Package 'optBuck'

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Type Package

Title Optimal bucking

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Description This package contains functions for extracting and handling data from cut-to-length harvesters and optimizing the bucking. It uses harvester production report (.hpr) files as input. The main function is optBuck() which optimizes the bucking of tree stems using dynamic programming. The package is based on harvester production data retrieved from cut-to-length harvesters in the StanFord data format. Therefore, input data, units, variable names, and parameters follow this format. In case of the input data not originating from .hpr files, but for example from .pri files or field data, a set of taper functions are provided to transform the input data into the required format.

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Encoding UTF-8

LazyData true

RoxygenNote 7.1.2

R topics documented:

`BarkFunction` *BarkFunction*

Description

Calculates diametervalues under bark

Usage

```
BarkFunction(
  DiameterValue,
  SpeciesGroupKey,
  SpeciesGroupDefinition,
  Top_ob,
  DBH,
  LogLength
)
```

Arguments

`DiameterValue`	Numeric vector of diameters (mm)
`SpeciesGroupKey`	Species ID (see e.g. getProductData())
`SpeciesGroupDefinition`	List of species group information, with speciesgroupkey as the name of the elements (see getSpeciesGroupDefinition())
`Top_ob`	Top diameter ober bark
`DBH`	in mm, for Skogforsk 2004 barkFunction categories
`LogLength`	in cm

Value

Log volume in m3

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

getBucking *getBucking*

Description

Extract bucking outcomes from a .hpr file

Usage

```
getBucking(hprfile, PriceMatrices, ProductData, StemProfile)
```

Arguments

hprfile	Path to .hpr file
PriceMatrices	list of prices matrices for all ProductKeys (see getPriceMatrices())
ProductData	Matrix containing product data (see getProductData())
StemProfile	Stem profiles for all stems in hprfile (see getStemProfile())

Value

Output structure with bucking outcomes

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

OptBuck, Optbuck_hpr

getHarvestedArea *getHarvestedArea*

Description

Extract harvested area

Usage

```
getHarvestedArea(Stems)
```

Arguments

Stems	output of getStems()

Value

Simple feature object of area around harvested trees

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

Examples

```
Stems=getStems(hprfile)
getHarvestedArea(Stems)
```

---

getLengthClasses *getLengthClasses*

Description

Extract the length classes for each assortment from .hpr files, needed for volume calculation when VolumeLengthCategory=="Length as defined in LengthClasses"

Usage

```
getLengthClasses(hprfile)
```

Arguments

hprfile	Path to input .hpr file

Value

List of length classes for assortments, element names correspond to product keys

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

---

getLogs *getLogs*

Description

Extract information on harvested logs from .hpr files

Usage

```
getLogs(hprfile)
```

Arguments

hprfile	Path to input .hpr file

Value

data table with log information

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

`getPermittedGrades` *getPermittedGrades*

Description

Extract the permitted stem grades for each assortment from .hpr files

Usage

```
getPermittedGrades(hprfile)
```

Arguments

`hprfile`	Path to input .hpr file

Value

List of permitted grades for assortments, element names correspond to product keys

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

getPriceMatrices *getPriceMatrices*

Description

Extract product data from .hpr files

Usage

```
getPriceMatrices(hprfile)
```

Arguments

hprfile	Path to input .hpr file

Value

list of prices matrices for all ProductKeys. Element names are productkeys.

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

getProductData *getProductData*

Description

Extract product data from .hpr files

Usage

```
getProductData(hprfile)
```

Arguments

hprfile	Path to input .hpr file

Value

Information on ProductKeys, ProductNames, ProductGroupName, SpeciesGroupKey, DiameterUnderBark, DiameterClassLowerLimit, DiameterClassMAX, LengthClassLowerLimit, LengthClassMAX, VolumeDiameterCategory, DiameterTopPositions

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

`getSortimentOverview` *getSortimentOverview*

Description

Extract distribution of harvested volume over assortments

Usage

```
getSortimentOverview(Logs, ProductData)
```

Arguments

`Logs`	otput from getLogs
`ProductData`	output from getProductData

Value

figure in viewer

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

getLogs, getProductData

`getSpeciesGroupDefinition` *getSpeciesGroupDefinition*

Description

Extract information on species groups from .hpr files

Usage

```
getSpeciesGroupDefinition(hprfile)
```

Arguments

`hprfile`	Path to input .hpr file

Value

List of species group information, with speciesgroupkey as the name of the elements

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

`getStemprofile` *getStemprofile*

Description

Extract stem profiles from .hpr files

Usage

```
getStemprofile(hprfile)
```

Arguments

`hprfile`	Path to input .hpr file

Value

Stem profiles of harvested stems with stem grades

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

`getStems` *getStems*

Description

Extract information on harvested stems from .hpr files

Usage

```
getStems(hprfile)
```

Arguments

`hprfile`	Path to input .hpr file

Value

data table with stem information

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

optBuck

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impute_top *impute_top*

Description

Impute unused top of stem into result matrix of optBuck (waste)

