

# Package: ipdw (via r-universe)

September 29, 2024

**Title** Spatial Interpolation by Inverse Path Distance Weighting

**Description** Functions are provided to interpolate geo-referenced point data via Inverse Path Distance Weighting. Useful for coastal marine applications where barriers in the landscape preclude interpolation with Euclidean distances.

**Version** 2.0-0

**URL** <https://github.com/jsta/ipdw>

**BugReports** <https://github.com/jsta/ipdw/issues>

**Depends** R (>= 3.0.2),gdistance

**Imports** sf,raster,methods

**Suggests** gstat,gdata,spatstat, testthat, knitr, rmarkdown

**License** GPL (>= 2)

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**VignetteBuilder** knitr

**Roxygen** list(markdown = TRUE)

**Repository** <https://jsta.r-universe.dev>

**RemoteUrl** <https://github.com/jsta/ipdw>

**RemoteRef** HEAD

**RemoteSha** 630a20a635b9a21b3838270c1f5ec02b1399fc0d

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costrasterGen                      *Generate a cost Raster*

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## Description

Generate a cost raster from an object of class sf with point or polygon geometries

## Usage

```
costrasterGen(xymat, polys, extent = "polys", projstr, resolution = 1)
```

## Arguments

xymat	Matrix of coordinates or an sf object with point geometries
polys	sf object with polygon geometries
extent	Define extent based on extent of xymat/sf (points) or polys (polys). Default is polys.
projstr	proj4 string defining the output projection. A warning will be thrown if projstr does not match the projection of the extent target. Pass NULL for non-geographic grids.
resolution	Numeric defaults to 1. See <a href="#">raster</a> .

## Details

Ensure that the projection of the xymat coordinates and polys match. If they do not match use the `st_transform` command.

## Value

RasterLayer

## See Also

[rasterize](#)

## Examples

```
## Not run:
library(sf)
Sr1 <- st_polygon(list(cbind(c(0, 0, 1, 1, 0), c(0, 12, 12, 0, 0))))
Sr4 <- st_polygon(list(cbind(c(9, 9, 10, 10, 9), c(0, 12, 12, 0, 0))))
Sr2 <- st_polygon(list(cbind(c(1, 1, 9, 9, 1), c(11, 12, 12, 11, 11))))
Sr3 <- st_polygon(list(cbind(c(1, 1, 9, 9, 1), c(0, 1, 1, 0, 0))))
Sr5 <- st_polygon(list(cbind(c(4, 4, 5, 5, 4), c(4, 8, 8, 4, 4))))
polys <- st_as_sf(st_sfc(Sr1, Sr2, Sr3, Sr4, Sr5,
  crs = "+proj=longlat +datum=WGS84 +no_defs +ellps=WGS84 +towgs84=0,0,0"))

# using a matrix object
```

```
xymat <- matrix(3, 3, nrow = 1, ncol = 2)
costras <- costrasterGen(xymat, pols, projstr = NULL)

# plotting
plot(costras)
points(xymat)

## End(Not run)
```

---

errorGen

*Generate interpolation error stats from validation datasets*

---

## Description

Generate error statistics from validation point datasets overlaid on a raster surface

## Usage

```
errorGen(
  finalraster,
  validation.sf_ob,
  validation.data,
  plot = FALSE,
  title = ""
)
```

## Arguments

finalraster	RasterLayer object
validation.sf_ob	sf object with points geometry
validation.data	data.frame
plot	logical. Plot comparison?
title	Plot labels

## Value

List of error statistics

## Examples

```
library(sf)
validation.data <- data.frame(rnorm(10, mean = 0.2, sd = 1))
names(validation.data) <- c("validation")
validation.sf_ob <- validation.data
validation.data <- as.numeric(unlist(validation.data))
xy <- data.frame(x = c(0:9), y = rep(1, 10))
```

```
validation.sf_ob <- st_as_sf(cbind(validation.sf_ob, xy), coords = c("x", "y"))

m <- matrix(NA, 1, 10)
out.ras <- raster(m, xmn = 0, xmx = ncol(m), ymn = 0, ymx = nrow(m))
out.ras[] <- validation.data + rnorm(ncell(out.ras), mean = 0.01, sd = 0.2)

valid.stats <- errorGen(out.ras, validation.sf_ob, validation.data, plot = TRUE,
  title = "Validation Plot")
valid.stats
```

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ipdw

*Inverse Path Distance Weighting*


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## Description

Interpolate geo-referenced point data using inverse path distance weighting.

