Package 'geos'

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Title Open Source Geometry Engine ('GEOS') R API

Version 0.0.2

Description Provides an R API to the Open Source Geometry Engine ('GEOS') library (<https://trac.osgeo.org/geos/>) and a vector format with which to efficiently store 'GEOS' geometries. High-performance functions to extract information from, calculate relationships between, and transform geometries are provided. Finally, facilities to import and export geometry vectors to other spatial formats are provided.

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Encoding UTF-8

LazyData true

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Imports libgeos (>= 3.8.1-2)

URL https://paleolimbot.github.io/geos/, https://github.com/paleolimbot/geos/

BugReports https://github.com/paleolimbot/geos/issues

LinkingTo libgeos

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R topics documented:

`as_geos_geometry` *Create GEOS Geometry Vectors*

Description

Create GEOS Geometry Vectors

Usage

```
as_geos_geometry(x, ...)

## S3 method for class 'geos_geometry'
as_geos_geometry(x, ...)

## S3 method for class 'character'
as_geos_geometry(x, ...)

## S3 method for class 'blob'
as_geos_geometry(x, ...)

## S3 method for class 'WKB'
as_geos_geometry(x, ...)

## S3 method for class 'sfc'
```

```
as_geos_geometry(x, ...)

## S3 method for class 'sf'
as_geos_geometry(x, ...)

## S3 method for class 'wk_wkb'
as_geos_geometry(x, ...)

## S3 method for class 'wk_wkt'
as_geos_geometry(x, ...)
```

Arguments

x	An object to be coerced to a geometry vector
...	Unused

Value

A geos geometry vector

Examples

```
as_geos_geometry("LINESTRING (0 1, 3 9)")
```

`geos_area` *Extract information from a GEOS geometry*

Description

Note that `geos_x()`, `geos_y()`, and `geos_z()` do not handle empty points (use `geos_write_xy()` if you need to handle this case). Similarly, the min/max functions will error on empty geometries.

Usage

```
geos_area(geom)

geos_length(geom)

geos_x(geom)

geos_y(geom)

geos_z(geom)

geos_xmin(geom)
```

```
geos_ymin(geom)

geos_xmax(geom)

geos_ymax(geom)

geos_minimum_clearance(geom)

geos_is_empty(geom)

geos_is_simple(geom)

geos_is_ring(geom)

geos_has_z(geom)

geos_is_closed(geom)

geos_type_id(geom)

geos_type(geom)

geos_precision(geom)

geos_srid(geom)

geos_num_coordinates(geom)

geos_num_geometries(geom)

geos_num_interior_rings(geom)

geos_num_rings(geom)

geos_dimension(geom)

geos_coordinate_dimension(geom)

geos_is_clockwise(geom)
```

Arguments

geom	A GEOS geometry vector

Value

A vector of length geom

Examples

```
geos_area("POLYGON ((0 0, 10 0, 10 10, 0 10, 0 0))")
geos_length("POLYGON ((0 0, 10 0, 10 10, 0 10, 0 0))")
geos_x("POINT Z (1 2 3)")
geos_y("POINT Z (1 2 3)")
geos_z("POINT Z (1 2 3)")
geos_xmin("LINESTRING (0 1, 2 3)")
geos_ymin("LINESTRING (0 1, 2 3)")
geos_xmax("LINESTRING (0 1, 2 3)")
geos_ymax("LINESTRING (0 1, 2 3)")
geos_minimum_clearance("POLYGON ((0 0, 10 0, 10 10, 3 5, 0 10, 0 0))")

geos_is_empty(c("POINT EMPTY", "POINT (0 1)"))
geos_is_simple(c("LINESTRING (0 0, 1 1)", "LINESTRING (0 0, 1 1, 1 0, 0 1)"))
geos_is_ring(
  c(
    "LINESTRING (0 0, 1 0, 1 1, 0 1, 0 0)",
    "LINESTRING (0 0, 1 0, 1 1, 0 1)"
   )
)
geos_is_closed(
  c(
    "LINESTRING (0 0, 1 0, 1 1, 0 1, 0 0)",
    "LINESTRING (0 0, 1 0, 1 1, 0 1)"
   )
)
geos_has_z(c("POINT Z (1 2 3)", "POINT (1 2)"))

geos_type_id(c("POINT (0 0)", "LINESTRING (0 0, 1 1)"))
geos_srid(wk::as_wkb(c("SRID=1234;POINT (0 0)", "POINT (0 0)")))
geos_num_coordinates(c("POINT (0 0)", "MULTIPOINT (0 0, 1 1)"))
geos_num_geometries(c("POINT (0 0)", "MULTIPOINT (0 0, 1 1)"))
geos_num_interior_rings("POLYGON ((0 0, 1 0, 1 1, 0 1, 0 0))")
geos_dimension(c("POINT (0 0)", "LINESTRING (0 0, 1 1)"))
geos_coordinate_dimension(c("POINT (0 0)", "POINT Z (0 0 1)"))
```

