C. Killet Software Ing.-GbR, Postbox 400225, 47896 Kempen, Germany - Internet http://www.killetsoft.de - Email killet@killetsoft.de
Phone +49 (0)2152 961127 - Fax +49 (0)2152 961128

Data base tables "Geo Data German Houses"

Description

House Coordinates or also called Geo Coded Building Addresses are meaning the connection between the postal addresses of buildings or building complexes and their positions in the coordinate system. The house coordinates are the basis for applications, which are developed to assign buildings or building complexes positions in the form of coordinates. By Geo Coding buildings or building complexes are cartographically representable.

For the area of the Federal Republic of Germany house coordinates with a coverage of 100% are available. The house coordinates are delivered as a standard for the whole Federal Republic of Germany or divided in its Federal States.

Linking with other database tables

Using the data field MUNIC_CODE, which contains the official municipality key (Kreisgemeindeschlüssel, KGS) of the town / city, you can link the house coordinates to additional town specific data from the database tables of the product "Geo Data German Admin". For example, you can add federal states, provinces, districts, population and area values, car license plates, landscapes, natural areas, topographic map numbers and names and much more. More detailed information can be found on the website http://www.killetsoft.de/p_dgda_e.htm and in the data specifications of the product "Geo Data German Admin.

Quality of the Geo Data

The geo data offered here are in very precise quality and are present in several coordinate and reference systems. The geo data are specifically for your order purchased from the current data release of well-known international manufacturers e.g. such as NAVTEQ, Tele Atlas or INFAS. The geo data then are supplemented, unified and, where appropriate, adapted to your needs by KilletSoft. The geo data therefore are always up to date and are subject to constant quality control by the manufacturer.

The house-exact geo data are used in many mobile navigation systems. They were determined by building-inspection and partially by interpolation of exact street-sections and residential district coordinates. The coordinates are not based on information of the land registry offices or the land surveying authorities. The accuracy refers to individual buildings or building complexes. House number suffixes and house number ranges are not dissolved, since the local proximity of a building complex can be represented regularly by an individual numeric house number.

Detailed information, hints to the use of the geo references and the formulas for distance calculation can be found in the provided data specification.

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 ANSI. This format is used often and in most cases you can import the data directly into your own system. For example, you can process the data directly in MS-ACCESS or MS-EXCEL without further editing.

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, as Gauss-Krueger coordinates and as UTM coordinates.

UTM coordinates are globally present in 60 meridian strips with a width of 6 degree each. Gauss-Krueger coordinates are distributed on 120 meridian strips with a width of 3 degree each. In order to be able to accomplish country-wide distance calculations between the coordinates, the UTM coordinates and the Gauss-Krueger coordinates are converted country-wide to a uniform, national central meridian strip.

The geographical coordinates 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 WGS84 named ellipsoid. It is used for navigation with the American satellite navigation system GPS (Global Positioning System).

The Gauss-Krueger coordinates are present in the reference system "Potsdam-Datum (PD, DHDN), Bessel". This reference system together with Gauss-Krueger coordinates is still in use for the official topographic cartography of the FRG.

The UTM coordinates 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 WGS84 deviates only very slightly within millimeter range from the ETRS89, the direct unification of the here used coordinates with GPS data and modern maps is possible.

Distance calculation with right-angled and metric coordinates

Because UTM coordinates and Gauss-Krueger coordinates are converted to a uniform meridian strip, distances between two points can be calculated by the simple execution of the Pythagoras theorem. 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 Gauss-Krueger coordinates:

```
difEast      = abs(GK_E_CENT_1 - GK_E_CENT_2)
difNorth     = abs(GK_N_CENT_1 - GK_N_CENT_2)
distance     = sqrt(difEast * difEast + difNorth * difNorth)
  with
GK_E_CENT_1:   Easting of the first coordinate
GK_N_CENT_1:   Northing of the first coordinate
GK_E_CENT_2:   Easting of the second coordinate
GK_N_CENT_2:   Northing of the second coordinate
abs():         Absolute value function
sqrt():        Square root function
distance:      Distance in meters as result
```

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 notation, which is also called decimal notation. Geographical coordinates in the degree notation are for the distance computation better suitable than geographical coordinates in the degrees/minutes/second notation. For a distance computation the longitude and latitude of the first point (LON_DEC1, LAT_DEC1) and the longitude and latitude of the second point (LON_DEC2, LAT_DEC2) are needed. If the latitude has a minus sign, the point is on the southern earth hemisphere, otherwise on the northern earth hemisphere. If a longitude has a minus sign, the point is situated west of the Greenwich meridian, otherwise east of it. In the Federal Republic of Germany no minus signs occur, because all coordinates are on the northern earth hemisphere and east of Greenwich.

