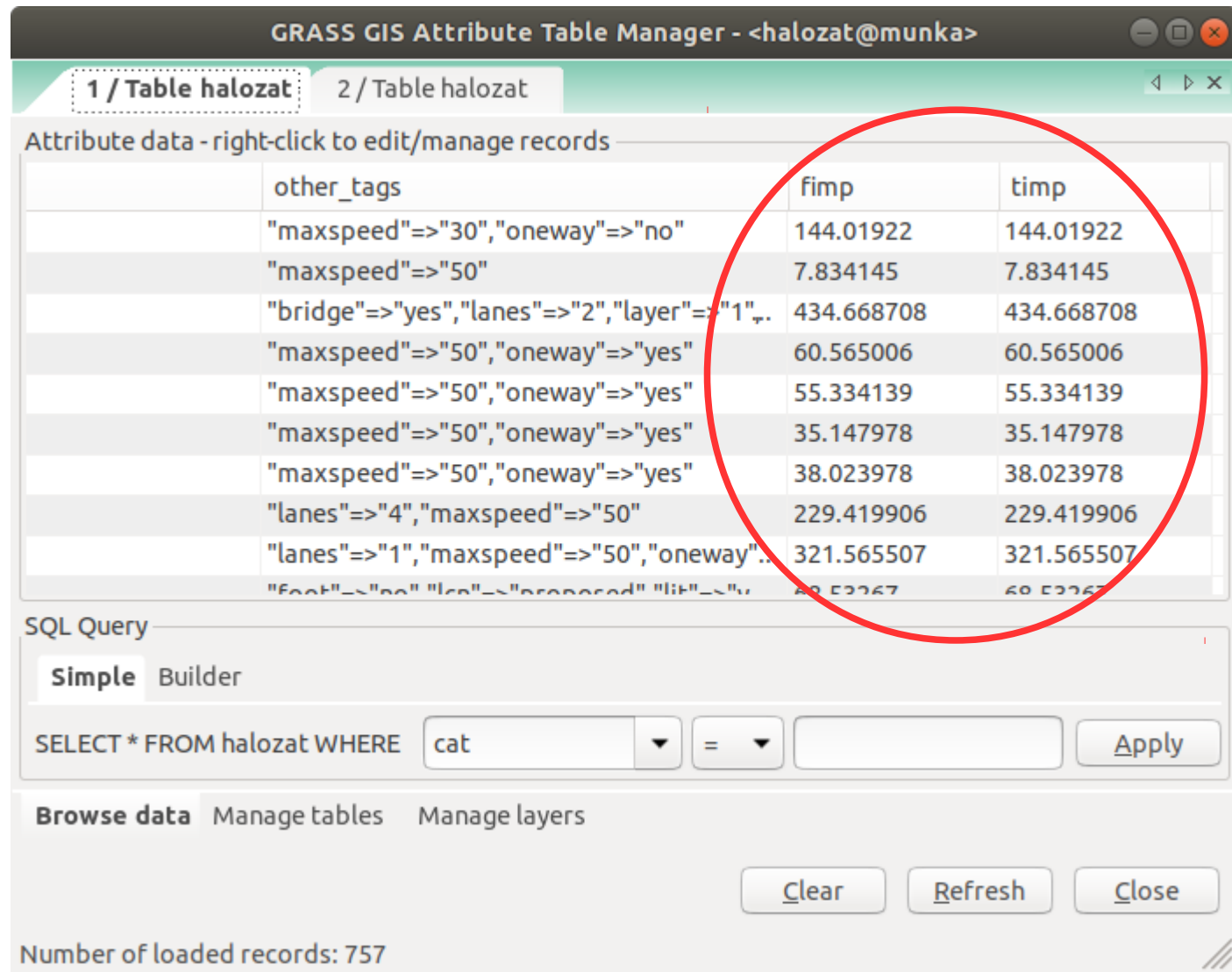
The image shows two overlapping QGIS processing tool windows. The left window is titled 'v.to.db [vector, attribute table, database]' and the right window is titled 'v.to.db [vector, attribute table, database]'. Both windows have a description: 'Populates attribute values from vector features.' The left window has the following settings: 'Name of vector map:' (Required) set to 'halozat@munka'; 'Value to upload:' (Print) set to 'length'; and '[multiple] Name of attribute column(s) to populate:' (Manual) set to 'fimp|'. The right window has the same 'Name of vector map:' and 'Value to upload:' settings, but the '[multiple] Name of attribute column(s) to populate:' (Manual) is set to 'timp|'. In the right window, the 'length' value and the 'timp|' column name are circled in red. At the bottom of the left window, the command 'v.to.db map=halozat@munka option=length columns=fimp' is visible. At the bottom of the right window, the command 'v.to.db map=halozat@munka option=length columns=timp' is visible.

Hálózat készítés

Töltsük fel az új oszlopot a hosszakkal:

v.to.db map=halozat optio=length columns=dist

vagy Vector/Update attributes/Update database value from vector



GRASS GIS Attribute Table Manager - <halozat@munka>

1 / Table halozat | 2 / Table halozat

Attribute data - right-click to edit/manage records

other_tags	fimp	timp
"maxspeed"=>"30","oneway"=>"no"	144.01922	144.01922
"maxspeed"=>"50"	7.834145	7.834145
"bridge"=>"yes","lanes"=>"2","layer"=>"1"	434.668708	434.668708
"maxspeed"=>"50","oneway"=>"yes"	60.565006	60.565006
"maxspeed"=>"50","oneway"=>"yes"	55.334139	55.334139
"maxspeed"=>"50","oneway"=>"yes"	35.147978	35.147978
"maxspeed"=>"50","oneway"=>"yes"	38.023978	38.023978
"lanes"=>"4","maxspeed"=>"50"	229.419906	229.419906
"lanes"=>"1","maxspeed"=>"50","oneway"=>"no"	321.565507	321.565507
"foot"=>"no","lanes"=>"one","lit"=>"v"	60.52267	60.52267

SQL Query

Simple Builder

SELECT * FROM halozat WHERE cat = [] Apply

Browse data | Manage tables | Manage layers

Clear Refresh Close

Number of loaded records: 757

Hálózat készítés

Vegyük figyelem az egyirányú utcákat

```
v.db.update map=halozat@munka col=timp value=-1
```

```
where="other_tags like '%"oneway"=>"yes"%" "
```

vagy Database/Vector database connections/Change values

v.db.update [vector, attribute table, database]

Updates a column in the attribute table | Updates a column in the attribute table connected to a vector map.

Required: Name of vector map: halozat@munka

Optional: Layer number: 1

Optional: Name of attribute column: timp

Required: Literal value to update the column with: -1

Optional: Name of other attribute column to query, can be combination of columns (e.g. col1+col2): (query_)

Optional: WHERE conditions of SQL statement without 'where' keyword: other_tags like '%"oneway"=>"yes"%' (wh)

Optional: Name of SQLite extension file for extra functions (SQLite backend only): (sqli)

Buttons: Close, Run, Copy, Help

Command line: v.db.update map=halozat@munka v.db.update map=halozat@munka column=timp value=-1 where=other_tags like '%"oneway"=>"yes"%'

Hálózat készítés

Vegyük figyelem az egyirányú utcákat

```
v.db.update map=halozat@munka col=timp value=-1
```

```
where="other_tags like '%"oneway'"=>"yes"%" "
```

vagy Database Manager

GRASS GIS Attribute Table Manager - <halozat@munka>

1 / Table halozat 2 / Table halozat

Updates a column in Attribute data - right-click to edit/manage records

other_tags	fimp	timp
"maxspeed"=>"30","oneway"=>"no"	144.01922	144.01922
"maxspeed"=>"50"	7.834145	7.834145
"bridge"=>"yes","lanes"=>"2","layer"=>"1","maxspeed"=>"50"	434.668708	-1
"maxspeed"=>"50","oneway"=>"yes"	60.565006	-1
"maxspeed"=>"50","oneway"=>"yes"	55.334139	-1
"maxspeed"=>"50","oneway"=>"yes"	35.147978	-1
"maxspeed"=>"50","oneway"=>"yes"	38.023978	-1
"lanes"=>"4","maxspeed"=>"50"	229.419906	229.419906
"lanes"=>"1","maxspeed"=>"50","oneway"=>"yes"	321.565507	-1
"foot"=>"no","ice"=>"proposed","lit"=>"yes","maxspeed"=>"50"	69.52267	-1

SQL Query

Simple Builder

SELECT * FROM halozat WHERE cat = [] Apply

Browse data Manage tables Manage layers

Clear Refresh Close

v.db.update map=halozat@munka

Number of loaded records: 757

Hálózat készítés

Hozzuk létre a csomópontok tábláját
nyissuk meg a hálózat réteg attribútum tábláját és válasszuk a **Manage layers** fület

The screenshot shows the GRASS GIS Attribute Table Manager window. The title bar reads "GRASS GIS Attribute Table Manager - <halozat@munka>".

