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Data base tables "Geodata International"

Description

The data base tables of nearly all countries of the world contain postal zip codes, places and local parts with geo references, which make possible an unique local allocation and distance calculations.

Quality of the geodata

The geodata of the product "Geodata International" are from official sources, they are **not** part of open-source data!

The geodata described here are subject to a continuing quality control. The raw data of the individual countries as basis for "Geodata International" are recorded from there residents authorities, institutions and suppliers. As result the quality of the raw data depends on the infrastructure and the possibilities inside the respective countries. Geodata of the industrial nations exhibit therefore normally a higher quality than those of the developing countries. The geodata are prepared, computed and standardized from these raw data with best knowledge by specialized experts. We have to emphasize expressly that from the raw data resulting deviations or error of a small extent can not excluded in any case and cannot be criticized.

Conversion to the necessary data format

As a standard the database tables are present in the file format CSV (Comma Separated Values). The used character set is UTF8. This format is used often and in most cases you can import the data directly into your own system.

The freeware program CONVERT, downloadable from the site **http://www.killetsoft.de/p_cona_e.htm**, converts the available database tables into other data formats and character sets with the necessary sortings and selections. With the program for example CSV data can be converted into the SDF format (Simple Document Format) or into the dBase format. For the use of the data on different platforms it is possible to select between the character sets ASCII, ANSI, UTF8 and UniCode. Thus the import of the data in any database management system or file system will be possible.

For the import in MySQL or SQL data bases the necessary "CREATE TABLE" script can be generated. Further the selection of the data on data fields and data records is possible. In addition the data can be sorted on base of the data fields. Data from several files can be joined to a common file.

Please contact us, if you need the data in another format, sort sequence or in another coordinate system.

Coordinate systems and Reference systems

The geo references of all objects are contained in the tables as geographic coordinates in degree and degree/minute/second notation and as UTM coordinates.

The UTM coordinates are globally present in 60 meridian strips with a width of 6 degree each. In order to be able to accomplish country-wide and even countries spreading distance calculations between the coordinates, the UTM coordinates with the suffix "_CENT" are converted country-wide to a uniform, national central meridian strip. The UTM coordinates with the suffix "_NAT" are present with the strip number of their natural meridian strip.

The Geographical coordinates and the UTM coordinates of the countries not belonging to Europe are present as the reference system "WGS84 (worldwide, GPS), geocentric, WGS84". The reference system WGS84 is standardized the in the year 1984 world-wide as "World Geodetic System" on the also named WGS84 ellipsoid. It is used for navigation tasks with the American satellite navigation system GPS (Global Positioning System).

The Geographical coordinates and the UTM coordinates of the European countries are present as the reference system "ETRS89 (Europe), geocentric, GRS80". ETRS89 is the reference system uniform for all European countries. GRS80 is the ellipsoid used for the mapping of the coordinates. ETRS89 is a geocentric (on the earth center referred) reference system, which is almost identical to the reference system WGS84.

Because the reference systems WGS84 and ETRS89 deviates less than one meter, the direct unification of the here used coordinates with GPS data and modern maps is possible.

The ground level elevations were interpolated from the Digital Elevation Models (DEM) "Shuttle Radar Topography Mission" (SRTM)developed by the NASA.

Distance calculation with right-angled and metric coordinates

Distances between two points in UTM coordinates can be computed by the simple execution of the Pythagoras theorem, since this coordinate system is right-angled and metric. That has the advantage in relation to the computation with geographical coordinates (see below) that it is substantially simpler and much faster. The result is the distance between the points in meters.

Formula for the distance calculation with UTM coordinates:

```
difEast  := abs(UTM_E_CENT_1 - UTM_E_CENT_2)
difNorth := abs(UTM_N_CENT_1 - UTM_N_CENT_2)
distance  := sqrt(difEast * difEast + difNorth * difNorth)
with
UTM_E_CENT_1:    Easting of the first coordinate
UTM_N_CENT_1:    Northing of the first coordinate
UTM_E_CENT_2:    Easting of the second coordinate
UTM_N_CENT_2:    Northing of the second coordinate
abs():           Absolute value
sqrt():          Square root
distance:        The result is the distance in meters
```

Distance calculation with geographic coordinates

Geographic coordinates are indicated in longitude and latitude. Usually longitude and latitude are represented in the degree/minute/second notation. For further calculations with the coordinates, the minute and second portions must be converted into parts of a degree. The representation of latitude and longitude in degrees is called the decimal notation. For a distance computation the longitude and latitude of the first point (Lon1, Lat1) and the longitude and latitude of the second point (Lon2, Lat2) are needed. If the longitude has a minus sign, the point is situated west of the Greenwich meridian, otherwise east of it. If the latitude has a minus sign, the point is on the southern earth hemisphere, otherwise on the northern earth hemisphere.