## Usage

```
ipdw(
  sf_ob,
  costras,
  range,
  paramlist,
  overlapped = FALSE,
  yearmon = "default",
  removefile = TRUE,
  step = 16,
  dist_power = 1,
  trim_rstack = FALSE
)
```

## Arguments

sf_ob	sf object with point geometries
costras	RasterLayer. Cost raster
range	numeric. Range of interpolation neighborhood
paramlist	character. String representing parameter names
overlapped	logical. Default is FALSE, specify TRUE if some points lie on top of barriers
yearmon	character. String specifying the name of the sf_ob
removefile	logical. Remove files after processing?
step	numeric. Number of sub loops to manage memory during raster processing.
dist_power	numeric. Distance decay power (p)
trim_rstack	logical. Trim the raster output by the convex hull of sf_ob

**Details**

This is a high level function that interpolates an sf object with point geometries in a single pass. Points must be located within a single contiguous area. The presence of "landlocked" points will cause errors. It may be necessary to increase the value assigned to land areas when using a large range value in combination with a large sized cost rasters (grain x extent). In these cases, the value of land areas should be increased to ensure that it is always greater than the maximum accumulated cost path distance of any given geo-referenced point.

**Value**

RasterLayer

**Examples**

```
# see vignette
```

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ipdwInterp	<i>Inverse Distance Weighting with custom distances</i>
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**Description**

This function takes a rasterstack of pathdistances and generates surfaces by weighting parameter values by these distances

**Usage**

```
ipdwInterp(
  sf_ob,
  rstack,
  paramlist,
  overlapped = FALSE,
  yearmon = "default",
  removefile = TRUE,
  dist_power = 1,
  trim_rstack = FALSE
)
```

**Arguments**

sf_ob	sf object with point geometries
rstack	RasterStack of path distances
paramlist	character. String representing parameter names
overlapped	logical. Default is FALSE, specify TRUE if some points lie on top of barriers
yearmon	character. String specifying the name of the sf object
removefile	logical. Remove files after processing?
dist_power	numeric. Distance decay power (p)
trim_rstack	logical. Trim the raster stack by the convex hull of sf_ob

## Details

Under the hood, this function evaluates:

$$V = \frac{\sum_{i=1}^n v_i \frac{1}{d_i^p}}{\sum_{i=1}^n \frac{1}{d_i^p}}$$

where  $d$  is the distance between prediction and measurement points,  $v_i$  is the measured parameter value, and  $p$  is a power parameter.

## Value

RasterLayer

## Examples

```
library(sf)
sf_ob <- data.frame(rnorm(2))
xy <- data.frame(x = c(4, 2), y = c(8, 4))
sf_ob <- st_as_sf(cbind(sf_ob, xy), coords = c("x", "y"))

m <- matrix(NA, 10, 10)
costras <- raster(m, xmn = 0, xmx = ncol(m), ymn = 0, ymx = nrow(m))

# introduce spatial gradient
costras[] <- runif(ncell(costras), min = 1, max = 10)
for (i in 1:nrow(costras)) {
  costras[i, ] <- costras[i, ] + i
  costras[, i] <- costras[, i] + i
}

rstack <- pathdistGen(sf_ob, costras, 100, progressbar = FALSE)
final.raster <- ipdwInterp(sf_ob, rstack, paramlist = c("rnorm.2."), overlapped = TRUE)
plot(final.raster)
plot(sf_ob, add = TRUE)
```

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pathdistGen

*Generate a stack of path distance raster objects*

---

## Description

Generate a stack of path accumulated distance raster objects

## Usage

```
pathdistGen(sf_ob, costras, range, yearmon = "default", progressbar = TRUE)
```

**Arguments**

sf_ob	sf object with point geometries
costras	RasterLayer cost raster
range	numeric. Range of interpolation neighborhood
yearmon	character. String specifying the name of the sf_ob
progressbar	logical show progressbar during processing?

**Value**

RasterStack object of path distances

**Examples**

```
library(sf)
sf_ob <- data.frame(rnorm(2))
xy <- data.frame(x = c(4, 2), y = c(8, 4))
sf_ob <- st_as_sf(cbind(sf_ob, xy), coords = c("x", "y"))

m <- matrix(NA, 10, 10)
costras <- raster(m, xmn = 0, xmx = ncol(m), ymn = 0, ymx = nrow(m))
costras[] <- runif(ncell(costras), min = 1, max = 10)
# introduce spatial gradient
for (i in 1:nrow(costras)) {
  costras[i, ] <- costras[i, ] + i
  costras[, i] <- costras[, i] + i
}

rstack <- pathdistGen(sf_ob, costras, 100, progressbar = FALSE)
```

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rm\_na\_pointslayers      *Remove NA points features and drop corresponding raster stack layers*

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**Description**

Remove NA points features and drop corresponding raster stack layers

**Usage**

```
rm_na_pointslayers(param_name, sf_ob, rstack)
```

**Arguments**

param_name	character name of data column
sf_ob	sf object with point geometries
rstack	RasterStack or RasterBrick

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