List of layers

Layer	Driver	Database	Table	Key
1	sqlite	/home/siki/grassdata/bme/munka/sqlite/sqlite.db	halozat	cat

Layer description

Layer: 2 - +

Driver: sqlite

Database: /home/siki/grassdata/bme/munka/sqlite/sc

Table: halozat

Key column: cat

Insert record for each category into table

Buttons: Set default, Add layer, Create table

Table description

Table name: []

Key column: cat

Navigation: Browse data, Manage tables, **Manage layers**

Buttons: Clear, Refresh, Close

Hálózat készítés

Hozzuk létre a csomópontok tábláját
nyissuk meg a hálózat réteg attribútum tábláját és válasszuk a **Manage layers** fület

GRASS GIS Attribute Table Manager - <halozat@munka>

List of layers

Layer	Driver	Database	Table	Key
1	sqlite	/home/siki/grassdata/bme/munka/sqlite/sqlite.db	halozat	cat
2	sqlite	/home/siki/grassdata/bme/munka/sqlite/sqlite.db	halozat	cat

Add layer Remove layer Modify layer

Layer description

Layer: 3 - +

Driver: sqlite

Database: /home/siki/grassdata/bme/munka/sqlite/sc

Table: halozat

Key column: cat

Insert record for each category into table

Set default Add layer

Table description

Table name:

Key column: cat

Create table

Browse data Manage tables **Manage layers**

Clear Refresh **Close**

Number of loaded records: 757

Hálózat készítés

Hozzuk létre a csomópontok tábláját
nyissuk meg a hálózat réteg attribútum tábláját és válasszuk a **Manage layers** fület

The screenshot shows the GRASS GIS Attribute Table Manager interface. It features two side-by-side panels for managing layers. The left panel shows layer 1, and the right panel shows layer 2. The right panel's configuration is highlighted with a red oval. Below the panels are tabs for 'Browse data', 'Manage tables', and 'Manage layers'. At the bottom right, there are 'Clear', 'Refresh', and 'Close' buttons, with the 'Close' button highlighted by a red oval. The status bar at the bottom indicates 'Number of loaded records: 757'.

Layer	Driver	Database	Table	Key
1	sqlite	/home/siki/grassdata/	halozat	cat
2	sqlite	/home/siki/grassdata/bme/munka/sqlite/sqlite.db	halozat	cat

Layer description for Layer 2:

- Layer: 2
- Driver: sqlite
- Database: /home/siki/grassdata/bme/munka/sqlite/sqlite.db
- Table: halozat
- Key column: cat
- Insert record for each category into table

Table description:

- Table name: []
- Key column: cat
-

Buttons:

Navigation:

Number of loaded records: 757

Útvonalkeresés

Legrövidebb útvonal

```
v.net.path input=halozat@munka output=utv1@munka file=tmp.txt  
(tmp.txt: 1 200 300 // cat start_node end_node)
```

vagy

```
Echo "1 200 300" | v.net.path input=halozat output=utv
```

```
v.net.path input=halozat output=utv1_2 < tmp.txt
```

vagy Vector/Network analysis/Shortest path

v.net.path [vector, network, shortest path]

Finds shortest path on vector network.

Required Name of input vector map: * (input=name)
Cost halozat@munka

Optional Name for output vector map: * (output=name)
Command output utv1

Manual Arc layer: * (arc_layer=string)
1

Arc type: * (arc_type=string)
 line boundary

Node layer: * (node_layer=string)
2

Add created map(s) into layer tree
 Close dialog on finish

v.net.path -overwrite input=halozat@munka output=utv1 file=/home/siki/grassdata/bme/munka/.tmp/...

Útvonalkeresés

Legrövidebb útvonal

```
v.net.path input=halozat@munka output=utv1@munka file=tmp.txt  
(tmp.txt: 1 200 300 // cat start_node end_node)
```

vagy

```
Echo "1 200 300" | v.net.path input=halozat output=utv
```

```
v.net.path input=halozat output=utv1_2 < tmp.txt
```

vagy Vector/Network analysis/Shortest path

The image shows two screenshots of the v.net.path dialog box in QGIS. The left screenshot shows the 'Shortest path' dialog with the following fields: Name of input vector map: halozat@munka, Name for output vector map: utv1, Arc layer: 1, Arc type: line and boundary checked, Node layer: 2. The right screenshot shows the 'Shortest path' dialog with the following fields: Arc forward/both direction(s) cost column (number): fimp, Arc backward direction cost column (number): timp, Node cost column (number):. Red circles highlight the 'fimp' and 'timp' entries in the cost columns. Both screenshots have 'Add created map(s) into layer tree' checked and 'Close dialog on finish' unchecked.

```
v.net.path -overwrite input=halozat@munka output=utv1 fi v.net.path -overwrite input=halozat@munka output=utv1 file=/home/siki/grassdata/bme/munka/.tmp/...
```


Útvonalkeresés

Legrövidebb útvonal

```
v.net.path input=halozat@munka output=utv1@munka file=tmp.txt  
(tmp.txt: 1 200 300 // cat start_node end_node)
```

vagy

```
Echo "1 200 300" | v.net.path input=halozat output=utv
```

```
v.net.path input=halozat output=utv1_2 < tmp.txt
```

vagy Vector/Network analysis/Shortest path

The screenshot shows the 'v.net.path' dialog box in GRASS GIS. The dialog is titled 'v.net.path [vector, network, shortest path]'. It contains several sections for configuring the shortest path search:

- Required:** Name (ha), Cost (g), Turntable (s), Command output (ut), Manual (1).
- Optional:** Name (ut), Cost (g), Turntable (s), Command output (ut), Manual (1).
- Advanced options:**
 - Use geodesic calculation for longitude-latitude locations (g)
 - Write output as original input segments, not each path as one line (s)
 - Allow output files to overwrite existing files (overwrite)
 - Verbose module output (verbose)
 - Quiet module output (quiet)
- Name of file containing start and end points. If not given, read from stdin: (file=name)**
/home/siki/grassdata/bme/munka/.tmp/Augustiener/20613.1 [Browse]
- or enter values directly:**
1 200 300 (circled in red)

At the bottom, there are buttons for 'Close', 'Run' (highlighted in green), 'Copy', and 'Help'. Below the dialog, there are checkboxes for 'Add created map(s) into layer tree' (checked) and 'Close dialog on finish' (unchecked). At the very bottom, the command line is visible: `v.net.path -overwrite input=halozat@munka output=utv1 file=/home/siki/grassdata/bme/munka/.tmp/Augustiener/20613.1`

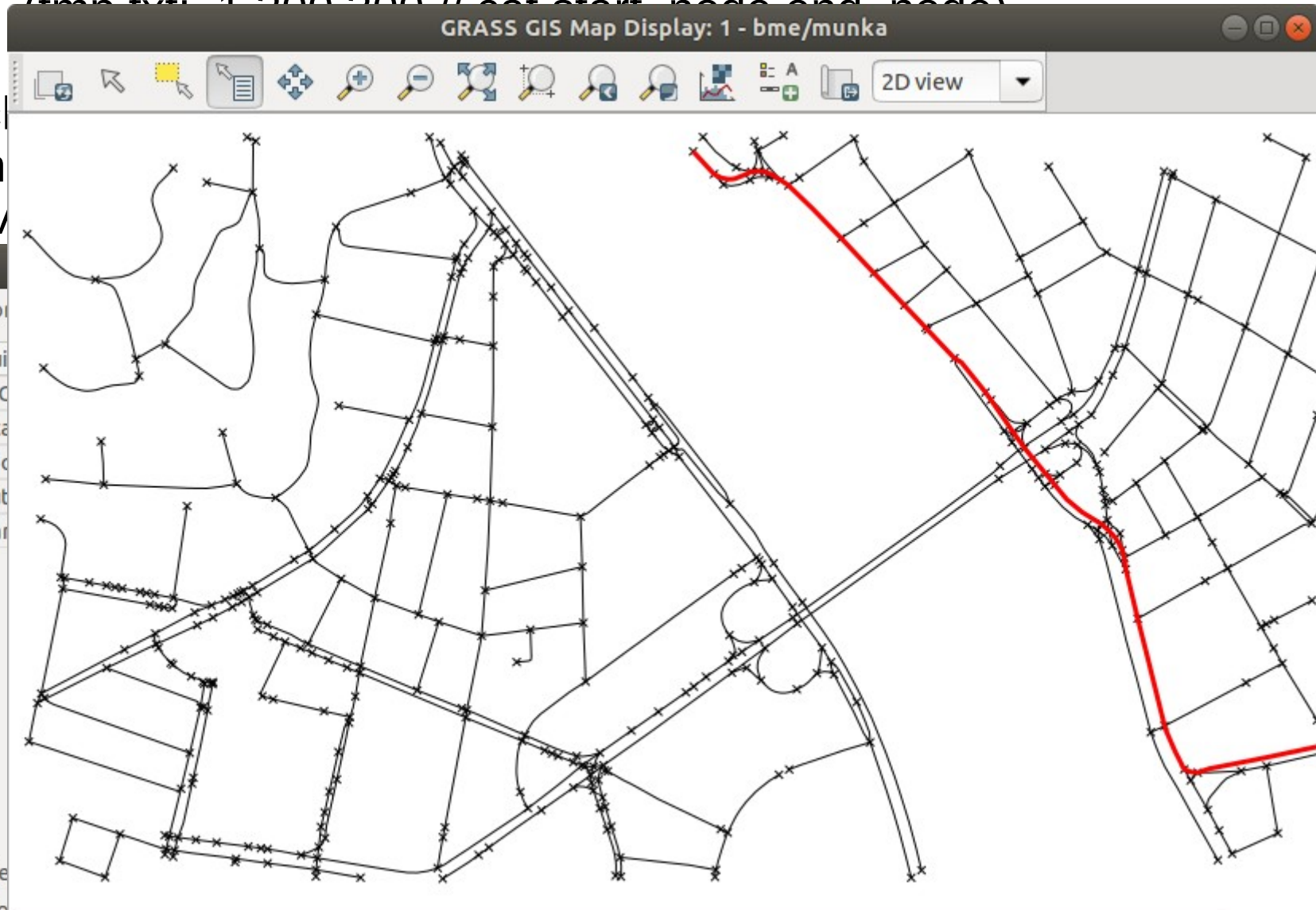
Útvonalkeresés

Legrövidebb útvonal

```
v.net.path input=halozat@munka output=utv1@munka file=tmp.txt
```

```
(tmp.txt: 1 200 200 // set start node end node)
```