Representation of the longitude and latitude of a coordinate in the degree/minute/second notation (Data fields **LON_GEO** and **LAT_GEO**).

```
| Two to three digit degree portion of the coordinate (d)
|  | Two digit minute portion of the coordinate (m)
|  | | Two digit second portion of the coordinate (s)
|  | |  | Decimal portion of one second(s)
dddmmss.ss
with
d:        Degree portion of longitude or latitude
m:        Minute portion of longitude or latitude
s:        Second portion with decimals of longitude or latitude
```

Conversion of the lengths and widths of the two coordinates into the decimal notation. This is not necessary if Geographic coordinates in degree notation are used directly (data fields **LON_DEC** and **LAT_DEC**).

```
Lon1d = d + (m / 60) + (s / 3600)
Lat1d = d + (m / 60) + (s / 3600)
Lon2d = d + (m / 60) + (s / 3600)
```

Lat2d = d + (m / 60) + (s / 3600)
with
Lon1d: Decimal longitude of the first point
Lat1d: Decimal latitude of the first point
Lon1d: Decimal longitude of the second point
Lat1d: Decimal latitude of the second point

For further computation the longitude and latitude are converted into radians. The unit of the radian is [rad].
Lon1r = Lon1d * PI / 180
Lat1r = Lat1d * PI / 180
Lon2r = Lon2d * PI / 180
Lat2r = Lat2d * PI / 180
with
Lon1r: Radian of the longitude of the first point
Lat1r: Radian of the latitude of the first point
Lon1r: Radian of the longitude of the second point
Lat1r: Radian of the latitude of the second point
PI: Circle constant Pi (3,14...)

Now the longitudes and latitudes of the two coordinates are so far prepared that they can be inserted into the formula for the distance computation.
distance = r * acos[sin(Lat1r) * sin(Lat2r)
+ cos(Lat1r) * cos(Lat2r) * cos(Lon2r - Lon1r)]
with
sin(): Sinus function
cos(): Cosinus function
acos(): Arcus Cosinus function
r: Earth equatorial radius = 6378137 meter
distance: The result is the distance in meters

Field widths and data types

Field	**Max-Width**	**Typ**	**Description**
CONT_CODE	2	C	Unique ID of the continent
COUNT_CODE	2	C	Unique ID of the country (ISO 3166-1 ALPHA-2)
LANG_CODE	2	C	Unique ID of the language (ISO 639-1 ALPHA-2)
POST_CODE	8	C	Postal code / Zip code
TOWN	40	C	Town name / municipality name / local name
QUARTER	40	C	Town quarter / local part name
MUNIC_CODE	8	C	Administrative identification (e.g. municipality key)
ADMIN1	40	C	Name of the 1st administr. unit (e.g. federal state)
ADMIN2	40	C	Name for the 2nd adm. unit (e.g. province)
ADMIN3	40	C	Name of the 3rd admin. unit (e.g. county / district)
LON_DEC	10	N	Geographical longitude in degree notation
LAT_DEC	9	N	Geographical latitude in degree notation
LON_GEO	10	N	Geographical longitude in degree/minute/second notation
LAT_GEO	9	N	Geographical latitude in degree/minute/second notation
UTM_E_NAT	8	N	UTM easting on the natural meridian strip
UTM_N_NAT	8	N	UTM northing on the natural meridian strip
UTM_E_CENT	8	N	UTM easting on an uniform meridian strip
UTM_N_CENT	8	N	UTM northing on an uniform meridian strip
UTM_STRIP	2	N	UTM strip number of the uniform meridian strip and identification of the hemisphere
ELEVATION	4	N	Ground elevation over the sea level
UTC_DIF	6	N	Offset to UTC world time
RELEASE	4	N	Month of the last data update

Data field CONT_CODE

Unique ID for the continent of the country. In tables, which cover several countries of different continents, the town, the country (COUNT_CODE) and the continent (CONT_CODE) must be combined to a unique identifier.

Data field COUNT_CODE

Unique ID for the country / the state, on whose territory the locations contained in the file are. The ID corresponds to the international country code in ISO 3166-1 ALPHA-2 standard. Capital letters are used. For some countries, in addition to the file written in national language, some more files in other languages are available.

Data field LANG_CODE

Unique ID for the language, in which the file content is written. The ID corresponds to the international language code in ISO 639-1 ALPHA-2 standard. Lower case letters are used. For some countries, in addition to the file in national language, more files written in other languages exist.

Data field POST_CODE

Postal code / Zip code in the notation of the respective country. In some countries postalcodes are not used. Some countries only use postal codes in some regions or for large towns.

Data field TOWN

Designation of the place. The place name is the name of a town / city or a municipality.

Data field QUARTER

Designation of a local part. An inside the place located town quarter, local part, local area, a community or a living place is designated.

Data field MUNIC_CODE

Administrative ID, which permits a unique allocation of the place in the hierarchical administrative structure in the respective country. In Germany is e.g. the eight-digit municipality key. Not for each country an administrative ID is present.

