



improvedLHS {lhs}

R Documentation

Improved Latin Hypercube Sample

Description

Draws a Latin Hypercube Sample from a set of uniform distributions for use in creating a Latin Hypercube Design. This function attempts to optimize the sample with respect to an optimum euclidean distance between design points.

Usage

```
improvedLHS(n, k, dup=1)
```

Arguments

`n` The number of partitions (simulations or design points)

`k` The number of replications (variables)

`dup` A factor that determines the number of candidate points used in the search. A multiple of the number of remaining points than can be added.

Details

Latin hypercube sampling (LHS) was developed to generate a distribution of collections of parameter values from a multidimensional distribution. A square grid containing possible sample points is a Latin square iff there is only one sample in each row and each column. A Latin hypercube is the generalisation of this concept to an arbitrary number of dimensions. When sampling a function of k variables, the range of each variable is divided into n equally probable intervals. n sample points are then drawn such that a Latin Hypercube is created. Latin Hypercube sampling generates more efficient estimates of desired parameters than simple Monte Carlo sampling.

This program generates a Latin Hypercube Sample by creating random permutations of the first n integers in each of k columns and then transforming those integers into n sections of a standard uniform distribution. Random values are then sampled from within each of the n sections. Once the sample is generated, the uniform sample from a column can be transformed to any distribution by using the quantile functions, e.g. `qnorm()`. Different columns can have different distributions.

This function attempts to optimize the sample with respect to an optimum euclidean distance between design points.

$$\textit{Optimum distance} = n/n^{(1.0/k)}$$

Value

An n by k Latin Hypercube Sample matrix with values uniformly distributed on $[0,1]$

Author (s)

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References

Beachkofski, B., Grandhi, R. (2002) Improved Distributed Hypercube Sampling *American Institute of Aeronautics and Astronautics Paper 1274*.

This function is based on the MATLAB program written by John Burkardt and modified 16 Feb 2005 http://www.csit.fsu.edu/~burkardt/m_src/ihs/ihs.m

See Also

[randomLHS](#), [geneticLHS](#), [maximinLHS](#), and [optimumLHS](#) to generate Latin Hypercube Samples. [optAugmentLHS](#), [optSeededLHS](#), and [augmentLHS](#) to modify and augment existing designs.

Examples

```
improvedLHS(4, 3, 2)
```