

# Package ‘desirability’

January 8, 2012

**Version** 1.05

**Date** 2012-01-07

**Title** Desirability Function Optimization and Ranking

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**Description** S3 classes for multivariate optimization using the desirability function by Derringer and Suich (1980)

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**Suggests** lattice

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**Repository** CRAN

**Date/Publication** 2012-01-08 14:36:09

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dMax *Desirability Functions*

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## Description

Functions implementing multivariate optimization and ranking using the desirability function approach described in Derringer and Suich (1980)

**Usage**

```

## Default S3 method:
dMax(low, high, scale = 1, tol = NULL, ...)
## Default S3 method:
dMin(low, high, scale = 1, tol = NULL, ...)
## Default S3 method:
dTarget(low, target, high, lowScale = 1, highScale = 1, tol = NULL, ...)
## Default S3 method:
dArb(x, d, tol = NULL, ...)
## Default S3 method:
dBox(low, high, tol = NULL, ...)
## Default S3 method:
dCategorical(values, tol = NULL, ...)
## Default S3 method:
dOverall(...)

```

**Arguments**

low	a constant to define the desirability function for dMax, dMin, dTarget and dBox
high	a constant to define the desirability function for dMax, dMin, dTarget and dBox
target	a constant to define the desirability function for dMax, dMin, dTarget and dBox
scale	the scaling factor for dMax and dMin. Values less than one make the criteria more difficult to satisfy while values greater than one make it easier.
lowScale	the scaling factor for dTarget. This bends the curve between the points low and target. Values less than one make the criteria more difficult to satisfy while values greater than one make it easier.
highScale	the scaling factor for dTarget. This bends the curve between the points high and target. Values less than one make the criteria more difficult to satisfy while values greater than one make it easier.
x	a set of input values
d	a set of desirabilites between zero and one (inclusive) that match the length of x
values	a named numeric vector of possible values
tol	an optional tolerance for zero desirability. When this is non-null, zero desirabilites are replaced with this value
...	For dOverall, this is one or more desirability objects. For the other methods, this argument is not currently used

**Details**

The functions dMax, dMin, dTarget and dOverall are the basic equations used by Derringer and Suich (1980). dBox is a simple step function between two points. dArb can be used to create other shapes that do not fall into the other functional forms. See the package vignette or the references for more details

**Value**

a list. Common values are:

tol	the value specified by the tol argument
call	the original function call

**Author(s)**

Max Kuhn

**References**

Derringer, G. and Suich, R. (1980), Simultaneous Optimization of Several Response Variables. *Journal of Quality Technology* **12**, 214–219.

**See Also**

[predict.dMax](#)

**Examples**

```
dMax.default(1,3)
dMax(1,3)
```

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predict.dMax	<i>Predict method for desirability functions</i>
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**Description**

Predicted values based on desirability objects

**Usage**

```
## S3 method for class 'dMax'
predict(object, newdata = NA, missing = object$missing, ...)
## S3 method for class 'dMin'
predict(object, newdata = NA, missing = object$missing, ...)
## S3 method for class 'dTarget'
predict(object, newdata = NA, missing = object$missing, ...)
## S3 method for class 'dArb'
predict(object, newdata = NA, missing = object$missing, ...)
## S3 method for class 'dBox'
predict(object, newdata = NA, missing = object$missing, ...)
## S3 method for class 'dCategorical'
predict(object, newdata = NA, missing = object$missing, ...)
## S3 method for class 'dOverall'
predict(object, newdata = data.frame(NA, ncol = length(object$d)), all = FALSE, ...)
```

**Arguments**

object	a object of class: dMax, dMin, dTarget, dArb, dBox or dOverall
newdata	values of the response for predicting desirability
all	a logical (for predict.dOverall only); should the individual desirabilities also be returned?
missing	a number between 0 and 1 for missing values (the internally estimated value is used by default)
...	no currently used

**Details**

The responses are translated into desirability units.

**Value**

a vector, unless predict.dOverall is used with all=TRUE, in which case a matrix is returned.

**Author(s)**

Max Kuhn

**References**

Derringer, G. and Suich, R. (1980), Simultaneous Optimization of Several Response Variables. *Journal of Quality Technology* **12**, 214–219.

**See Also**

[dMax](#)

**Examples**

```
d1 <- dMin(1,3)
d2 <- dTarget(1, 2, 3)
d3 <- dCategorical(c("a" = .1, "b" = .7))
dAll <- dOverall(d1, d2, d3)

outcomes <- data.frame(seq(0, 4, length = 10),
                      seq(0.5, 4.5, length = 10),
                      sample(letters[1:2], 10, replace = TRUE))
names(outcomes) <- c("x1", "x1", "x3")

predict(d1, outcomes[,2])
predict(d2, outcomes[,2])
predict(d3, outcomes[,3])
predict(dAll, outcomes)
predict(dAll, outcomes, all = TRUE)
```

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