vagy
Ec
v.n
vagy v



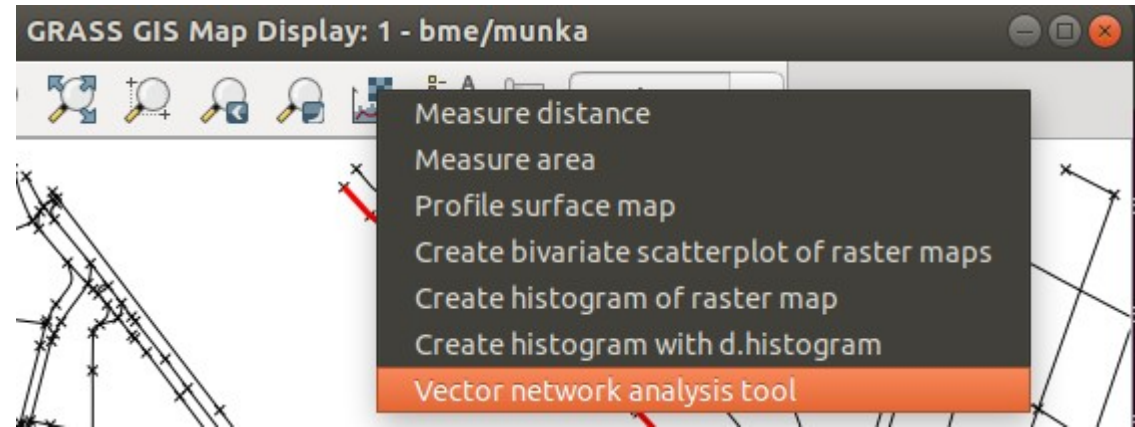
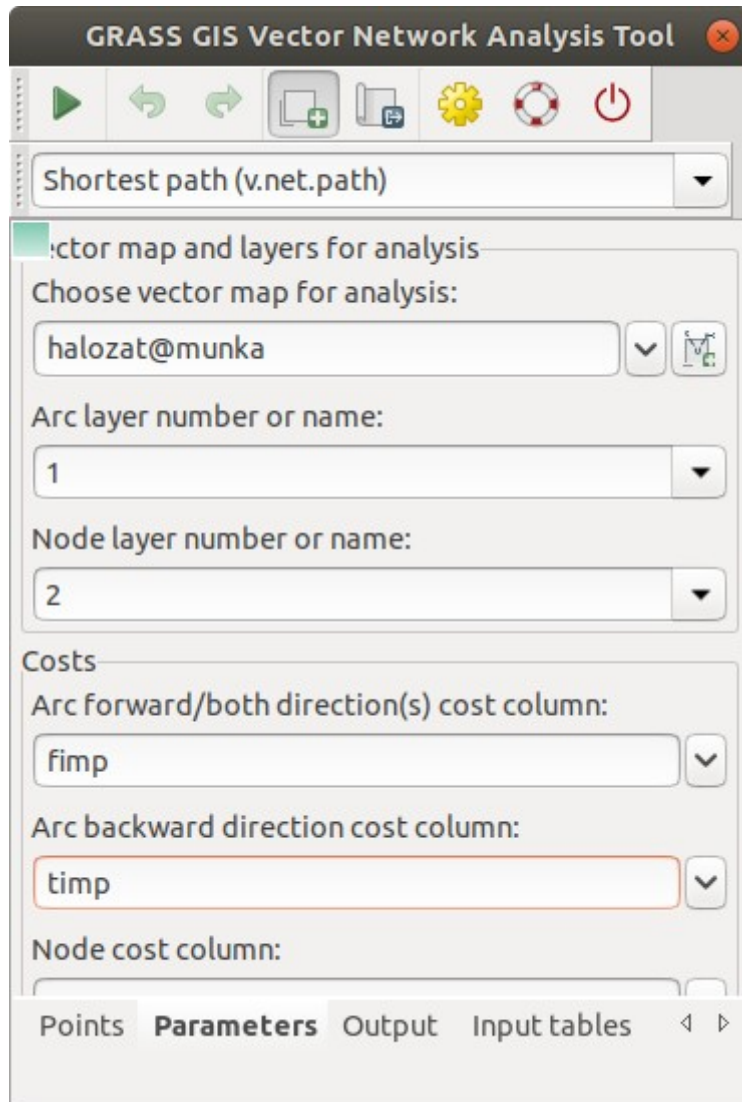
650828.82; 237963.24

v.net.path -ov

Coordinate: bme/munka/.tmp/...

Útvonalkeresés

Legrövidebb útvonal



Útvonalkeresés

Legrövidebb útvonal

The image shows two instances of the GRASS GIS Vector Network Analysis Tool. The left instance displays the 'Shortest path (v.net.path)' tool with the following settings:

- Choose vector map for analysis: halozat@munka
- Arc layer number or name: 1
- Node layer number or name: 2
- Costs:
 - Arc forward/both direction(s) cost column: fimp
 - Arc backward direction cost column: timp
 - Node cost column: (empty)

The right instance shows the 'Points for analysis' section with a table of points:

use	type	topology
<input checked="" type="checkbox"/>	1 Start point	new point
<input checked="" type="checkbox"/>	2 End point	new point

Below the table, the 'Analysis settings' section shows 'Maximum distance of point to' set to 100000. A context menu is also visible in the background with options: Measure distance, Measure area, Profile surface map, te scatterplot of raster maps, am of raster map, am with d.histogram, and k analysis tool.

Útvonalkeresés

Legrövidebb útvonalak két csomópont csoport között

`v.net.distance ...`

Csomópontok közötti összes legrövidebb útvonal

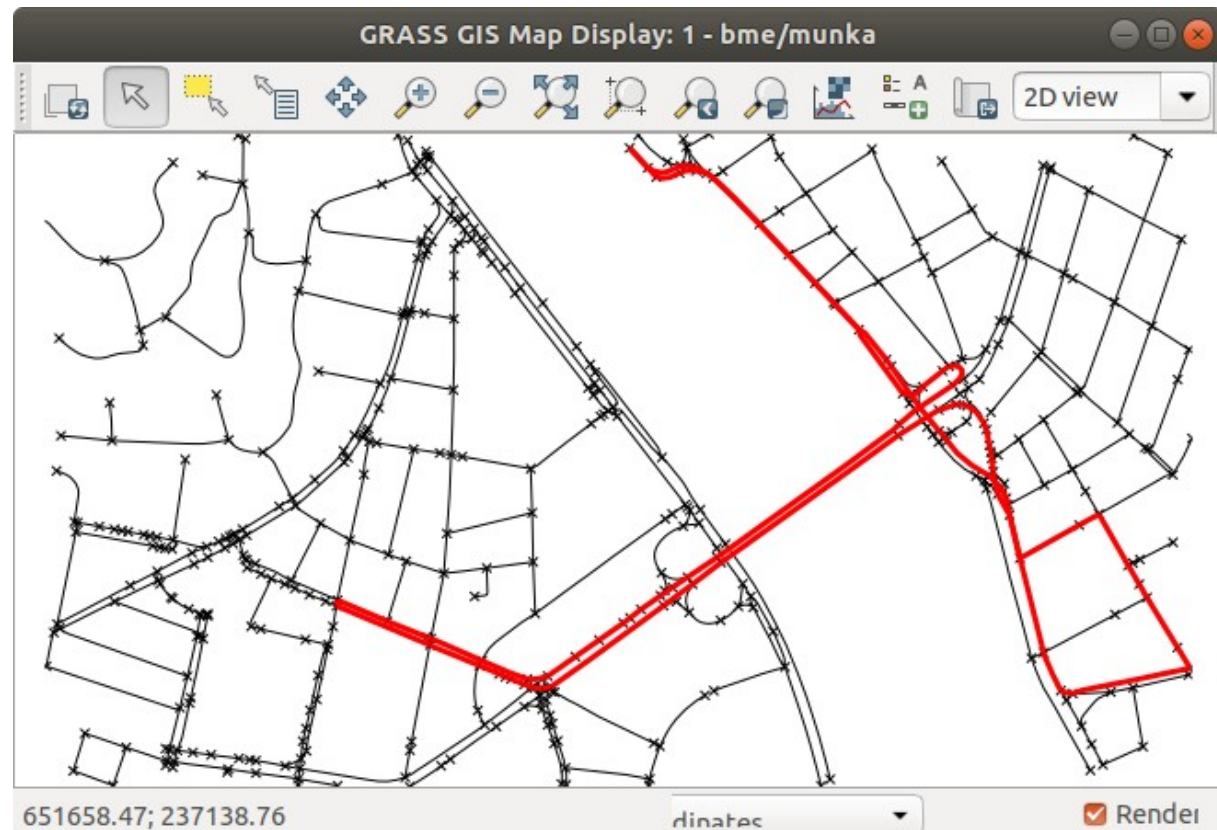
`v.net.allpairs input=halozat output=utv`

