Type Package

Title Definition of Geographic Dimensions

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Description The geographic dimension plays a fundamental role in multidimensional systems. To define a geographic dimension in a star schema, we need a table with attributes corresponding to the levels of the dimension. Additionally, we will also need one or more geographic layers to represent the data using this dimension. The goal of this package is to support the definition of geographic dimensions from layers of geographic information related to each other. It makes it easy to define relationships between layers and obtain the necessary data from them.

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add_geometry

Add geometry to a level

Description

A level can have several geometries (point, polygon or line). This function adds the geometry of the layer to the level.

Usage

```r
add_geometry(gl, layer = NULL, layer_key = NULL, level_key = NULL)
```

```r
## S3 method for class 'geolevel'
add_geometry(gl, layer = NULL, layer_key = NULL, level_key = NULL)
```
add_level

Arguments

- gl: A geolevel object.
- layer: A sf object.
- layer_key: A vector of string.
- level_key: A vector of string.

Details

The association of the geometry to the existing instances is done through join using the level key and the layer key.

If none is indicated, by default the key defined in the level is considered.

Value

A geolevel.

See Also

Other level definition functions: check_key(), complete_point_geometry(), coordinates_to_geometry(), geolevel(), get_empty_geometry_instances(), get_geometry()

Examples

```r
library(tidyr)
library(sf)

us_state_point <- coordinates_to_geometry(layer_us_state,
   lon_lat = c("intptlon", "intptlat"))

state <- geolevel(name = "state",
   layer = layer_us_state,
   key = c("geoid") %>%
   add_geometry(layer = us_state_point)
```

Description

Once a level is part of the dimension, it can then be related to other levels of the dimension.
Usage

add_level(gd, level = NULL)

## S3 method for class 'geodimension'
add_level(gd, level = NULL)

Arguments

gd A geodimension object.
level A geolevel, level to add to the dimension.

Value

A geodimension.

See Also

Other level association functions: complete_relation_by_geography(), geodimension(), get_unrelated_instances(), relate_levels()

Examples

library(tidyrr)
library(sf)

region <-
  geolevel(name = "region",
         layer = layer_us_region,
         key = c("geoid"))

division <-
  geolevel(name = "division",
         layer = layer_us_division,
         key = c("geoid"))

gd <-
  geodimension(name = "gd_us",
              level = region) %>%
  add_level(dvision)

check_key Check key

Description

Check if the specified set of attributes can be the key of the table.
check_key(table, key = NULL)

Arguments

- `table`: A tibble object.
- `key`: A vector, attributes that compose the key.

Details

The table can be a data table or a vector layer.

Value

A boolean.

See Also

Other level definition functions: `add_geometry()`, `complete_point_geometry()`, `coordinates_to_geometry()`, `geolevel()`, `get_empty_geometry_instances()`, `get_geometry()`

Examples

```r
library(sf)

is_key <- check_key(layer_us_region, key = c("name"))
```

**complete_point_geometry**

*Complete point geometry*

Description

In case of having the polygon geometry defined, it obtains the point geometry from it.

Usage

complete_point_geometry(gl, use_intermediate_projected_crs = FALSE)

# S3 method for class 'geolevel'
complete_point_geometry(gl, use_intermediate_projected_crs = FALSE)

Arguments

- `gl`: A geolevel object.
- `use_intermediate_projected_crs`: A boolean.
Details

If the point geometry was already defined, if there are instances with this geometry empty, it completes them.

If the geometry of the CRS is not projected, it warns that the calculations may not be correct. A projected intermediate geometry can be used to perform the operation, indicating it by the boolean parameter.

Value

A geolevel object.

See Also

Other level definition functions: `add_geometry()`, `check_key()`, `coordinates_to_geometry()`, `geolevel()`, `get_empty_geometry_instances()`, `get_geometry()`

Examples

```r
library(tidyr)
library(sf)

state <-
  geolevel(name = "state",
          layer = layer_us_state,
          key = c("geoid")) %>%
  complete_point_geometry()
```

---

**complete_relation_by_geography**

*Complete relation by geography*

Description

Two levels can be related by attributes or by geography (if the upper level has polygon-type geometry). Once related, if there are unrelated instances, you can try to relate those instances using this function, which considers alternative geographic relationships.

Usage

```r
complete_relation_by_geography(
  gd,
  lower_level_name = NULL,
  upper_level_name = NULL
)
```

## S3 method for class 'geodimension'
complete_relation_by_geography

complete_relation_by_geography(
  gd,
  lower_level_name = NULL,
  upper_level_name = NULL
)

Arguments

gd A geodimension object.
lower_level_name A string, name of the lower level.
upper_level_name A string, name of the upper lever.