As preparation for the distance computation the longitude and latitude are converted into radians. The unit of the radian is [rad].

```
Lon1r     = LON_DEC1 * PI / 180
Lat1r     = LAT_DEC1 * PI / 180
Lon2r     = LON_DEC2 * PI / 180
Lat2r     = LAT_DEC2 * PI / 180
  with
LON_DEC1:   Longitude of the first point in degree notation
LAT_DEC1:   Latitude of the first point in degree notation
LON_DEC2:   Longitude of the second point in degree notation
LAT_DEC2:   Latitude of the second point in degree notation
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:   Distance in meters as result
```

Field widths and data types

Field	Max-Width	Typ	Description
STREET	40	C	Designation of the road
STR_NO	4	N	House number of a building or building complex
STR_SIDE	1	N	Street side of the building or building complex
POST_CODE	5	C	Postal zip code
TOWN	40	C	Designation of the town / city
QUARTER	40	C	Designation of the town quarter (optional)
MUNIC_CODE	8	C	Administration ID (municipality key)
LON_DEC	8	N	Geographic longitude in degree notation (WGS84)
LAT_DEC	8	N	Geographic latitude in degree notation (WGS84)
LON_GEO	8	N	Geographic longitude in degree/minute/second notation (WGS84)
LAT_GEO	8	N	Geographic latitude in degree/minute/second notation (WGS84)
GK_E_NAT	7	N	Gauss-Krueger easting (DHDN) on the natural meridian strip
GK_N_NAT	7	N	Gauss-Krueger northing (DHDN) on the natural meridian strip
GK_E_CENT	7	N	Gauss-Krueger easting (DHDN) on an uniform meridian strip
GK_N_CENT	7	N	Gauss-Krueger northing (DHDN) on an uniform meridian strip

UTM_E_NAT	8	N	UTM easting (ETRS89) on the natural meridian strip
UTM_N_NAT	7	N	UTM northing (ETRS89) on the natural meridian strip
UTM_E_CENT	8	N	UTM easting (ETRS89) on an uniform meridian strip
UTM_N_CENT	7	N	UTM northing (ETRS89) on an uniform meridian strip

Data field STREET

Designation of the street / road, where the building / building complex is placed. If in a town / municipality several times the same road designation occurs, the streets are differentiated with the entries in the fields POST_CODE and QUARTER.

Data field STR_NO

House number of a building or building complex.

Data field STR_SIDE

This flag reprents the street side of the building or building complex.

Digit 1:
- L left street side
- R right street side

Data field POST_CODE

Postal Zip Code of the postal area, in which the building / building complex is placed. If in a town a street designation is several times present, the address is differentiated with the entries in the fields POST_CODE and QUARTER.

Data field TOWN

Designation of the town / municipality in which the building / building complex is located.

Data field QUARTER

Designation of a town / municipality quarter in which the building / building complex is located. If the data field contains the designation "Center", the building is in the main quarter of the town. If in a town a street designation is several times present, the address is differentiated with the entries in the fields POST_CODE and QUARTER.

Data field MUNIC_CODE

Eight-digit Administration ID (municipality key).

Digits 1 and 2: Key for the Federal State
- 01: Schleswig-Holstein
- 02: Hamburg
- 03: Lower Saxony
- 04: Bremen
- 05: North-Rhine Westphalia
- 06: Hesse
- 07: Rhineland-Palatinate
- 08: Baden-Wurttemberg
- 09: Bavaria
- 10: Saarland
- 11: Berlin
- 12: Brandenburg
- 13: Mecklenburg-Western Pomerania
- 14: Saxonia
- 15: Saxonia-Anhalt
- 16: Thuringia

Digit 3: Key for the Administrative District
- 0: No Administrative District assigned

Digits 4 and 5: Key for the County
00: No County assigned

Digits 6 to 8: key for the City or a Municipality
000: County independent City

Data field LON_DEC

Geographic longitude (WGS84) of the building / building complex in degree notation.