`cats=84,124,252,328 arc_column=fimp arc_backward_column=timp`

Utazó ügynök

`v.net.salesman -o input=halozat output=utv1 center_cats=100,200,300`

`arc_column=fimp arc_backward_column=timp`



Hálózat elemzés

Utazó ügynök

v.net.salesman input=halozat output=utv centercats=992,949,876 -o

Allokáció

v.net.alloc input=halozat output=utv cats=84,124,252,529 -o

v.category input=utv option=report

Megjelenítés kategória színezéssel vagy
Kategóriánként

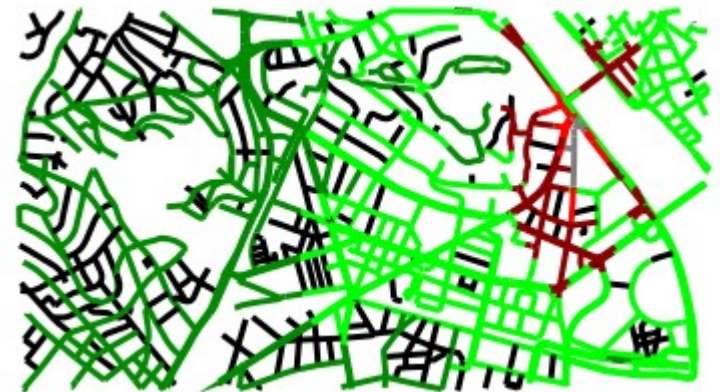


Hálózat felosztása

v.net.iso input=halozat output=iso center_cats=84 costs=250,500,1000,2500

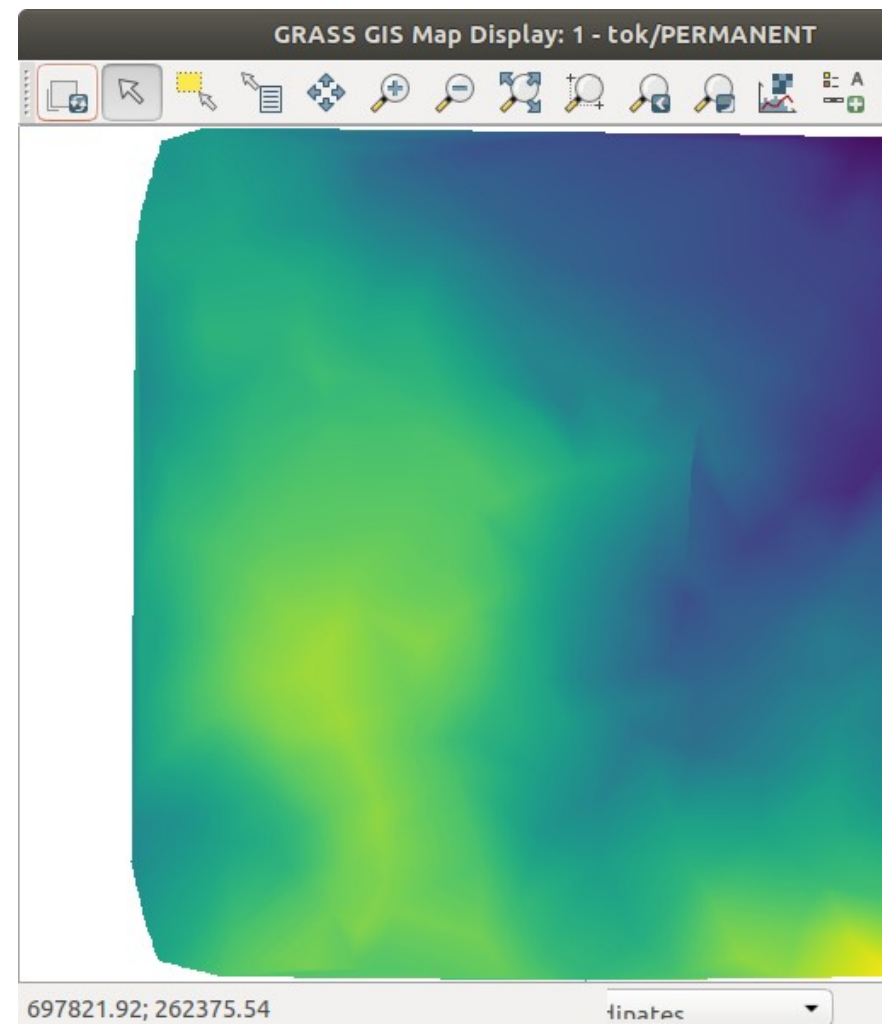
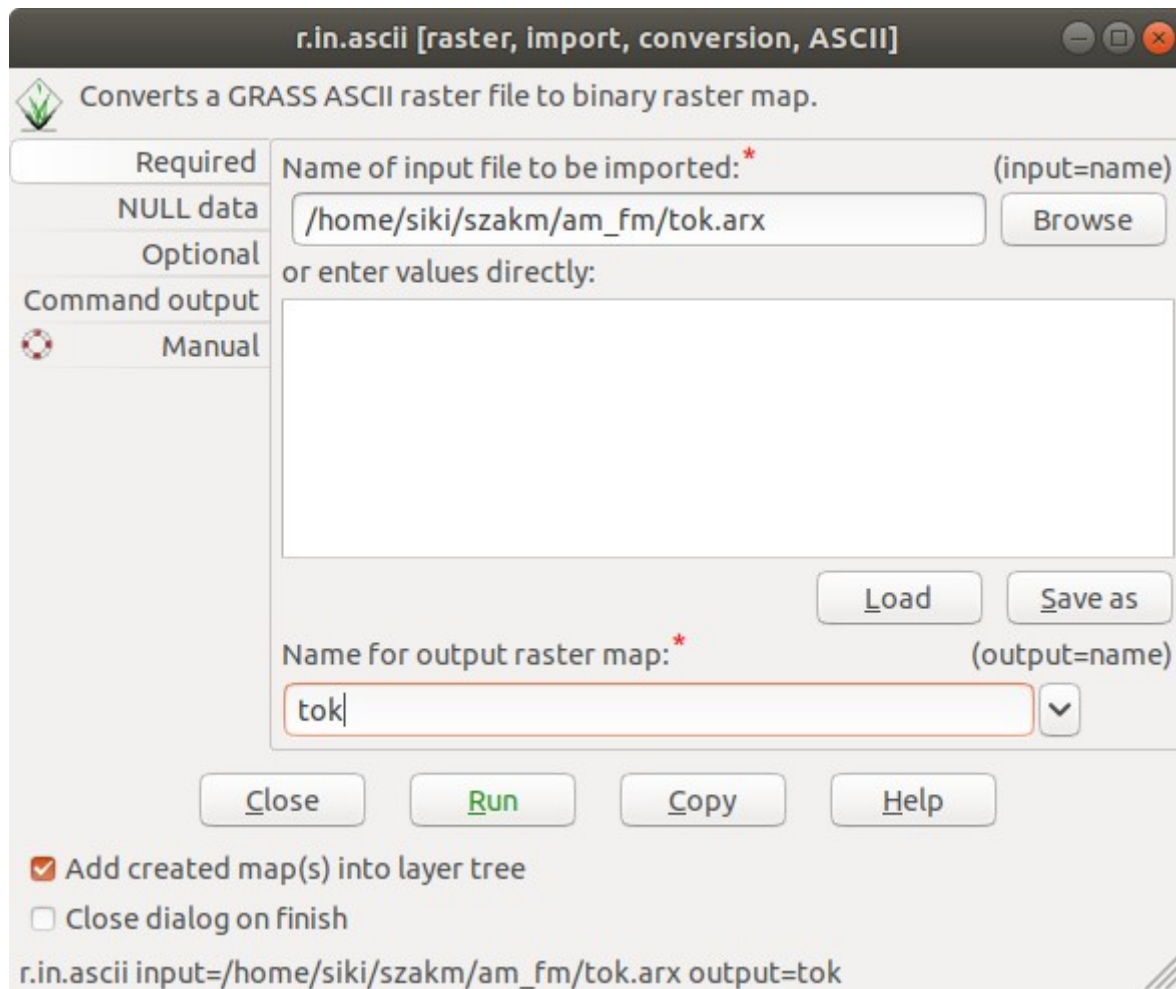
Minimális feszítő fa

v.net.spanningtree input=halozat output=st



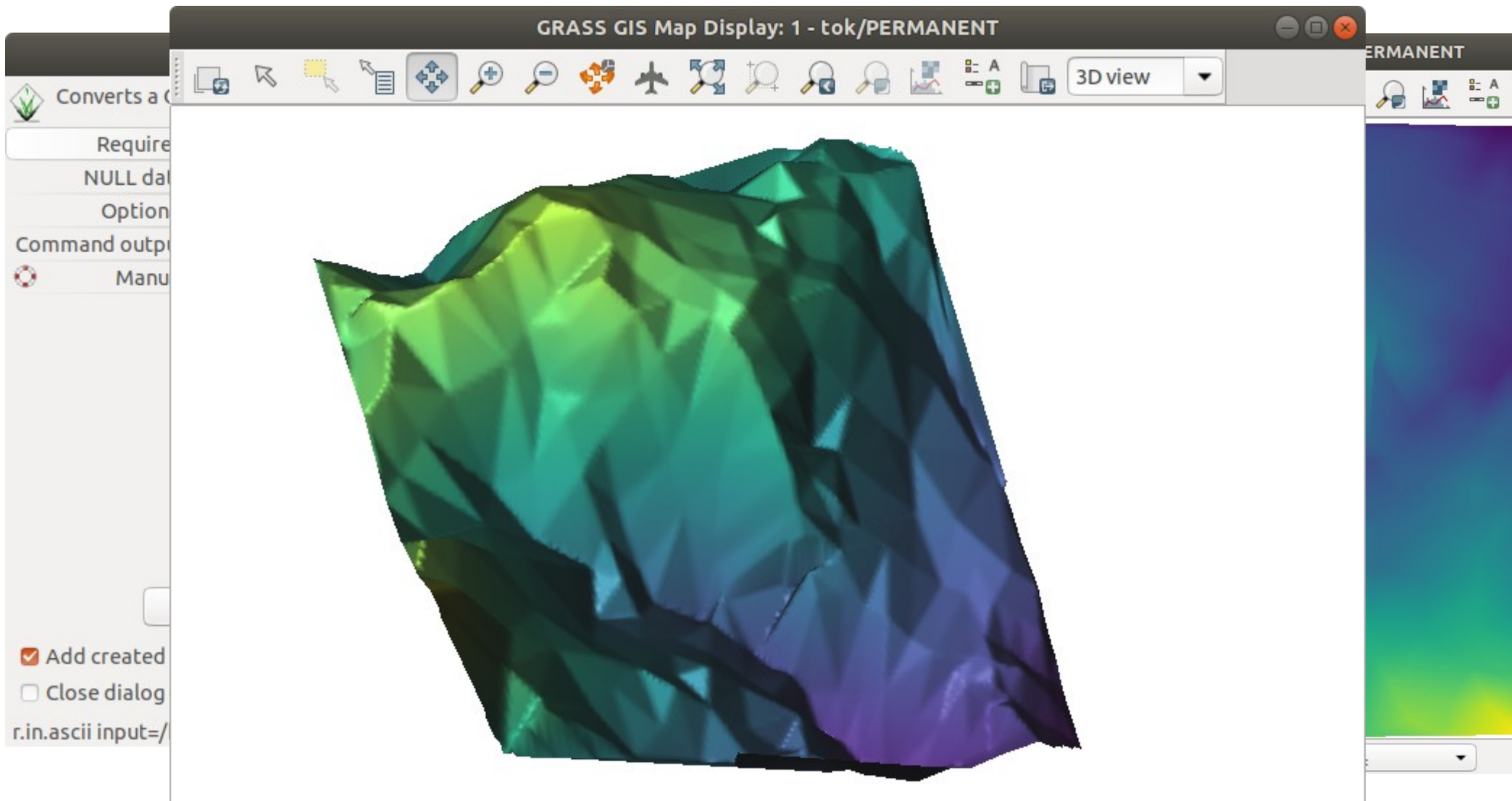
Útvonal keresés raszteren

Töltsük be tok.asc DEM-et. File/Import raster data/ASCII grid import r.in.ascii



Útvonal keresés raszteren

Töltsük be tok.asc DEM-et. **File/Import raster data/ASCII grid import**
r.in.ascii



Útvonal keresés raszteren

Állítsuk be a számítási régiót. Settings/Computational region/Set region
r.region

g.region [general, settings, computational region, extent, resolution, level1]

Manages the boundary definitions for the geographic region.