Details

For example, if the lower level has associated point and polygon geometries, only point geometry is considered to establish the initial relationship. Polygon geometry is also considered in this function.

It does not necessarily succeed trying to relate the instances.

Value

A geodimension object.

See Also

Other level association functions: add_level(), geodimension(), get_unrelated_instances(), relate_levels()
coordinates_to_geometry

Transform coordinates to point geometry

Description

From the coordinates defined in fields such as latitude and longitude, it returns a layer of points.

Usage

coordinates_to_geometry(table, lon_lat = NULL, crs = NULL)

Arguments

table  
A tibble object.

lon_lat  
A vector, name of longitude and latitude attributes.

crs  
A coordinate reference system: integer with the EPSG code, or character with proj4string.

Details

If we start from a geographic layer, it initially transforms it into a table.

The CRS of the new layer is indicated. If a CRS is not indicated, it considers the layer’s CRS by default and, if it is not a layer, it considers 4326 CRS (WGS84).

Value

A sf object.

See Also

Other level definition functions: `add_geometry()`, `check_key()`, `complete_point_geometry()`, `geolevel()`, `get_empty_geometry_instances()`, `get_geometry()`

Examples

```r
library(sf)

us_state_point <-
  coordinates_to_geometry(layer_us_state, 
    lon_lat = c("intptlon", "intptlat"))
```
Description

geodimension obtained from vector layers over USA.

Usage

gd_us

Format

A geodimension.

Details

It includes the levels city, county, state, region, division and nation.

Source

https://www.census.gov

Description

A geodimension object is created. A geodimension allows you to relate levels. In addition to the name of the geodimension, a level has to be given.

Usage

geodimension(name = NULL, level = NULL)

Arguments

name  A string, name of the dimension.
level  A geolevel.

Value

A geodimension object.
See Also

Other level association functions: `add_level()`, `complete_relation_by_geography()`, `get_unrelated_instances()`, `relate_levels()`

Examples

```r
library(tidyr)
library(sf)

region <-
  geolevel(name = "region",
           layer = layer_us_region,
           key = c("geoid"))

gd <-
  geodimension(name = "gd_us",
              level = region)
```

**Description**

A `geolevel` object is created from a given geographic layer. The attributes of the layer to be included in the level can be indicated, and the subset of these that make up the natural key. If no attribute is indicated, all are considered. In any case, the attributes that make up the key must be indicated.

**Usage**

```r
ggeolevel(name = NULL, layer = NULL, attributes = NULL, key = NULL)
```

**Arguments**

- `name` A string, level name.
- `layer` A `sf` object.
- `attributes` A vector, selected attributes.
- `key` A vector, attributes that compose the key.

**Details**

A level can have several associated geometries (point, polygon or line). The geometry is obtained from the layer data.

The name of the level is used later to reference it and relate it to other levels.
get_empty_geometry_instances

Value
A geolevel object.

See Also
Other level definition functions: add_geometry(), check_key(), complete_point_geometry(), coordinates_to_geometry(), get_empty_geometry_instances(), get_geometry()

Examples
library(sf)

region <-
geolevel(name = "region",
      layer = layer_us_region,
      key = c("geoid"))

---

get_empty_geometry_instances

Get empty geometry instances

Description
Get the instances of the data table that do not have associated geometry for the specified geometry type.

Usage
get_empty_geometry_instances(gl, geometry = NULL)

## S3 method for class 'geolevel'
get_empty_geometry_instances(gl, geometry = NULL)

Arguments
- gl: A geolevel object.
- geometry: A string, type of geometry of the layer.

Value
A tibble.

See Also
Other level definition functions: add_geometry(), check_key(), complete_point_geometry(), coordinates_to_geometry(), geolevel(), get_geometry()
get_geometry

Examples

```r
library(tidyr)
library(sf)

us_state_point <-
  coordinates_to_geometry(layer_us_state,
    lon_lat = c("intptlon", "intptlat"))

state <-
  geolevel(name = "state",
    layer = layer_us_state,
    key = c("geoid")) %>%
  add_geometry(layer = us_state_point)

empty_geometry_instances <- state %>%
  get_empty_geometry_instances(geometry = "point")
```

get_geometry  Get geometry

Description

Get the geometry of a layer, as it is interpreted to define a geolevel object.

Usage

```r
get_geometry(layer)
```

Arguments

layer  A sf object.

Details

It will only be valid if one of the three geometries is interpreted: point, line or polygon.

Value

A string.