---

geos_buffer *Buffer a geometry*

Description

- `geos_buffer()` returns a polygon or multipolygon geometry.
- `geos_offset_curve()` returns a linestring offset to the left by `distance`.

Usage

```
geos_buffer(geom, distance, params = geos_buffer_params())
```

```
geos_offset_curve(geom, distance, params = geos_buffer_params())

geos_buffer_params(
  quad_segs = 30,
  end_cap_style = c("round", "flat", "square"),
  join_style = c("round", "mitre", "bevel"),
  mitre_limit = 1,
  single_sided = FALSE
)
```

Arguments

geom	A GEOS geometry vector
distance	The buffer distance. Can be negative to buffer or offset on the righthand side of the geometry.
params	A geos_buffer_params()
quad_segs	The number of segments per quadrant. A higher number here will increase the apparent resolution of the resulting polygon.
end_cap_style	One of "round", "flat", or "square".
join_style	One of "round", "mitre", or "bevel".
mitre_limit	If join_style is "mitre", the relative extent (from zero to one) of the join.
single_sided	Use TRUE to buffer on only the right side of the geometry. This does not apply to geos_offset_curve(), which is always one-sided.

Value

A GEOS geometry vector along the recycled length of geom and distance.

Examples

```
geos_buffer("POINT (0 0)", 1)
geos_offset_curve("LINESTRING (0 0, 0 10, 10 0)", 1)
```

---

geos_centroid *Geometry transformers*

Description

Geometry transformers

Usage

```
geos_centroid(geom)

geos_boundary(geom)

geos_minimum_width(geom)

geos_minimum_clearance_line(geom)

geos_minimum_rotated_rectangle(geom)

geos_minimum_bounding_circle(geom)

geos_unary_union(geom)

geos_coverage_union(geom)

geos_point_on_surface(geom)

geos_node(geom)

geos_make_valid(geom)

geos_unique_points(geom)

geos_reverse(geom)

geos_merge_lines(geom)

geos_build_area(geom)

geos_envelope(geom)

geos_convex_hull(geom)

geos_point_start(geom)

geos_point_end(geom)

geos_clone(geom)

geos_set_srid(geom, srid)

geos_point_n(geom, index)

geos_simplify(geom, tolerance)

geos_simplify_preserve_topology(geom, tolerance)
```

```
geos_set_precision(
  geom,
  grid_size,
  preserve_topology = TRUE,
  keep_collapsed = FALSE
)

geos_normalize(geom)

geos_clip_by_rect(geom, rect)
```

Arguments

geom	A GEOS geometry vector
srid	An integer spatial reference identifier.
index	The index of the point or geometry to extract.
tolerance	A minimum distance to use for simplification. Use a higher value for more simplification.
grid_size	The size of the grid to which coordinates should be rounded.
preserve_topology	Should topology internal to each feature be preserved?
keep_collapsed	Should items that become EMPTY due to rounding be kept in the output?
rect	A `list()` representing rectangles in the form `list(xmin,ymin,xmax,ymax)`. List items with length 1 will be recycled to the length of the longest item.