Existing Set from default region (d)

Bounds Save as default region (s)

Resolution Set current region from named region: (region=name)

Effects

Print

Optional [multiple] Set region to match raster map(s): (raster=name)

Command output tok@PERMANENT

Manual Set region to match 3D raster map(s) (both 2D and 3D values): (raster_3d=name)

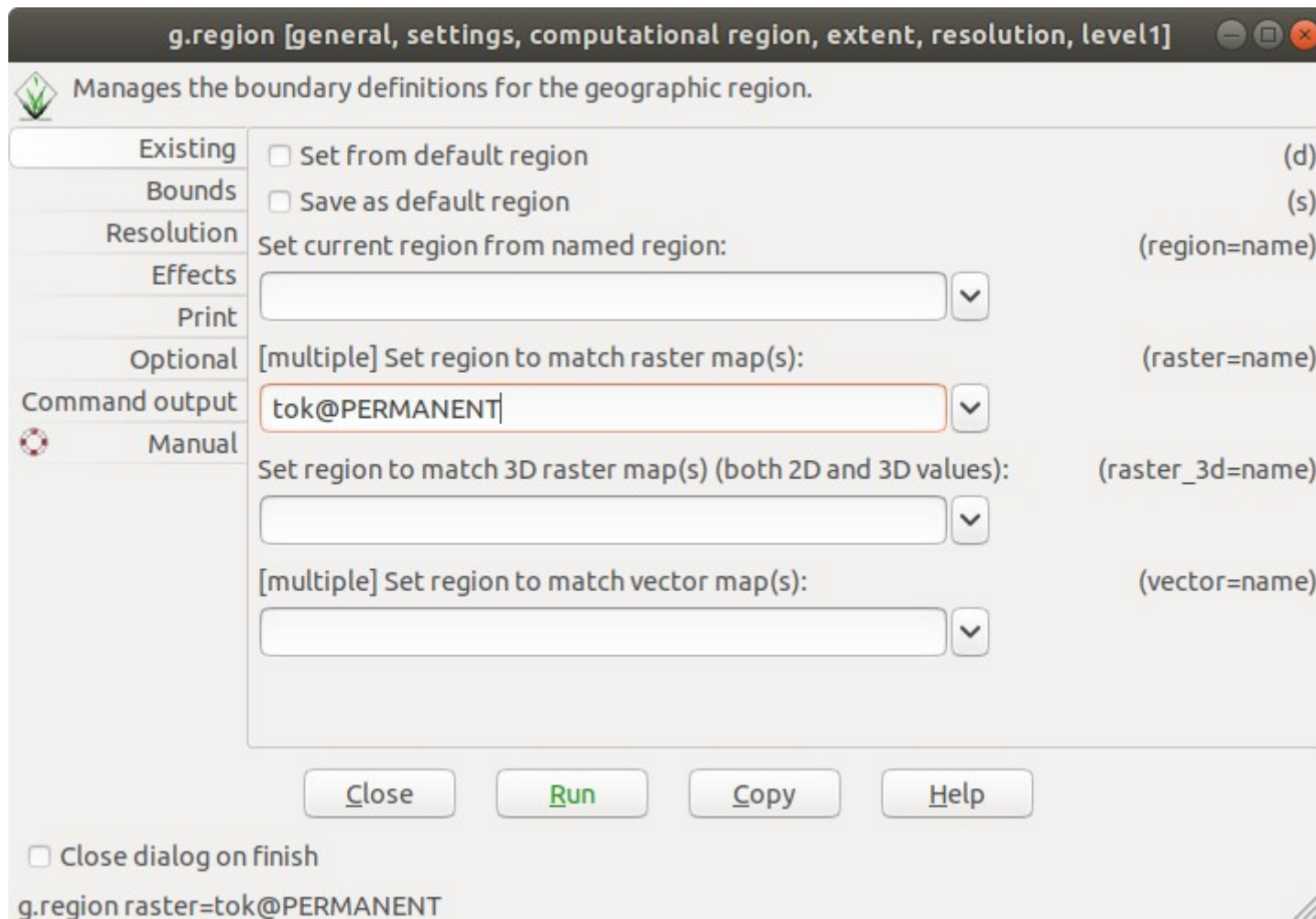
[multiple] Set region to match vector map(s): (vector=name)

Close dialog on finish

g.region raster=tok@PERMANENT

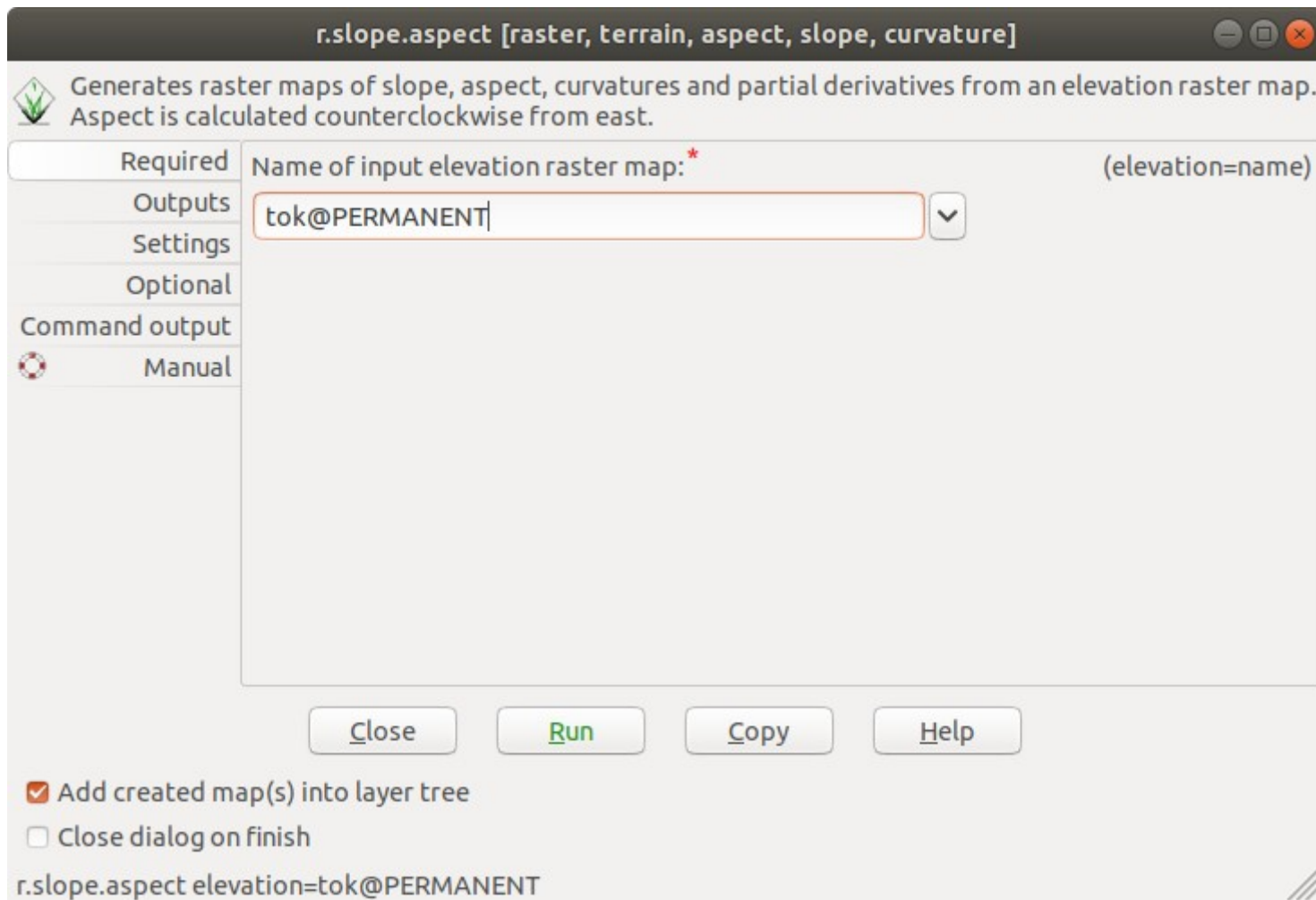
Útvonal keresés raszteren

Állítsuk be a számítási régiót. Settings/Computational region/Set region
r.region



Útvonal keresés raszteren

Készítsünk lejtőkategória térképet Raster/Terrain analysis/Slope and aspect
r.slope.aspect



Útvonal keresés raszteren

Készítsünk lejtőkategória térképet Raster/Terrain analysis/Slope and aspect
r.slope.aspect

r.slope.aspect [raster, terrain, aspect, slope, curvature]

Generates raster maps of slope, aspect, curvatures and partial derivatives from an elevation raster map. Aspect is calculated counterclockwise from east.