See Also

Other level definition functions: add_geometry(), check_key(), complete_point_geometry(), coordinates_to_geometry(), geolevel(), get_empty_geometry_instances()
Examples

```r
library(sf)

geometry <- get_geometry(layer_us_region)
```

get_higher_level_names

*Get higher level names*

Description

Get the names of levels included in the geodimension that are at a higher level than the indicated level. You can get only the direct levels or the levels reached by passing through other levels.

Usage

```r
get_higher_level_names(gd, level_name = NULL, indirect_levels = FALSE)
```

## S3 method for class 'geodimension'
get_higher_level_names(gd, level_name = NULL, indirect_levels = FALSE)

Arguments

- `gd` A geodimension object.
- `level_name` A string.
- `indirect_levels` A boolean.

Details

The indicated level may inherit properties of the obtained levels.

Value

A vector of names.

See Also

Other information output functions: `get_level_data()`, `get_level_geometries()`, `get_level_layer()`, `get_level_names()`
Examples

```r
library(tidyr)

ln <- gd_us %>%
  get_higher_level_names(level_name = "state",
                        indirect_levels = TRUE)
```

Description

Get the data table of a given level.

Usage

```r
get_level_data(gd, level_name = NULL, inherited = FALSE, add_prefix = TRUE)
```

## S3 method for class 'geodimension'

```r
get_level_data(gd, level_name = NULL, inherited = FALSE, add_prefix = TRUE)
```

Arguments

- `gd`: A `geodimension` object.
- `level_name`: A string.
- `inherited`: A boolean.
- `add_prefix`: A boolean.

Details

It allows selecting whether we want only the data defined locally in the level or also those that it inherits from other higher levels with which it is related.

In case of inheriting attributes from other levels, in the table, these can have as a prefix the name of the level in uppercase.

Value

A tibble object.

See Also

Other information output functions: `get_higher_level_names()`, `get_level_geometries()`, `get_level_layer()`, `get_level_names()`
Examples

```r
library(tidyr)

ld <- gd_us %>%
  get_level_data(level_name = "state",
                 inherited = TRUE)
```

Description

Gets the geometry types defined for a given level.

Usage

```r
get_level_geometries(gd, level_name = NULL)
```

## S3 method for class 'geodimension'
```r
get_level_geometries(gd, level_name = NULL)
```

Arguments

- `gd`: A `geodimension` object.
- `level_name`: A string.

Value

A vector of names.

See Also

Other information output functions: `get_higher_level_names()`, `get_level_data()`, `get_level_layer()`, `get_level_names()`

Examples

```r
library(tidyr)

lg <- gd_us %>%
  get_level_geometries(level_name = "state")
```
get_level_layer  

Get level layer

Description

Get a geographic layer associated with a level. We can select the geometry and, using boolean parameters, which attributes are included in the layer’s table: only the attributes that make up the key, the subrogate key, inherited attributes.

Usage

```r
get_level_layer(
  gd,
  level_name = NULL,
  geometry = NULL,
  only_key = FALSE,
  surrogate_key = FALSE,
  inherited = FALSE,
  add_prefix = TRUE
)
```

Arguments

- `gd` A `geodimension` object.
- `level_name` A string.
- `geometry` A string.
- `only_key` A boolean.
- `surrogate_key` A boolean.
- `inherited` A boolean.
- `add_prefix` A boolean.

Details

In case of inheriting attributes from other levels, in the table, these can have as a prefix the name of the level in uppercase.
**get_level_names**

**Value**

A `sf` object.

**See Also**

Other information output functions: `get_higher_level_names()`, `get_level_data()`, `get_level_geometries()`, `get_level_names()`

**Examples**

```r
library(tidyr)
library(sf)

ll <- gd_us %>%
  get_level_layer(level_name = "division",
                  only_key = TRUE,
                  surrogate_key = TRUE)
```

---

**Description**

Get the names of levels included in the geodimension.

**Usage**

```r
get_level_names(gd)
```

## S3 method for class 'geodimension'

get_level_names(gd)

**Arguments**

- `gd` A geodimension object.

**Value**

A vector of names.

**See Also**

Other information output functions: `get_higher_level_names()`, `get_level_data()`, `get_level_geometries()`, `get_level_layer()`
get_unrelated_instances

Examples

```r
library(tidyr)

ln <- gd_us %>%
    get_level_names()
```

Description

Given two levels between which an explicit relationship is defined, it returns the lower-level instances that are not related to any higher-level instances.

Usage

```r
get_unrelated_instances(gd, lower_level_name = NULL, upper_level_name = NULL)
```

## S3 method for class 'geodimension'
```r
get_unrelated_instances(gd, lower_level_name = NULL, upper_level_name = NULL)
```

Arguments

- `gd` A geodimension object.
- `lower_level_name` A string, name of the lower level.
- `upper_level_name` A string, name of the upper level.