Value

A GEOS geometry vector of length geom

Examples

```
geos_centroid(c("POINT (0 1)", "LINESTRING (0 0, 1 1)"))
geos_boundary(c("POLYGON ((0 0, 1 0, 0 1, 0 0))", "LINESTRING (0 0, 1 1)"))
geos_minimum_width("POLYGON ((0 0, 1 0, 0 1, 0 0))")
geos_minimum_clearance_line("POLYGON ((0 0, 10 0, 10 10, 3 5, 0 10, 0 0))")
geos_minimum_rotated_rectangle("POLYGON ((0 0, 1 0, 0.5 0.5, 0 0))")
geos_minimum_bounding_circle("LINESTRING (-1 -1, 1 1)")
geos_unary_union("MULTIPOINT (0 1, 0 1)")
geos_point_on_surface("LINESTRING (0 1, 0.2 3, 10 10)")
geos_node("POLYGON ((0 0, 1 0, 0 1, 0 0))")
geos_make_valid("POLYGON ((0 0, 1 1, 1 0, 0 1, 0 0))")
geos_unique_points("POLYGON ((0 0, 1 0, 0 1, 0 0))")
geos_reverse("LINESTRING (0 0, 1 1)")
geos_merge_lines(
  "MULTILINESTRING ((0 0, 0.5 0.5, 2 2), (0.5 0.5, 2 2))"
)
geos_build_area("LINESTRING (0 0, 1 0, 0 1, 0 0)")
geos_envelope("LINESTRING (0 0, 1 2)")
```

```
geos_convex_hull("MULTIPOINT (0 0, 1 0, 0 2, 0 0)")
geos_point_start("LINESTRING (0 0, 1 1)")
geos_point_end("LINESTRING (0 0, 1 1)")

geos_simplify("LINESTRING (0 0, 0 1, 0 2)", 0.1)
geos_simplify_preserve_topology("LINESTRING (0 0, 0 1, 0 2)", 0.1)
```

`geos_delaunay_triangles` *Delaunay triagulations and Voronoi diagrams*

Description

These functions return one triangulation/diagram per feature as a multi geometry. These functions are not vectorized along their parameters.

Usage

```
geos_delaunay_triangles(geom, tolerance = 0)

geos_delaunay_edges(geom, tolerance = 0)

geos_voronoi_polygons(geom, env = NULL, tolerance = 0)

geos_voronoi_edges(geom, env = NULL, tolerance = 0)
```

Arguments

`geom`	A GEOS geometry vector whose nodes will be used as input.
`tolerance`	A snapping tolerance or 0 to disable snapping
`env`	A boundary for the diagram, or `NULL` to construct one based on the input

Value

A GEOS geometry vector of length `geom`

Examples

```
geos_delaunay_triangles("MULTIPOINT (0 0, 1 0, 0 1)")
geos_delaunay_edges("MULTIPOINT (0 0, 1 0, 0 1)")

geos_voronoi_polygons("MULTIPOINT (0 0, 1 0, 0 1)")
geos_voronoi_edges("MULTIPOINT (0 0, 1 0, 0 1)")
```

geos_disjoint *Binary predicates*

Description

Binary predicates

Usage

```
geos_disjoint(geom1, geom2)

geos_touches(geom1, geom2)

geos_intersects(geom1, geom2)

geos_crosses(geom1, geom2)

geos_within(geom1, geom2)

geos_contains(geom1, geom2)

geos_overlaps(geom1, geom2)

geos_equals(geom1, geom2)

geos_equals_exact(geom1, geom2, tolerance = .Machine$double.eps^2)

geos_covers(geom1, geom2)

geos_covered_by(geom1, geom2)

geos_prepared_disjoint(geom1, geom2)

geos_prepared_touches(geom1, geom2)

geos_prepared_intersects(geom1, geom2)

geos_prepared_crosses(geom1, geom2)

geos_prepared_within(geom1, geom2)

geos_prepared_contains(geom1, geom2)

geos_prepared_contains_properly(geom1, geom2)

geos_prepared_overlaps(geom1, geom2)
```

```
geos_prepared_covers(geom1, geom2)

geos_prepared_covered_by(geom1, geom2)
```

Arguments

geom1	GEOS geometry vectors, recycled to a common length.
geom2	GEOS geometry vectors, recycled to a common length.
tolerance	The maximum separation of vertices that should be considered equal.