Required Name of input elevation raster map: tok@PERMANENT

Optional

- Name for output slope raster map: slope (slope=name)
- Name for output aspect raster map: (aspect=name)
- Name for output profile curvature raster map: (pcurvature=name)
- Name for output tangential curvature raster map: (tcurvature=name)
- Name for output first order partial derivative dx (E-W slope) raster map: (dx=name)

Add created map(s) into layer tree
 Close dialog on finish

r.slope.aspect elevation=tok@PERMANENT slope=slope

r.slope.aspect elevation=tok@PERMANENT

Útvonal keresés raszteren

Készítsünk lejtőkategória térképet Raster/Terrain analysis/Slope and aspect
r.slope.aspect

The screenshot displays the GRASS GIS interface for the `r.slope.aspect` tool. The main window, titled "GRASS GIS Map Display: 1 - tok/PERMANENT", shows a 3D terrain map with a color gradient from red (steep slopes) to blue (shallow slopes). The tool's settings panel is visible on the right, with the following options:

- Required: Name of input elevation raster map: tok@PERMANENT
- Outputs: (slope=name)
- Settings: (aspect=name)
- Optional: (pcurvature=name)
- Command output: (tcurvature=name)
- Manual: dx (E-W slope) raster map: (dx=name)

At the bottom of the interface, the command line shows: `r.slope.aspect elevation=tok@PERMANENT slope=slope`. The status bar at the bottom left indicates the coordinates 698066.45; 262887.80. A "Close" button is located at the bottom left of the tool's settings panel.

Útvonal keresés raszteren

Készítsünk költség térképet Raster/Terrain analysis/Cost map
r.cost

r.cost [raster, cost surface, cumulative costs, cost allocation]

Creates a raster map showing the cumulative cost of moving between different geographic locations on input raster map whose cell category values represent cost.

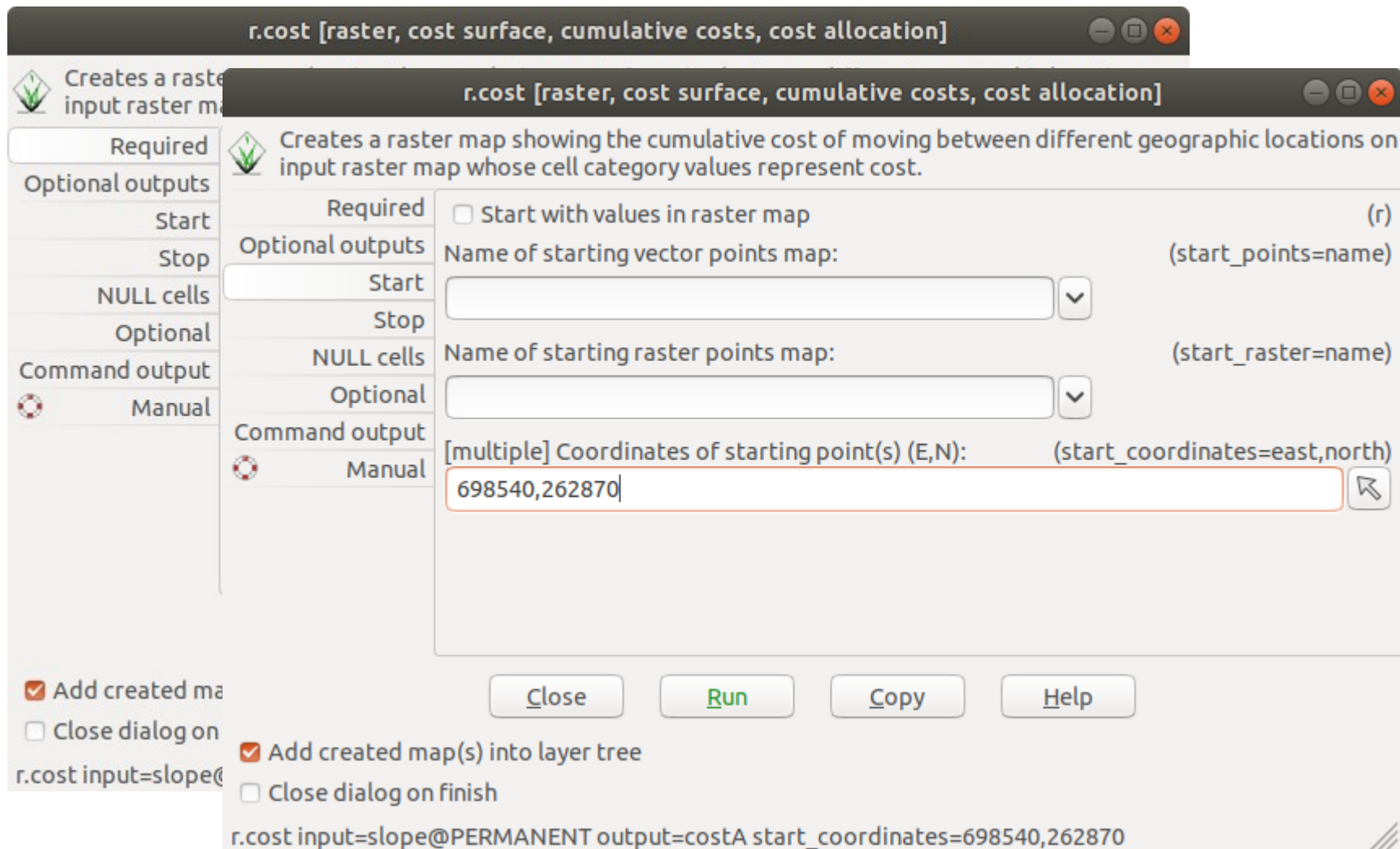
Required	Name of input raster map containing grid cell cost information:*	(input=name)
Optional outputs	<input type="text" value="slope@PERMANENT"/>	
Start		
Stop	Name for output raster map:*	(output=name)
NULL cells	<input type="text" value="costA"/>	
Optional		
Command output		
Manual		

Add created map(s) into layer tree
 Close dialog on finish

r.cost input=slope@PERMANENT output=costA start_coordinates=698540,262870

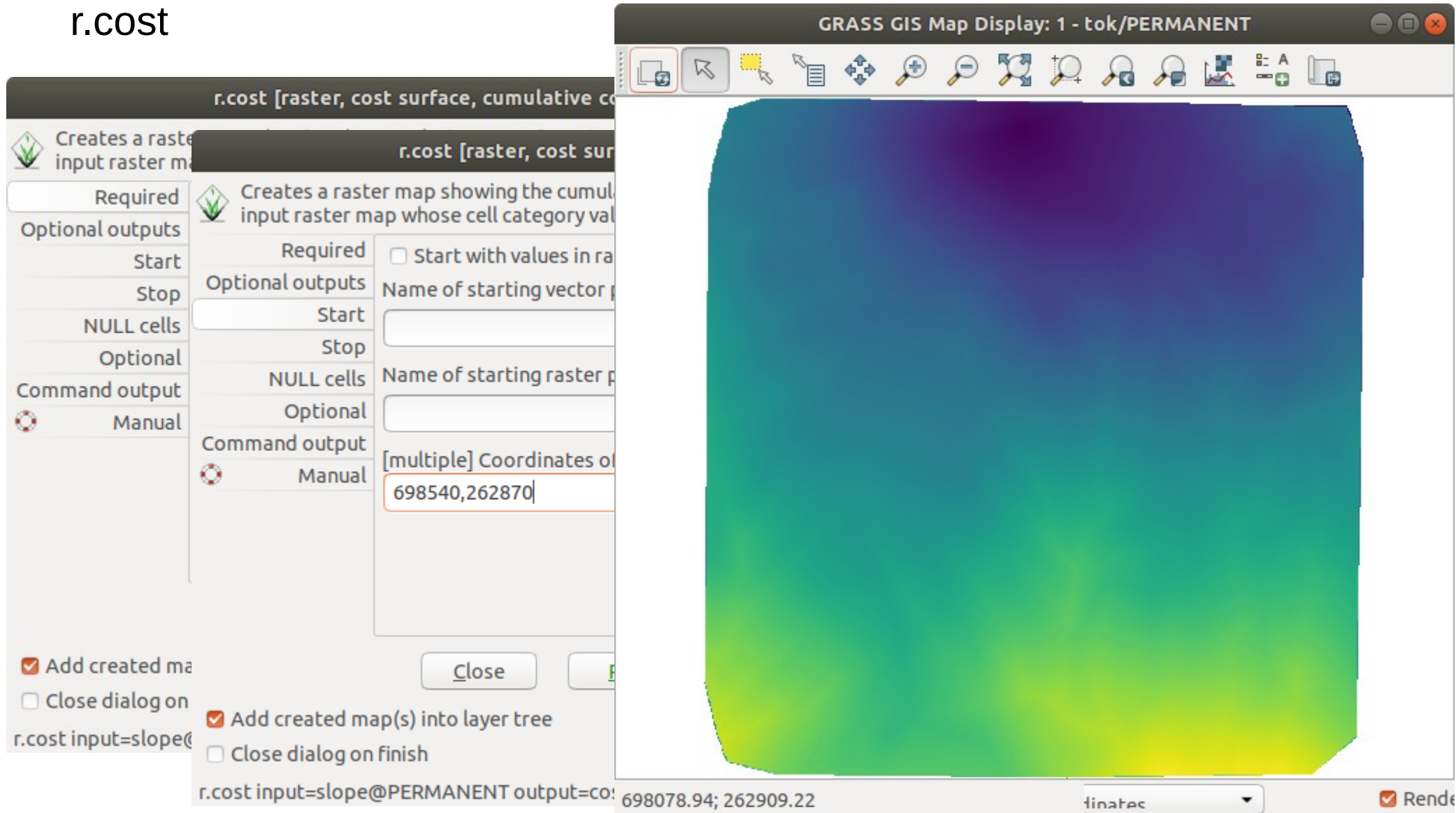
Útvonal keresés raszteren

Készítsünk költség térképet Raster/Terrain analysis/Cost map
r.cost



Útvonal keresés raszteren

Készítsünk költség térképet Raster/Terrain analysis/Cost map
r.cost



The image displays the GRASS GIS interface. On the left, the **r.cost** dialog box is open, showing the following options:

- Required:** Creates a raster map showing the cumulative cost surface of an input raster map whose cell category values are greater than the specified start value.
- Optional outputs:** Start, Stop, NULL cells, Optional.
- Command output:** Manual.
- Add created map(s) into layer tree
- Close dialog on finish

The **Manual** section contains the following fields:

- Start with values in raster map
- Name of starting vector point layer:** [Empty]
- Name of starting raster point layer:** [Empty]
- [multiple] Coordinates of starting point:** 698540,262870

At the bottom of the dialog, the command line shows: `r.cost input=slope@PERMANENT output=cost@PERMANENT`

On the right, the **GRASS GIS Map Display: 1 - tok/PERMANENT** window shows a cost map visualization. The map uses a color gradient from purple (high cost) to yellow (low cost). The map is displayed in a window with a toolbar and a status bar at the bottom showing coordinates: 698078.94; 262909.22.