Data field ADMIN1

Name of the administrative unit standing most highly in the hierarchical structure of the country (e.g. federal state)

Data field ADMIN2

Name of the administrative unit standing at 2nd place in the hierarchical structure of the country (e.g. province)

Data field ADMIN3

Name of the administrative unit standing at 3rd place in the hierarchical structure of the country (e.g. county / district)

Data field LON_DEC

Geographic longitude in degree notation. The geographical coordinates with the suffix "_DEC" are represented in the decimal notation. The integer degrees of the coordinate are placed before the comma. The minute and second portion of the coordinate are converted into a decimal fraction of a degree and are placed behind the comma. Please read the section "Coordinate and Reference Systems" for resuming information.
  Digits 1 to 4: Degree of the geographic longitude inclusive sign
  Digits 5 to 10: Decimal fraction of a degree

Data field LAT_DEC

Geographic latitude in degree notation. The notation is described at the data field LON_DEC. Please read the section "Coordinate and Reference Systems" for resuming information.

  Digits 1 to 3: Degree of the geographic latitude inclusive sign
  Digits 4 to 9: Decimal fraction of a degree

Data field LON_GEO

Geographic longitude in degree/minute/second notation. The geographical coordinates with the suffix "_GEO" are represented in the gradual notation. Four digits are available before the comma for the degrees inclusive signs, two digits for the minutes and two digits for the seconds. The decimal part of one second is placed behind the comma. Please read the section "Coordinate and Reference Systems" for resuming information.

```
  Digits 1 to 4: Degree portion of the geographic longitude inclusive sign.
  Digits 5 and 6: Minute portion of the geographic longitude
  Digits 7 and 8: Second portion of the geographic longitude
  Digits 9 and 10: Decimal fraction of a second
```

Data field LAT_GEO

Geographic latitude in degree/minute/second notation. The notation is described at the data field LON_GEO. Please read the section "Coordinate and Reference Systems" for resuming information.

```
  Digits 1 to 3: Degree portion of the geographic latitude inclusive sign.
  Digits 4 and 5: Minute portion of the geographic latitude
  Digits 6 and 7: Second portion of the geographic latitude
  Digits 8 and 9: Decimal fraction of a second
```

Data field UTM_E_NAT

UTM easting of the natural meridian strip. Please read the section "Coordinate and Reference Systems" for resuming information.

```
  Digits 1 and 2: UTM meridian strip number of the natural meridian
  Digits 3 to 8:  UTM easting in meters on the meridian strip
```

Data field UTM_N_NAT

UTM northing of the natural meridian strip. Please read the section "Coordinate and Reference Systems" for resuming information.

```
  Digit 1:        Sign for coordinates of the southern hemisphere
  Digits 2 to 8:  UTM northing in meters
```

Data field UTM_E_CENT

UTM easting of an uniform meridian strip. Please read the section "Coordinate and Reference Systems" for resuming information.

```
  Digits 1 and 2: UTM meridian strip number of the uniform meridian
  Digits 3 to 8:  UTM easting in meters on the meridian strip
```

Data field UTM_N_CENT

UTM northing of an uniform meridian strip. Please read the section "Coordinate and Reference Systems" for resuming information.

```
  Digit 1:        Sign for coordinates of the southern hemisphere
  Digits 2 to 8:  UTM northing in meters
```

Data field UTM_STRIP

Strip number of the uniform UTM coordinates of the data fields UTM_E_CENT and UTM_N_CENT.

```
  Digits 1 to 2:  UTM strip number of the uniform meridian
  Digit 3:        Identification of the hemisphere of the UTM coordinates
                  N: northern hemisphere
                  S: southern hemisphere
```

Data field ELEVATION

Ground elevation over the sea level

The ground elevations were interpolated from the digital elevation model "3 Seconds Digital Elevation Data" of the "Shuttle Radar Topography Mission" (SRTM) provided by the NASA. The elevation model is present in a raster of 3 arc seconds. That corresponds to a resolution of maximal 90 meters in equator proximity. In direction to the poles the resolution is increasing. The accuracy is still increased by interpolation of the neighbouring elevation points.

The elevation data are not measured NN altitudes, but rather "ground elevation over the sea level", which was determined by satellite observation. On results of newer studies the elevation deviate depending on building development and afforestation up to maximally 6 meters from the real measured sea level altitudes.

```
  Digits 1 to 4:  Ground elevation in meter
                  0000: Zero meters or water coverage
                  9999: unknown
```

Data field UTC_DIF

Offset to UTC world time.

UTC (Universal Time Coordinated) is the time standard by which the world regulates clocks and time. The data field contains the offset between the zero UTC zone (also known as "Zulu") and the time zones used in the country.

Data field RELEASE

Month of the last data update.

```
  Digits 1 to 2:  Year
  Digits 3 to 4:  Month
```