



GIS Fundamental

An introduction of modern GIS technology

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Biodata Diri



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GIS related projects

- WebGIS – Indonesia Tourism Development Project
- Geoportal Cagar Budaya - Ertim Conservation Institute



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Full-stack WebGIS Course

1. GIS fundamental
2. Introduction to HTML & CSS
3. Front-end Development with JavaScript
4. JavaScript Mapping Library
5. Build a Geo API
6. Working with Spatial Database
7. Python Fundamental
8. Backend Development for Geospatial Applications
9. WebGIS Project: Tourism WebMap in Bikini Bottom

From A to Z

Fullstack WebGIS Course

Geocourse.id Special Course for All!



Are You Interested?

Full-stack WebGIS course roadmap

GIS Fundamental

2 sessions ~ QGIS

HTML & CSS

2 sessions ~ HTML & CSS

JavaScript

4 sessions ~ JavaScript

Spatial Database

3 sessions ~ PostgreSQL & PostGIS

Geospatial API

3 sessions ~ GeoServer

JavaScript for Map

3 sessions ~ Openlayers & Leaflet

Python

3 sessions ~ Python

Backend Framework

4 sessions ~ Django

Final Project

6 sessions





Lisensi



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Versi 2, Juni 1991

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Boston, MA 02111-1307, USA

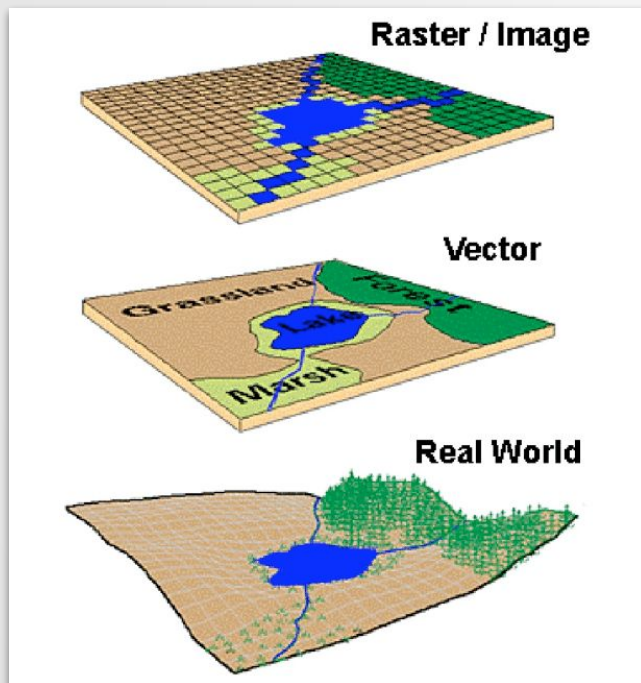
Semua orang diperbolehkan untuk menggandakan dan mendistribusikan salinan kata
demi kata dari dokumen lisensi ini, namun tidak diperkenankan untuk mengubahnya



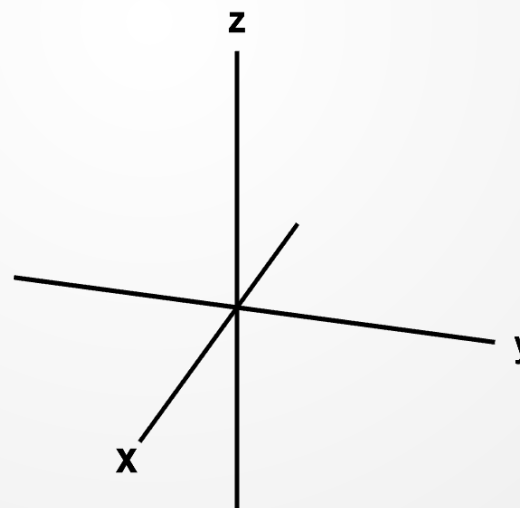
Data Spasial

“Data spasial adalah data yang bisa menunjukkan lokasi letak data tersebut di permukaan bumi. Data spasial memiliki referensi posisi geografis dan digambarkan dalam sebuah sistem koordinat.”

geospasialis.com



Source: <https://www.researchgate.net/profile/David-Saab/>



Sistem Koordinat Kartesian





Data Spasial: Spatial Text Markup Language

opengeospatial/wkt



A standalone reference describing the Well-known Text Representation of Geometry. (Work In Progress)



1

Contributor



3

Issues



4

Stars



1

Fork



Well-known text (WKT) merupakan bahasa markup teks yang merepresentasikan objek geometri vektor.