Útvonal keresés raszteren

Készítsünk költség térképet Raster/Terrain analysis/Cost map
r.cost

r.cost [raster, cost surface, cumulative costs, cost allocation]

Creates a raster map showing the cumulative cost of moving between different geographic locations on input raster map whose cell category values represent cost.

Required	Name of input raster map containing grid cell cost information: *	(input=name)
Optional outputs	<input type="text" value="slope@PERMANENT"/>	
Start		
Stop	Name for output raster map: *	(output=name)
NULL cells	<input type="text" value="costB"/>	
Optional		
Command output		
Manual		

Add created map(s) into layer tree
 Close dialog on finish

r.cost input=slope@PERMANENT output=costB start_coordinates=698540,262870

Útvonal keresés raszteren

Készítsünk költség térképet Raster/Terrain analysis/Cost map
r.cost

r.cost [raster, cost surface, cumulative costs, cost allocation]

Creates a raster map showing the cumulative cost of moving between different geographic locations on input raster map whose cell category values represent cost.

Name: cost

Start:

Stop:

Name of starting vector points map: (start_points=name)

Name of starting raster points map: (start_raster=name)

[multiple] Coordinates of starting point(s) (E,N): (start_coordinates=east,north)
698700,262050

Add created map(s) into layer tree
 Close dialog on finish

r.cost input=slope@PERMANENT output=costB start_coordinates=698700,262050

Buttons: Close, Run, Copy, Help

Útvonal keresés raszteren

Készítsünk költség térképet Raster/Terrain analysis/Cost map
r.cost

The image shows two overlapping windows from the GRASS GIS software. The background window is the 'r.cost' dialog box, which is used to generate a cost surface. The dialog includes a description: 'Creates a raster map showing the cumulative cost of moving between cells in an input raster map whose cell category is...'. It has several sections: 'Required' (Name: slope), 'Optional outputs' (Name: cost), 'Start' (checkbox 'Start with values in'), 'Stop' (Name of starting vector), 'NULL cells' (Name of starting raster), 'Optional' ([multiple] Coordinates: 698700,262050), 'Command output', and 'Manual'. At the bottom, there are checkboxes for 'Add created map(s) into layer tree' (checked) and 'Close dialog on finish' (unchecked). The command line at the bottom reads 'r.cost input=slope@PERMANENT output=...'. The foreground window is the 'GRASS GIS Map Display: 1 - tok/PERMANENT' window, which shows a color-coded cost surface map. The map uses a color gradient from green (low cost) to blue/purple (high cost). The map display window has a toolbar with various navigation and editing tools. At the bottom of the map display window, there is a status bar showing coordinates '698209.24; 262925.28', a dropdown menu for 'tinatec', and a checked 'Render' checkbox.

Útvonal keresés raszteren

Összegezzük a két költséget Raster/Raster Map Calculator
r.mapcalc

The screenshot shows the GRASS GIS Raster Map Calculator window. The title bar reads "GRASS GIS Raster Map Calculator". The interface is divided into several sections:

- Operators:** A grid of buttons for mathematical and logical operators: +, -, &&, ||, *, /, &, |, >, >=, &&&, |||, <, <=, <<, >>, ==, !=, >>>, !, %, ^, a?b:c, ~.
- Output:** A section for defining the output map, with a text box containing "costAB" and a dropdown arrow.
- Operands:** Two sections for inserting mapcalc functions and existing raster maps, each with a dropdown arrow.
- Expression:** A large text box containing the expression: `costA@PERMANENT + costB@PERMANENT`.
- Buttons:** A row of buttons: Load, Save, Copy, Help, Run (highlighted in green), and Close.
- Options:** Three checkboxes: Generate random seed for rand() (with a Seed input field), Allow output files to overwrite existing files, and Add created raster map into layer tree.
- Status Bar:** At the bottom, it shows the command: `r.mapcalc expression="costAB = costA@PERMANENT + costB@PERMANENT"`.

Útvonal keresés raszteren

Összegezzük a két költséget Raster/Raster Map Calculator
r.mapcalc

GRASS GIS Raster Map Calculator

Operators

+	-	&&	
*	/	&	
>	>=	&&&	
<	<=	<<	>>
==	!=	>>>	!
%	^	a?b:c	~

Expression

costA@PERMANENT + costB@PERMANENT

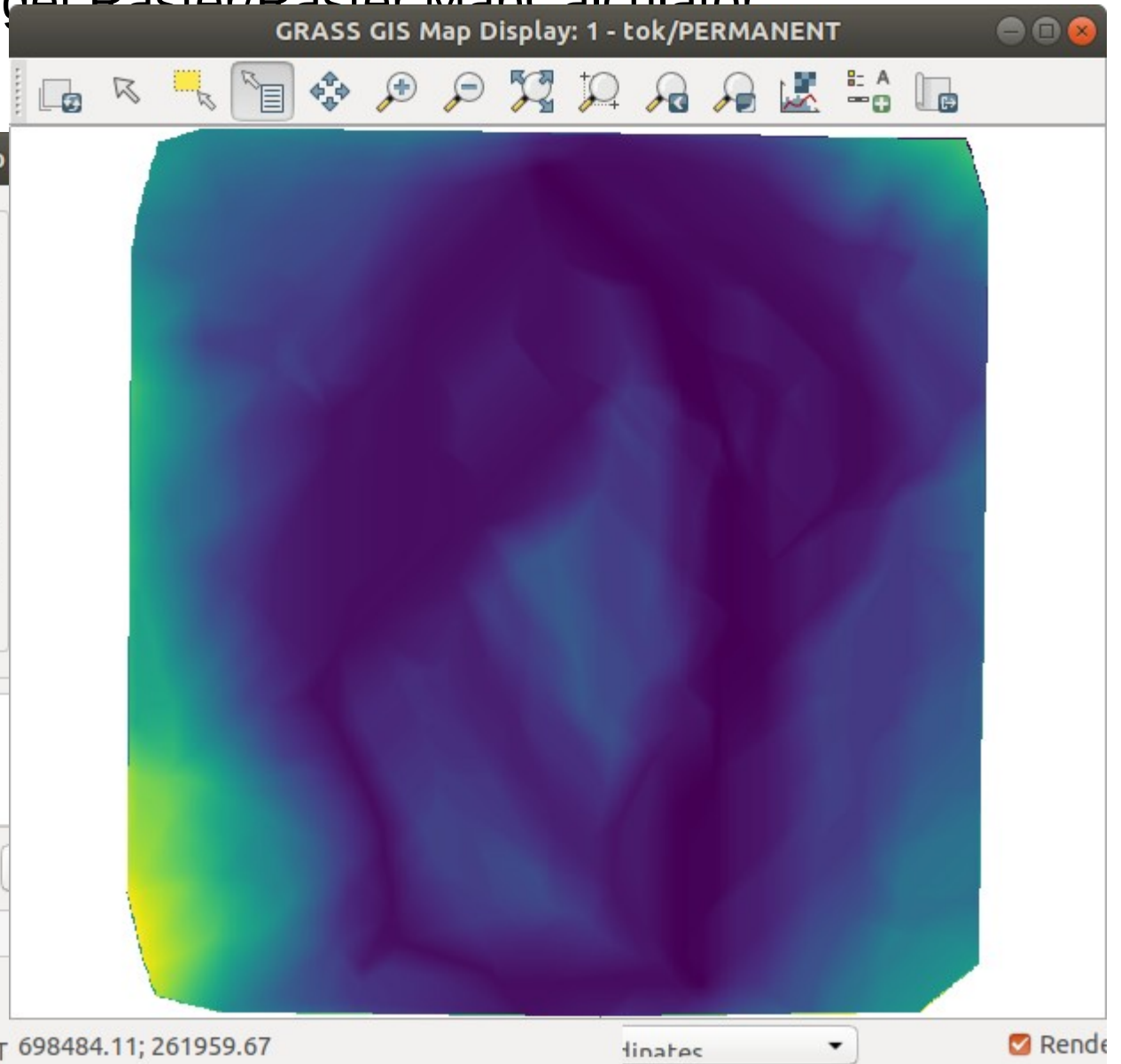
Load Save Copy

Generate random seed for rand() Seed:

Allow output files to overwrite existing files

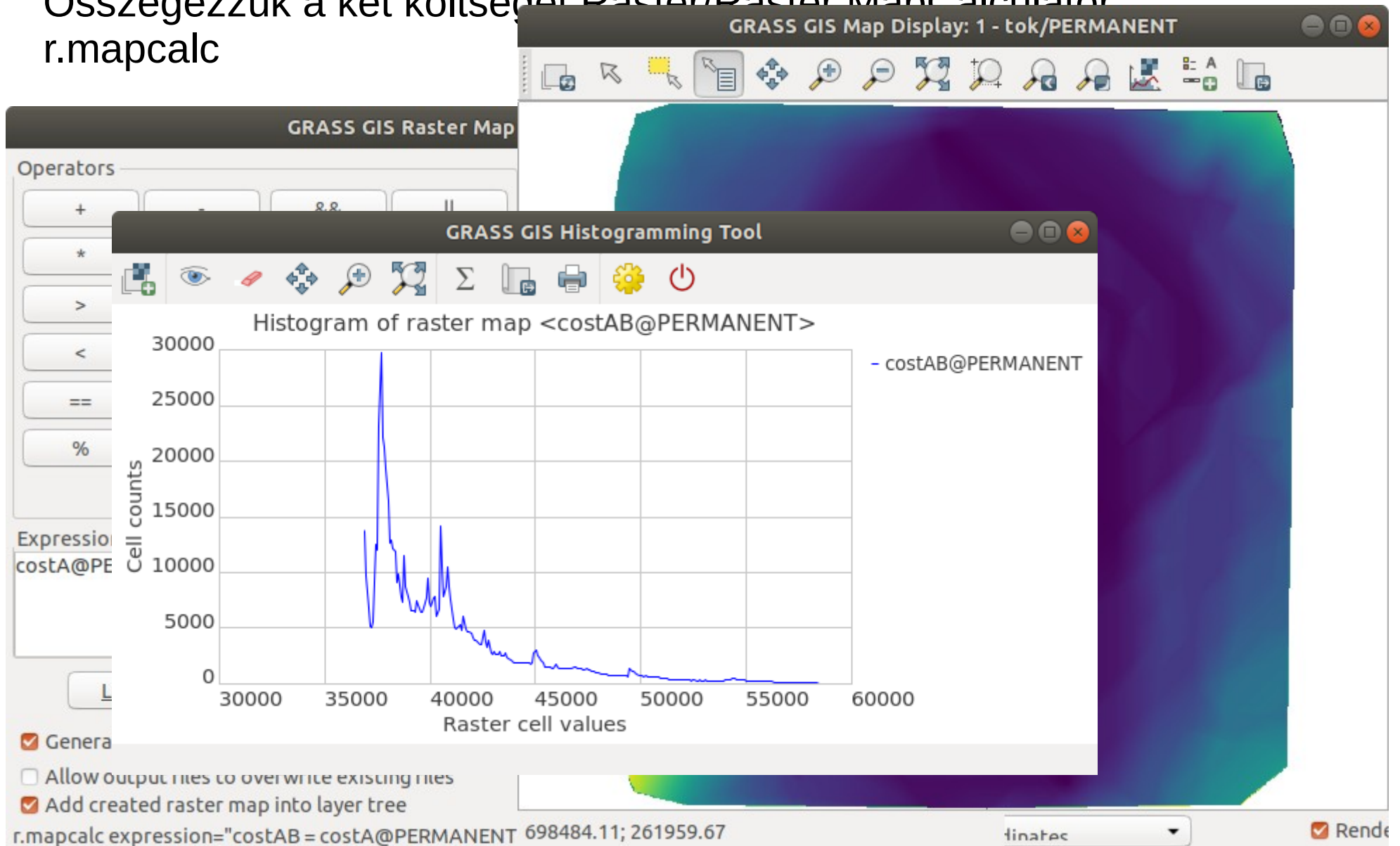
Add created raster map into layer tree

r.mapcalc expression="costAB = costA@PERMANENT + costB@PERMANENT 698484.11; 261959.67



Útvonal keresés raszteren

Összegezzük a két költséget Raster/Raster Map Calculator
r.mapcalc



Útvonal keresés raszteren

Válasszuk le a 40000-nélkisebb értékeket Raster/Raster Map Calculator
r.mapcalc

The screenshot shows the GRASS GIS Raster Map Calculator window. The title bar reads "GRASS GIS Raster Map Calculator".

Operators: A grid of buttons for mathematical and logical operations: +, -, &&, ||, *, /, &, |, >, >=, &&&, |||, <, <=, <<, >>, ==, !=, >>>, !, %, ^, a?b:c, ~.

Output: A section for defining the output raster map. It includes a text input field with "path" and a dropdown arrow.

Operands: A section for inserting mapcalc functions and existing raster maps. It contains two dropdown menus and a "Clear" button.

Expression: A large text area containing the expression: `costAB@PERMANENT < 40000 ? costAB@PERMANENT : 0`

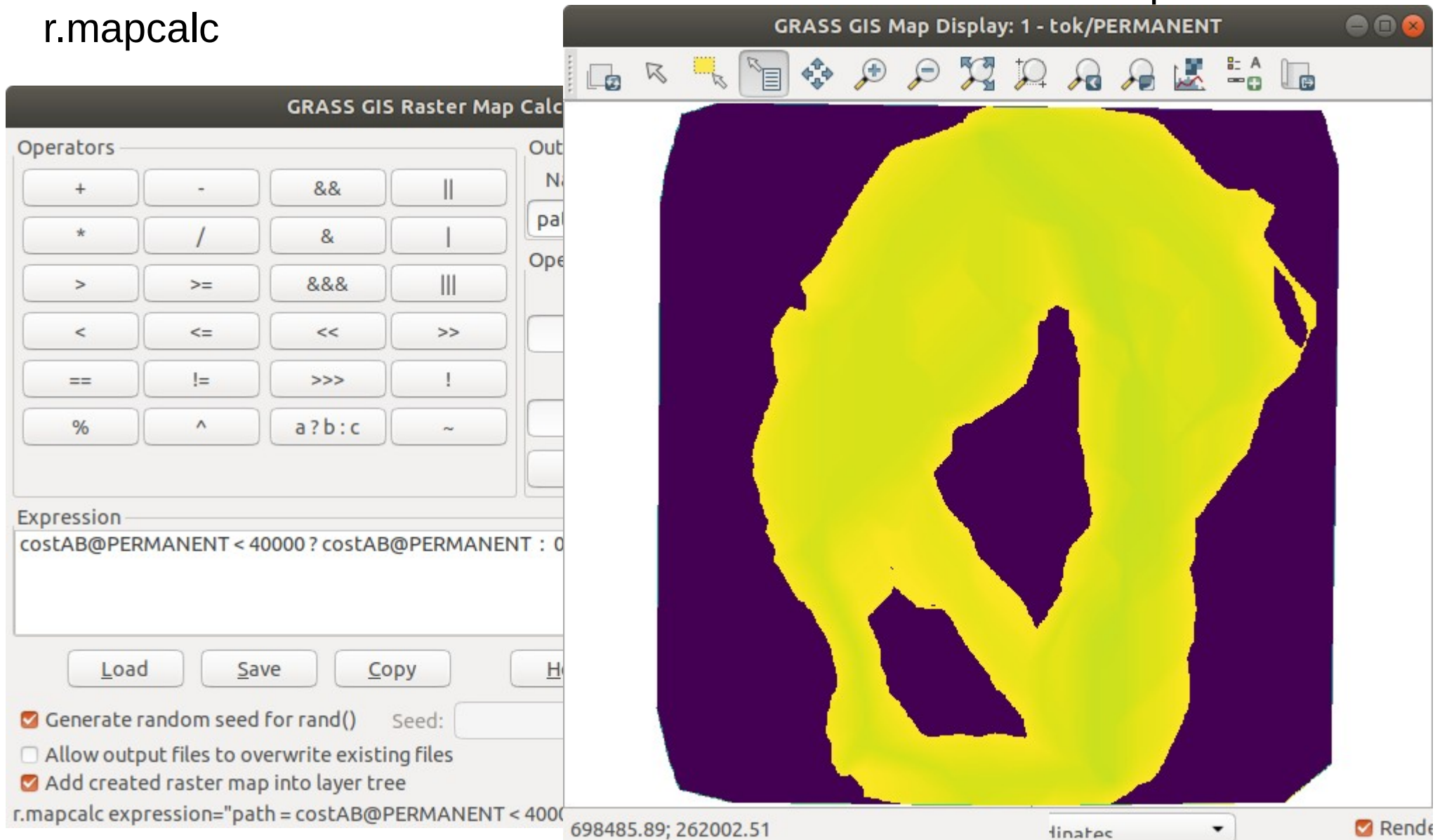
Buttons: A row of buttons: Load, Save, Copy, Help, Run (highlighted in green), Close.

Options: A list of checkboxes: Generate random seed for rand() (Seed:)
 Allow output files to overwrite existing files
 Add created raster map into layer tree

Status Bar: At the bottom, it displays the full expression: `r.mapcalc expression="path = costAB@PERMANENT < 40000 ? costAB@PERMANENT : 0"`

Útvonal keresés raszteren

Válasszuk le a 40000-nélkisebb értékeket Raster/Raster MapCalculator
r.mapcalc



The image shows two windows from the GRASS GIS software. The left window is the 'GRASS GIS Raster Map Calculator' dialog box. It features a grid of operator buttons (arithmetic, logical, and relational) and an 'Expression' field containing the command: `costAB@PERMANENT < 40000 ? costAB@PERMANENT : 0`. Below the expression field are buttons for 'Load', 'Save', 'Copy', and 'Help'. At the bottom, there are three checked options: 'Generate random seed for rand()', 'Allow output files to overwrite existing files', and 'Add created raster map into layer tree'. The bottom status bar shows the command: `r.mapcalc expression="path = costAB@PERMANENT < 40000`.

The right window is the 'GRASS GIS Map Display: 1 - tok/PERMANENT' window. It displays a map with a yellow path on a dark purple background. The path is a complex, irregular shape with several internal holes. The window includes a toolbar with various navigation and display tools. The bottom status bar shows the coordinates `698485.89; 262002.51`, a dropdown menu with 'tinatoc', and a 'Render' button.