Value

A logical vector along the recycled length of geom1 and geom2

---

geos_disjoint_matrix *Matrix predicates*

Description

Matrix predicates

Usage

```
geos_disjoint_matrix(geom, tree)

geos_touches_matrix(geom, tree)

geos_intersects_matrix(geom, tree)

geos_crosses_matrix(geom, tree)

geos_within_matrix(geom, tree)

geos_contains_matrix(geom, tree)

geos_contains_properly_matrix(geom, tree)

geos_overlaps_matrix(geom, tree)

geos_equals_matrix(geom, tree)

geos_equals_exact_matrix(geom, tree, tolerance = .Machine$double.eps^2)

geos_covers_matrix(geom, tree)

geos_covered_by_matrix(geom, tree)
```

```
geos_disjoint_any(geom, tree)

geos_touches_any(geom, tree)

geos_intersects_any(geom, tree)

geos_crosses_any(geom, tree)

geos_within_any(geom, tree)

geos_contains_any(geom, tree)

geos_contains_properly_any(geom, tree)

geos_overlaps_any(geom, tree)

geos_equals_any(geom, tree)

geos_equals_exact_any(geom, tree, tolerance = .Machine$double.eps^2)

geos_covers_any(geom, tree)

geos_covered_by_any(geom, tree)
```

Arguments

geom	A GEOS geometry vector
tree	A geos_strtree()
tolerance	The maximum separation of vertices that should be considered equal.

Value

A list() of integer vectors containing the indices of tree for which the predicate would return TRUE.

---

geos_distance *Distance calculations*

Description

Distance calculations

Usage

```
geos_distance(geom1, geom2)

geos_distance_indexed(geom1, geom2)
```

```
geos_distance_hausdorff(geom1, geom2, densify = NULL)

geos_distance_frechet(geom1, geom2, densify = NULL)
```

Arguments

geom1, geom2	GEOS geometry vectors, recycled to a common length.
densify	A fraction between 0 and 1 denoting the degree to which edges should be subdivided (smaller value means more subdivisions). Use NULL to calculate the distance as-is.

Value

A numeric vector along the recycled length of geom1 and geom2

---

geos_empty *Create empty geometries*

Description

Create empty geometries

Usage

```
geos_empty(type_id = "geometrycollection")

as_geos_type_id(type_id)

## Default S3 method:
as_geos_type_id(type_id)

## S3 method for class 'character'
as_geos_type_id(type_id)

## S3 method for class 'numeric'
as_geos_type_id(type_id)
```

Arguments

type_id	The numeric type identifier for which an empty should be returned, an object from which one can be extracted using as_geos_type_id() (default to calling geos_type_id()). This is most usefully a character vector with the geometry type (e.g., point, linestring, polygon).

Value

A GEOS geometry vector.

Examples

```
geos_empty(c("point", "linestring", "polygon"))
geos_empty(1:7)
geos_empty(geos_read_wkt(c("POINT (0 1)", "LINESTRING (0 0, 1 1)")))
```

`geos_geometry_n` *Access child geometries*

Description

Access child geometries

Usage

```
geos_geometry_n(geom, n)

geos_ring_n(geom, n)
```

Arguments

`geom`	A GEOS geometry vector
`n`	The (one-based) index of the child geometry

Value

A GEOS geometry vector along the recycled length of `geom` and `i`.

Examples

```
multipoint <- "MULTIPOINT (0 0, 1 1, 2 2)"
geos_geometry_n(multipoint, seq_len(geos_num_geometries(multipoint)))

poly <- "POLYGON ((0 0, 0 1, 1 0, 0 0), (0.1 0.1, 0.1 0.2, 0.2 0.1, 0.1 0.1))"
geos_ring_n(poly, seq_len(geos_num_rings(poly)))
```

geos_intersection *Binary geometry operators*

Description

- geos_intersection() returns the set of points common to both x and y.
- geos_difference() returns the set of points from x that are not contained by y.
- geos_sym_difference() returns the set of points that are *not* common to x and y.
- geos_union() returns the set of points contained by either x or y.
- geos_shared_paths() returns a GEOMETRYCOLLECTION containing two MULTILINESTRINGS: the first containing paths in the same direction, the second containing common paths in the opposite direction.
- geos_snap() snaps the vertices of x within tolerance of y to y.

Usage

```
geos_intersection(geom1, geom2)

geos_difference(geom1, geom2)

geos_sym_difference(geom1, geom2)

geos_union(geom1, geom2)

geos_shared_paths(geom1, geom2)

geos_snap(geom1, geom2, tolerance = .Machine$double.eps^2)

geos_clearance_line_between(geom1, geom2)
```

Arguments

geom1	GEOS geometry vectors, recycled to a common length.
geom2	GEOS geometry vectors, recycled to a common length.
tolerance	The maximum separation of vertices that should be considered equal.