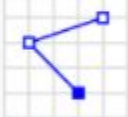


Well-known binary (WKB) digunakan untuk transfer dan penyimpanan data layaknya WKT untuk dibaca oleh komputer dan tidak tergolong *human-readable*





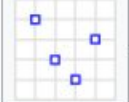
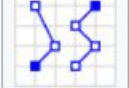
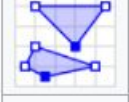
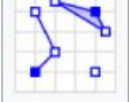
Data Spasial: Well-known Text

Geometry primitives (2D)

Type	Examples	
Point		<code>POINT (30 10)</code>
LineString		<code>LINESTRING (30 10, 10 30, 40 40)</code>
Polygon		<code>POLYGON ((30 10, 40 40, 20 40, 10 20, 30 10))</code>
		<code>POLYGON ((35 10, 45 45, 15 40, 10 20, 35 10), (20 30, 35 35, 30 20, 20 30))</code>

Source: <https://www.wikipedia.org/>

Multipart geometries (2D)

Type	Examples	
MultiPoint		<code>MULTIPOINT ((10 40), (40 30), (20 20), (30 10))</code>
		<code>MULTIPOINT (10 40, 40 30, 20 20, 30 10)</code>
MultiLineString		<code>MULTILINESTRING ((10 10, 20 20, 10 40), (40 40, 30 30, 40 20, 30 10))</code>
MultiPolygon		<code>MULTIPOLYGON (((30 20, 45 40, 10 40, 30 20)), ((15 5, 40 10, 10 20, 5 10, 15 5)))</code>
		<code>MULTIPOLYGON (((40 40, 20 45, 45 30, 40 40)), ((20 35, 10 30, 10 10, 30 5, 45 20, 20 35), (30 20, 20 15, 20 25, 30 20)))</code>
GeometryCollection		<code>GEOMETRYCOLLECTION (POINT (40 10), LINESTRING (10 10, 20 20, 10 40), POLYGON ((40 40, 20 45, 45 30, 40 40)))</code>





Data Spasial: Well-known Binary

Geometry types, and WKB integer codes

Type	2D	Z	M	ZM
Geometry	0000	1000	2000	3000
Point	0001	1001	2001	3001
LineString	0002	1002	2002	3002
Polygon	0003	1003	2003	3003
MultiPoint	0004	1004	2004	3004
MultiLineString	0005	1005	2005	3005
MultiPolygon	0006	1006	2006	3006
GeometryCollection	0007	1007	2007	3007
CircularString	0008	1008	2008	3008
CompoundCurve	0009	1009	2009	3009
CurvePolygon	0010	1010	2010	3010
MultiCurve	0011	1011	2011	3011
MultiSurface	0012	1012	2012	3012
Curve	0013	1013	2013	3013
Surface	0014	1014	2014	3014
PolyhedralSurface	0015	1015	2015	3015
TIN	0016	1016	2016	3016

Geometry types, and WKB integer codes

Type	2D	Z	M	ZM
Triangle	0017	1017	2017	3017
Circle	0018	1018	2018	3018
GeodesicString	0019	1019	2019	3019
EllipticalCurve	0020	1020	2020	3020
NurbsCurve	0021	1021	2021	3021
Clothoid	0022	1022	2022	3022
SpiralCurve	0023	1023	2023	3023
CompoundSurface	0024	1024	2024	3024
BrepSolid		1025		
AffinePlacement	102	1102		

Contoh, geometri POINT(2 4) ditunjukkan sebagai:
 0000000001400000000000000000401000000000000, di
 mana:

1-byte integer 00 atau 0: big endian

4-byte integer 00000001 atau 1: POINT (2D)

8-byte float 40000000000000000000 atau 2: x-coordinate

8-byte float 40100000000000000000 atau 4: y-coordinate













Supported Data di QGIS

Import Data









Berbasis File

-  Vector Data
-  Raster Data
-  Mesh
-  Delimited Text
-  Point clouds

Berbasis Database

-  GeoPackage
-  SpatiaLite
-  PostgreSQL
-  MSSQL
-  Oracle
-  SAP HANA
-  Virtual Layer

Berbasis Server

-  WMS/WMTS
-  WFS/OGC API
-  WCS
-  XYZ
-  Vector Tile
-  ArcGIS Map Service
-  ArcGIS Feature Service
-  Geonode