Value

A tibble.

See Also

Other level association functions: `add_level()`, `complete_relation_by_geography()`, `geodimension()`, `relate_levels()`

Examples

```r
library(tidyr)
library(sf)

region <-
    geolevel(name = "region",
            layer = layer_us_region,
```

```r```
layer_us_city

    key = c("geoid")

division <-
    geolevel(name = "division",
             layer = layer_us_division,
             key = c("geoid"))

gd <-
    geodimension(name = "gd_us",
                 level = region) %>%
    add_level(division)

gd <- gd %>%
    relate_levels(lower_level_name = "division",
                  upper_level_name = "region",
                  by_geography = TRUE)

ui <- gd %>%
    get_unrelated_instances(lower_level_name = "division",
                             upper_level_name = "region")

Description

Point geometry layer, with data for US cities.

Usage

layer_us_city

Format

A sf object.

Source

https://www.census.gov
Description
Polygon geometry layer, with data for US counties.

Usage
layer_us_county

Format
A sf object.

Source
https://www.census.gov

Description
Polygon geometry layer, with data for US divisions.

Usage
layer_us_division

Format
A sf object.

Source
https://www.census.gov
**layer_us_nation**

---

**Description**

Polygon geometry layer, with data for US nation.

**Usage**

`layer_us_nation`

**Format**

A `sf` object.

**Source**

[https://www.census.gov](https://www.census.gov)

---

**layer_us_region**

---

**Description**

Polygon geometry layer, with data for US regions.

**Usage**

`layer_us_region`

**Format**

A `sf` object.

**Source**

[https://www.census.gov](https://www.census.gov)
layer_us_state  layer_us_state

Description
Polygon geometry layer, with data for US states.

Usage
layer_us_state

Format
A sf object.

Source
https://www.census.gov

relate_levels  Relate levels in a dimension

Description
Definition of a direct relationship between two levels of the dimension: the lower level composes
the higher level.

Usage
relate_levels(
gd,
lower_level_name = NULL,
lower_level_attributes = NULL,
upper_level_name = NULL,
upper_level_key = NULL,
by_geography = FALSE
)

## S3 method for class 'geodimension'
relate_levels(
gd,
lower_level_name = NULL,
lower_level_attributes = NULL,
upper_level_name = NULL,
upper_level_key = NULL,
by_geography = FALSE
)
Arguments

- **gd**: A geodimension object.
- **lower_level_name**: A string, name of the lower level.
- **lower_level_attributes**: A vector of attribute names.
- **upper_level_name**: A string, name of the upper level.
- **upper_level_key**: A vector of attribute names.
- **by_geography**: A boolean.

Details

The relationship may exist by having attributes with common values or by their geographic attributes. In the latter case, the geometry of the upper level must be of the polygon type.

To use the geometric relationship, it must be explicitly indicated by the Boolean parameter.

If no top-level attributes are indicated, the attributes that make up the key are considered by default, only the corresponding attributes of the lower level have to be indicated.

As a special case, if the top level has only one instance, it is not necessary to specify any attributes to define the relationship.

Value

A geodimension.

See Also

Other level association functions: `add_level()`, `complete_relation_by_geography()`, `geodimension()`, `get_unrelated_instances()`

Examples

```r
library(tidyr)
library(sf)

region <-
  geolevel(name = "region",
          layer = layer_us_region,
          key = c("geoid"))

division <-
  geolevel(name = "division",
          layer = layer_us_division,
          key = c("geoid"))

gd <-
  geodimension(name = "gd_us", 
```

```r
library(tidyr)
gds <- gd_us %>%
  select_levels(level_names = c("division", "region", "nation"))
```

### Description

Select a subset of the levels of the dimension so that the rest of the levels no longer belong to it.

### Usage

```r
select_levels(gd, level_names = NULL)
## S3 method for class 'geodimension'
select_levels(gd, level_names = NULL)
```

### Arguments

- **gd**: A `geodimension` object.
- **level_names**: A vector of names.

### Value

A `geodimension` object.

### See Also

Other configuration functions: `transform_crs()`

### Examples

```r
library(tidyr)
gds <- gd_us %>%
  select_levels(level_names = c("division", "region", "nation"))
```
transform_crs

Transform CRS

Description
Transform the CRS of all the layers included in the dimension to the one indicated.

Usage

transform_crs(gd, crs = NULL)

## S3 method for class 'geodimension'
transform_crs(gd, crs = NULL)

Arguments

gd A geodimension object.
crs A coordinate reference system: integer with the EPSG code, or character with proj4string.

Value
A geodimension.

See Also
Other configuration functions: select_levels()
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