Value

A GEOS geometry vector along the recycled length of geom1 and geom2.

Examples

```
poly1 <- "POLYGON ((0 0, 0 10, 10 10, 10 0, 0 0))"
poly2 <- "POLYGON ((5 5, 5 15, 15 15, 15 5, 5 5))"
```

```
geos_intersection(poly1, poly2)
geos_difference(poly1, poly2)
geos_sym_difference(poly1, poly2)
geos_union(poly1, poly2)

line <- "LINESTRING (11 0, 11 10)"
geos_snap(poly1, line, tolerance = 2)

geos_shared_paths("LINESTRING (0 0, 1 1, 2 2)", "LINESTRING (3 3, 2 2, 1 1)")
```

`geos_is_valid` *Geometry validity*

Description

- `geos_is_valid()` returns a logical vector denoting if each feature is a valid geometry.
- `geos_is_valid_detail()` returns a data frame with columns `is_valid` (logical), `reason` (character), and `location` (geos_geometry).

Usage

```
geos_is_valid(geom)

geos_is_valid_detail(geom, allow_self_touching_ring_forming_hole = FALSE)
```

Arguments

`geom`	A GEOS geometry vector
`allow_self_touching_ring_forming_hole`	It's all in the name

Examples

```
geos_is_valid(
  c(
    "POLYGON ((0 0, 1 0, 1 1, 0 1, 0 0))",
    "POLYGON ((0 0, 1 1, 1 0, 0 1, 0 0))"
  )
)

geos_is_valid_detail(
  c(
    "POLYGON ((0 0, 1 0, 1 1, 0 1, 0 0))",
    "POLYGON ((0 0, 1 1, 1 0, 0 1, 0 0))"
  )
)
```

geos_make_point *Create geometries from vectors of coordinates*

Description

Create geometries from vectors of coordinates

Usage

```
geos_make_point(x, y, z = NA_real_)

geos_make_linestring(x, y, z = NA_real_, feature_id = 1L)

geos_make_polygon(x, y, z = NA_real_, feature_id = 1L, ring_id = 1L)

geos_make_collection(geom, type_id = "geometrycollection", feature_id = 1L)
```

Arguments

x	Vectors of coordinate values
y	Vectors of coordinate values
z	Vectors of coordinate values
feature_id	Vectors for which a change in sequential values indicates a new feature or ring. Use `factor()` to convert from a character vector.
ring_id	Vectors for which a change in sequential values indicates a new feature or ring. Use `factor()` to convert from a character vector.
geom	A GEOS geometry vector
type_id	The numeric type identifier for which an empty should be returned, an object from which one can be extracted using `as_geos_type_id()` (default to calling `geos_type_id()`). This is most usefully a character vector with the geometry type (e.g., point, linestring, polygon).

Value

A GEOS geometry vector

Examples

```
geos_make_point(1:3, 1:3)
geos_make_linestring(1:3, 1:3)
geos_make_polygon(c(0, 1, 0), c(0, 0, 1))
geos_make_collection("POINT (1 1)")
```

geos_nearest *Find the closest feature*

Description

Finds the closest item index in `tree` to `geom`, vectorized along `geom`.

Usage

```
geos_nearest(geom, tree)

geos_nearest_indexed(geom, tree)

geos_nearest_hausdorff(geom, tree, densify = NULL)

geos_nearest_frechet(geom, tree, densify = NULL)
```

Arguments

`geom`	A GEOS geometry vector
`tree`	A `geos_strtree()`
`densify`	A fraction between 0 and 1 denoting the degree to which edges should be subdivided (smaller value means more subdivisions). Use NULL to calculate the distance as-is.

Value

An integer vector of length `geom` containing the index of `tree` that is closest to each feature in `geom`.

geos_polygonize *Create polygons from noded edges*

Description

Create polygons from noded edges

Usage

```
geos_polygonize(collection)

geos_polygonize_valid(collection)

geos_polygonize_cut_edges(collection)

geos_polygonize_full(collection)
```

Arguments

collection	A GEOMETRYCOLLECTION or MULTILINESTRING of edges that meet at their endpoints.

