Package ‘saControlLimits’

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Type Package

Title Computation of control limits using stochastic approximation.

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Description The main function saControlLimits computes the control limits of a chart (single or combined) using the stochastic approximation algorithm described in Capizzi and Masarotto (2015). A simple parallel version of the same algorithm is also provided.

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Imports Rcpp (>= 0.11.2)

LinkingTo Rcpp

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saControlLimits	<i>Computation of control limits</i>
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Description

The function computes the control limits of a control charts using the stochastic approximation algorithm described in Capizzi and Masarotto (2015). The computation is distributed on multiple CPUs if a cluster has been previously created using [saPStart](#).

Usage

```
saControlLimits(hstart, Arl0, rlsim, ..., Nfixed = 500, Afixed = 0.1, Amin = 0.1, Amax = 100,  
delta = 0.1, q = 0.55, gamma = 0.01, Nmin = 1000, z = 3, Cmr1 = 10)
```

Arguments

hstart	A numeric vector containing the starting point;
Ar10	The desired in-control average run-length;
rlSim	A function used to simulate the run-length; see Details;
...	Extra arguments for rlSim;
Nfixed, Afixed, Amin, Amax, delta, q, gamma, Nmin, z, Cmr1	Tuning constants; see Section 2 in Capizzi and Masarotto (2015).

Details

Function `rlSim` is used to simulate the run-length. It is called by `saControlLimits` as

```
rlSim(h=h,...,maxrl=maxrl,delta=delta)
```

where

- `h`: a numeric vector containing the control limits;
- `...`: any other arguments needed to describe the control charts; for example the smoothing constant of an EWMA, the offset of a CUSUM, etc;
- `maxrl`: the maximum run-length, i.e., the function truncates the run-length simulation at `maxrl`;
- `delta`: a numeric scalar used to estimate the stochastic approximation gain.

`rlSim` returns a vector (of the same length of `h`) containing the simulated run-lengths of all the combined control charts.

If `delta` is greater than zero, the return vector has, as attributes `rl+` and `rl-`, rl_{ri}^+ and rl_{ri}^- . Here, rl_{ri}^+ and rl_{ri}^- denote the run-lengths obtained simulating from $h + \delta e_i$ and $h - \delta e_i$ where e_i is the standard unit vector in the i th direction.

See the supplementary material of the paper for an example.

Value

A list with components

<code>h</code>	A numeric vector containing the estimated control limits;
<code>iter</code>	Number of iterations.

Author(s)

Capizzi Giovanna and Masarotto Guido.

References

Capizzi Giovanna and Masarotto Guido (2015) Efficient Control Chart Calibration by Simulated Stochastic Approximation, *IIE Transactions*.

See Also

[saPStart](#), [saRepFun](#).

saParallel	<i>Computation of control limits using multiple cores</i>
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Description

saPStart, saPInit, saPSeed and saPStop are used to start, initialize, set the seed of the RNG streams and stop a cluster for saControllimits and saRepFun.

Usage

```
saPStart(ncpus)
saPInit(expr)
saPSeed(iseed)
saPStop()
```

Arguments

ncpus	Number of cores to be used;
expr	An expression to evaluate on each cluster node;
iseed	An integer to be supplied to set.seed, or NULL not to set reproducible seeds.

Note

The cluster is created using the R standard package [parallel-package](#).

Author(s)

Capizzi Giovanna and Masarotto Guido.

See Also

[saControllimits](#), [saRepFun](#).

saRepFun	<i>A simple (eventually parallel) replacement for replicate</i>
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Description

The function returns replicate(n, fun(...)). The computation is distributed over multiple CPUs if a cluster has been previously created by saPStart.

Usage

```
saRepFun(n, fun, ...)
```

Arguments

n	Integer: the number of replications;
fun	The function to be called;
...	Optional arguments to be passed to fun.

Author(s)

Capizzi Giovanna and Masarotto Guido.

See Also

[replicate](#), [saPStart](#).

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