Supported Data di QGIS

Create Data

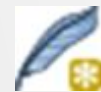
Kategori Data



New GeoPackage Layer



New Shapefile Layer



New SpatiaLite Layer



New Temporary Scratch Layer



New Virtual Layer



New GPX Layer



Manipulasi Data

Manipulasi Data adalah sebuah proses mengubah ataupun memodifikasi data guna menghasilkan data yang mudah dipahami dan tertata. Sebagai contoh, manipulasi data dilakukan dengan mengatur urutan data berdasarkan alfabet untuk menemukan informasi yang lebih berguna.

www.astera.com





QGIS Expressions

Expressions (ε) merupakan salah satu fitur dalam QGIS untuk melakukan manipulasi atribut berupa nilai, geometri dan variabel guna menghasilkan *insight* baru dalam menggali data.

- Aggregates Functions
- Conditional Functions
- Conversions Functions
- Fields and Values
- Files and Paths Functions
- Geometry Functions
- Maps Functions
- Mathematical Functions
- Processing Functions
- Rasters Functions
- dll.





QGIS Expressions Interface

The screenshot displays the QGIS Expression Dialog window, which is used for creating and editing expressions. The window has a title bar 'Expression Dialog' and two tabs: 'Expression' and 'Function Editor'. The 'Expression' tab is active, showing a text area with the expression: `-- Display the type of city`
`concat(upper("NAME_2"), ' is a ', "TYPE_2")`

Below the text area is a toolbar with icons for undo, redo, copy, paste, and help. At the bottom of the text area is a 'Feature' dropdown menu set to '4' and a 'Preview' label showing 'Preview: 'BETHEL is a Census Area''. A 'Help' button is located at the bottom left.

On the right side of the dialog is a 'Fields and Values' panel. It has a search bar and a 'Show Values' button. Below these is a list of fields: **symbol_color**, **value**, **Aggregates**, **Arrays**, **Color**, **Conditionals**, **Conversions**, **Custom**, **Date and Time**, and **Fields and Values**. The 'Fields and Values' section is expanded, showing a list of fields: **ID**, **NAME_2**, and **TYPE_2**. The 'NAME_2' field is selected.

Below the 'Fields and Values' panel is a 'Values' panel. It has a search bar and two buttons: 'All Unique' and '10 Samples'. Below these buttons is a list of values: Aleutians East, Aleutians West, Anchorage, Bethel, Bristol Bay, Denali, Dillingham, Fairbanks North Star, Haines, and Juneau.

At the bottom right of the dialog are 'Cancel' and 'OK' buttons.





QGIS Expressions

Expression Syntax

Expression syntax di QGIS menggunakan bahasa custom QGIS yang strukturnya seperti SQL syntax

```
"harga" > 10000
```

```
"total_pdd" / "luas_km2"
```

```
CASE  
  WHEN "kepadatan_pdd" < 50 THEN 'Kepadatan rendah'  
  WHEN "kepadatan_pdd" >= 50 AND "kepadatan_pdd" < 150 THEN 'Kepadatan sedang'  
  WHEN "kepadatan_pdd" >= 150 THEN 'Kepadatan tinggi'  
END
```



SQL & Python Console

QGIS memiliki Python API yang bisa digunakan oleh pengguna untuk berinteraksi dengan layer. Fitur ini dapat dilakukan menggunakan Python console untuk testing pembuatan plugin atau navigasi QGIS. QGIS juga memiliki fitur kueri database dengan menggunakan SQL untuk mendapatkan data.





QGIS SQL Database

QGIS mendukung untuk melakukan kueri beberapa koneksi database relasional, di antaranya:

- GeoPackage
- Oracle Spatial
- PostgreSQL/PostGIS
- SpatiaLite
- Virtual Layers

DOWNLOAD BAHAN TUTORIAL

<https://github.com/geocourse-id/fullstack-webgis-lesson1>





QGIS Python

Default code completion, APIs bawaan yang dapat dieksekusi di QGIS Python console:

- Python
- PyQGIS
- PyQt5
- QScintilla2
- osgeo-gdal-ogr

Open QGIS C++ API documentation by typing `_api`

Open QGIS Python API documentation by typing `_pyqgis`

Open PyQGIS Cookbook by typing `_cookbook`



Get in touch with me at



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