Value

A GEOMETRYCOLLECTION of polygons

Examples

```
geos_polygonize("MULTILINESTRING ((0 0, 0 1), (0 1, 1 0), (1 0, 0 0))")
geos_polygonize_valid("MULTILINESTRING ((0 0, 0 1), (0 1, 1 0), (1 0, 0 0))")
geos_polygonize_cut_edges("MULTILINESTRING ((0 0, 0 1), (0 1, 1 0), (1 0, 0 0))")
```

---

geos_project *Linear referencing*

Description

- geos_project() and geos_project_normalized() return the distance of point geom2 projected on geom1 from the origin of geom1, which must be a lineal geometry.
- geos_interpolate() performs an inverse operation, returning the point along geom representing the given distance from the origin along the geometry.
- _normalized() variants use a distance normalized to the geos_length() of the geometry.

Usage

```
geos_project(geom1, geom2)

geos_project_normalized(geom1, geom2)

geos_interpolate(geom, distance)

geos_interpolate_normalized(geom, distance_normalized)
```

Arguments

geom1	GEOS geometry vectors, recycled to a common length.
geom2	GEOS geometry vectors, recycled to a common length.
geom	A GEOS geometry vector
distance	Distance along the linestring to interpolate
distance_normalized	Distance along the linestring to interpolate relative to the length of the linestring.

Examples

```
geos_interpolate("LINESTRING (0 0, 1 1)", 1)
geos_interpolate_normalized("LINESTRING (0 0, 1 1)", 1)

geos_project("LINESTRING (0 0, 10 10)", "POINT (5 5)")
geos_project_normalized("LINESTRING (0 0, 10 10)", "POINT (5 5)")
```

---

geos_read_wkt *Read and write well-known text*

Description

Read and write well-known text

Usage

```
geos_read_wkt(wkt)

geos_write_wkt(geom, include_z = TRUE, precision = 16, trim = TRUE)

geos_read_wkb(wkb)

geos_write_wkb(geom, include_z = TRUE, include_srid = FALSE, endian = 1)

geos_read_hex(hex)

geos_write_hex(geom, include_z = TRUE, include_srid = FALSE, endian = 1)

geos_read_xy(point)

geos_write_xy(geom)
```

Arguments

wkt	A character vector containing well-known text.
geom	A GEOS geometry vector
include_z	Include the values of the Z and M coordinates and/or SRID in the output? Use FALSE to omit, TRUE to include, or NA to include only if present. Note that using TRUE may result in an error if there is no value present in the original.
precision	The rounding precision to use when writing (number of decimal places).
trim	Trim unnecessary zeroes in the output?
wkb	A list() of raw() vectors, such as that returned by sf::st_as_binary().
include_srid	Include the values of the Z and M coordinates and/or SRID in the output? Use FALSE to omit, TRUE to include, or NA to include only if present. Note that using TRUE may result in an error if there is no value present in the original.

endian	For WKB writing, 0 for big endian, 1 for little endian. Defaults to wk_platform_endian() (slightly faster).
hex	A hexidecimal representation of well-known binary
point	A list() representing points in the form list(x,y).

Examples

```
geos_read_wkt("POINT (30 10)")
geos_write_wkt(geos_read_wkt("POINT (30 10)"))
```

---

geos_relate *Dimensionally extended 9 intersection model*

Description

See the Wikipedia entry on DE-9IM for how to interpret pattern, match, and the result of geos_relate() and/or geos_relate_pattern_create().

Usage

```
geos_relate(geom1, geom2, boundary_node_rule = "mod2")

geos_relate_pattern(geom1, geom2, pattern, boundary_node_rule = "mod2")

geos_relate_pattern_match(match, pattern)

geos_relate_pattern_create(
  II = "*",
  IB = "*",
  IE = "*",
  BI = "*",
  BB = "*",
  BE = "*",
  EI = "*",
  EB = "*",
  EE = "*"
)
```

Arguments

geom1	GEOS geometry vectors, recycled to a common length.
geom2	GEOS geometry vectors, recycled to a common length.
boundary_node_rule	One of "mod2", "endpoint", "multivalent_endpoint", or "monovalent_endpoint".
pattern, match	A character vector representing the match

`II, IB, IE, BI, BB, BE, EI, EB, EE`
: One of "0", "1", "2", "T", "F", or "*" describing the dimension of the intersection between the interior (I), boundary (B), and exterior (E).