The degree notation is also called the decimal notation. The minute and second portion of the coordinate are converted into a decimal fraction of a degree and are placed behind the comma.

As geodetic reference system "WGS84 (worldwide, GPS), geocentric, WGS84" is used. Please read the section "Coordinate and Reference Systems" for resuming information.

Geographical coordinates in degree notation are particularly suitable well for searches with Google Earth. Here is as an example an Internet URL with coordinates from the "Geo Data International Houses", which can represent the location of Killet Software Ing.-GbR point-exactly:
http://maps.google.com/maps?t=k&ll=51.397363,6.450883&spn=0.002,0.002
The first value behind the identifier "ll" (lat / lon) is the geographical latitude, then the geographical longitude follows. The shown URL can be inserted directly into the address field of the browser to represent a map cutout on the screen.

Digits 1 to 8: Geographic longitude in degree

Data field LAT_DEC

Geographic latitude (WGS84) of the building / building complex in degree notation.

See information of the data field LON_DEC.

Digits 1 to 8: Geographic latitude in degree

Data field LON_GEO

Geographic longitude (WGS84) of the building / building complex in degree/minute/second notation.

The degree/minute/second notation is also called the gradual notation. The degree, minutes and seconds of the geographical longitude and latitude are represented as two digits each before the comma. The decimal part of one second is placed behind the comma.

As geodetic reference system the WGS84 datum on the WGS84 ellipsoid is used. Please read the section "Coordinate and Reference Systems" for resuming information.

Digits 1 and 2: Degree portion of the geographic longitude
Digits 3 and 4: Minute portion of the geographic longitude
Digits 5 and 6: Second portion of the geographic longitude
Digits 7 and 8: Decimal fraction of a second

Data field LAT_GEO

Geographic latitude (WGS84) of the building / building complex in degree/minute/second notation.

See information of the data field LON_GEO.

Digits 1 and 2: Degree portion of the geographic latitude
Digits 3 and 4: Minute portion of the geographic latitude
Digits 5 and 6: Second portion of the geographic latitude
Digits 7 and 8: Decimal fraction of a second

Data field GK_E_NAT

Gauss-Krueger easting (DHDN) of the building / building complex on the natural meridian strip.

Please read the section "Coordinate and Reference Systems" for resuming information.

Digit 1:	Gauss-Krueger meridian strip number of the natural meridian
Digits 2 to 7:	Gauss-Krueger easting in meter

Data field GK_N_NAT

Gauss-Krueger northing (DHDN) of the building / building complex on the natural meridian strip.

Please read the section "Coordinate and Reference Systems" for resuming information.

Digits 1 to 7:	Gauss-Krueger northing in meters

Data field GK_E_CENT

Gauss-Krueger easting (DHDN) of the building / building complex on an uniform meridian strip.

Please read the section "Coordinate and Reference Systems" for resuming information.

Digit 1:	Gauss-Krueger meridian strip number of the uniform meridian
Digits 2 to 7:	Gauss-Krueger easting in meters on the meridian strip

Data field GK_N_CENT

Gauss-Krueger northing (DHDN) of the building / building complex on an uniform meridian strip.

Please read the section "Coordinate and Reference Systems" for resuming information.

Digits 1 to 7:	Gauss-Krueger northing in meters

Data field UTM_E_NAT

UTM easting (ETRS89) of the building / building complex on 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 meter

Data field UTM_N_NAT

UTM northing (ETRS89) of the building / building complex on the natural meridian strip.

Please read the section "Coordinate and Reference Systems" for resuming information.

Digits 1 to 7:	UTM northing in meters

Data field UTM_E_CENT

UTM easting (ETRS89) of the building / building complex on 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 (ETRS89) of the building / building complex on an uniform meridian strip.

Please read the section "Coordinate and Reference Systems" for resuming information.

Digits 1 to 7: UTM northing in meters