Examples

```
geos_relate_pattern_match("FF*FF1***", c(NA, "FF*FF****", "FF*FF***F"))
geos_relate("POINT (0 0)", "POINT (0 0)")
geos_relate_pattern("POINT (0 0)", "POINT (0 0)", "T********")
geos_relate_pattern_create(II = "T")
```

---

geos_segment_intersection

Segment operations

Description

Segment operations

Usage

```
geos_segment_intersection(a, b)

geos_orientation_index(a, point)
```

Arguments

`a, b`	A `list()` representing segments in the form `list(x0,y0,x1,y1)`. List items with length 1 will be recycled to the length of the longest item.
`point`	A `list()` representing points in the form `list(x,y)`.

Value

`geos_segment_intersection()` returns a `list(x,y)`; `geos_orientation_index()` returns -1, 0 or 1, depending if the `point` lies to the right of (-1), is colinear with (0) or lies to the left of (1) the segment (as judged from the start of the segment looking towards the end).

Examples

```
geos_segment_intersection(
  list(0, 0, 10, 10),
  list(10, 0, 0, 10)
)

geos_orientation_index(
  list(0, 0, 10, 10),
  list(15, c(12, 15, 17))
)
```

geos_strtree *Create a GEOS STRTree*

Description

Create a GEOS STRTree

Usage

```
geos_strtree(geom)

geos_strtree_query(tree, geom)

geos_strtree_data(tree)

as_geos_strtree(x, ...)

## Default S3 method:
as_geos_strtree(x, ...)

## S3 method for class 'geos_strtree'
as_geos_strtree(x, ...)

## S3 method for class 'geos_geometry'
as_geos_strtree(x, ...)
```

Arguments

geom	A GEOS geometry vector
tree	A geos_strtree()
x	An object to convert to a geos_strtree()
...	Unused

Value

A geos_str_tree object

geos_unnest *Unnest nested geometries*

Description

Unnest nested geometries

Usage

```
geos_unnest(geom, keep_empty = FALSE, keep_multi = TRUE, max_depth = 1)
```

Arguments

geom	A GEOS geometry vector
keep_empty	If TRUE, a GEOMETRYCOLLECTION EMPTY is left as-is rather than collapsing to length 0.
keep_multi	If TRUE, MULTI* geometries are not expanded to sub-features.
max_depth	The maximum recursive GEOMETRYCOLLECTION depth to unnest.

Value

A GEOS geometry vector with a length greater than or equal to geom with an attribute "lengths" that can be used to map elements of the result to the original item.

Examples

```
geos_unnest("GEOMETRYCOLLECTION (POINT (1 2), POINT (3 4))")
```

---

geos_version *GEOS version information*

Description

GEOS version information

Usage

```
geos_version(runtime = TRUE)
```

Arguments

runtime	Use FALSE to return the build-time GEOS version, which may be different than the runtime version if a different version of the libgeos package was used to build this package.

Examples

```
geos_version()
geos_version(runtime = FALSE)

# check for a minimum version of GEOS
geos_version() >= "3.8.1"
```

`plot.geos_geometry` *Plot GEOS geometries*

Description

Plot GEOS geometries

Usage

```
## S3 method for class 'geos_geometry'
plot(
  x,
  ...,
  asp = 1,
  bbox = NULL,
  xlab = "",
  ylab = "",
  rule = "evenodd",
  add = FALSE
)
```

Arguments

x	A GEOS geometry vector
...	Passed to plotting functions for features: `graphics::points()` for point and multipoint geometries, `graphics::lines()` for linestring and multilinestring geometries, and `graphics::polypath()` for polygon and multipolygon geometries.
asp	Passed to `graphics::plot()`
bbox	The limits of the plot in the form returned by `wkt_ranges()`.
xlab	Passed to `graphics::plot()`
ylab	Passed to `graphics::plot()`
rule	The rule to use for filling polygons (see `graphics::polypath()`)
add	Should a new plot be created, or should x be added to the existing plot?

Value

The input, invisibly

Examples

```
if (requireNamespace("wkutils")) {
  plot(as_geos_geometry("LINESTRING (0 0, 1 1)"))
  plot(as_geos_geometry("POINT (0.5 0.4)"), add = TRUE)
}
```

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