Usage

```
impute_top(tt)
```

Arguments

tt	matrix of log segments which maximize cumulative value

Value

new matrix which includes the tree top as waste

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

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optBuck *Optimal bucking*

Description

Optimizes the bucking

Usage

```
hello()
```

Examples

```
optBuck()
```

optBuck_hpr *optBuck_hpr*

Description

Calculate optimal bucking for all stems in a hpr file

Usage

```
optBuck_hpr(
  hprfile,
  PriceMatrices,
  ProductData,
  StemProfile,
  PermittedGrades,
  ...
)
```

Arguments

hprfile	Path to input .hpr file
PriceMatrices	list of price matrices for all ProductKeys (see getPriceMatrices())
ProductData	Matrix containing product data (see getProductData())
StemProfile	Stem profiles for all stems in hprfile (see getStemProfile())
PermittedGrades	list with the same lenght of assortments, each element containing the stemgrades allowed in each assortment (see getPermittedGrades())
...	others

Value

result structure with optimum bucking solution for the stems in the input .hpr file

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

References

Skogforsk 2011. Introduction to StanForD 2010. URL: Skogforsk. https://www.skogforsk.se/contentassets/1a68cdce4af
2010-introduction-150826.pdf

See Also

getPermittedGrades, getPriceMatrices, getProductData

plotBucking *plotBucking*

Description

Plot the bucking outcome

Usage

```
plotBucking(diameterPosition, DiameterValue, StemGrade, res)
```

Arguments

diameterPosition	vector of diameter positions (cm) of a stem profile: 0,10,...,end
DiameterValue	vector of corresponding diameters (mm) for those diameter positions
StemGrade	vector of corresponding stem grades
res	the bucing outcome, i.e., output from optBuck()

Value

plot of bucking outcome

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

predictStemprofile *predictStemprofile*

Description

Predict and extract Norway spruce stem profiles using taper models based on the log dimensions, for cases when no stem profile is recorded in the hpr file.

Usage

```
predictStemprofile(hprfile, ProductData, PermittedGrades)
```

Arguments

hprfile	Path to .hpr file
ProductData	output of getProductData()
PermittedGrades	output of getPermittedGrades()

Value

Output structure with stem profile containing stem grades

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

`PriceVolumeCalc` *PriceVolumeCalc*

Description

Calculates log price volume, i.e., the volume which is used for price calculation

Usage

```
PriceVolumeCalc(
  VolumeDiameterAdjustment,
  VolumeDiameterCategory,
  VolumeLengthCategory,
  diameterPosition,
  DiameterValue,
  StartPos,
  StopPos,
  DiameterTopPosition,
  DiameterUnderBark = T,
  SpeciesGroupKey = NA,
  SpeciesGroupDefinition = NA,
  DBH = NA,
  LogLength = NA,
  LengthClasses = NA,
  ProductKey = NA
)
```

Arguments

`VolumeDiameterAdjustment`	Volume diameter adjustment according to stanford2010 (see getProductData()).
`VolumeDiameterCategory`	Volume calculation method according to stanford2010 (see getProductData()).
`VolumeLengthCategory`	Volume length category according to stanford2010 (see getProductData()).
`diameterPosition`	numeric vector of diameter positions (cm) of a stem profile; 0,10,...,end
`DiameterValue`	numeric vector of corresponding diameters (mm)
`StartPos`	Starting position of log along the stem
`StopPos`	Ending position of log
`DiameterTopPosition`	Position from top end of log where top diameter is measured. Cm
`DiameterUnderBark`	Logical TRUE/FALSE
`SpeciesGroupKey`	Species ID

`SpeciesGroupDefinition`
: List of species group information, with speciesgroupkey as the name of the elements(see getSpeciesGroupDefinition)

`DBH`
: Optional, in mm (see BarkFunction)

`LogLength`
: Optional, in cm (see BarkFunction)

`LengthClasses`
: List of length classes for the assortments (see getLengthClasses)

`ProductKey`
: Assortment key (see getProductData())

Value

Log volume in m3

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

Buck

StemprofileIncrement *StemprofileIncrement*

Description

Predict Stemprofile at another point in time given a vector of new DBHs

Usage

```
StemprofileIncrement(Stemprofile, DBH2, breastheight)
```

Arguments

`Stemprofile`
: Stem profiles for all stems in hprfile (see getStemProfile)

`DBH2`
: a numeric vector of new DBHs, of the same length as unique StemKeys in Stemprofile

`breastheight`
: height in cm which is considered breastheight (numeric), typically 110 or 130.

Value

A new Stemprofile object in which the new diameters are added

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

strsplits *strsplits*

Description

Helper function: modified strsplit for multiple splits

Usage

```
strsplits(x, splits)
```

Arguments

x	character vector to split
splits	vector of character patterns used to split

Value

List of permitted grades for assortments

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

getPriceMatrices

track_trace *track_trace*

Description

helper function for optBuck: back-track optimum bucking solution

Usage

```
track_trace(m, tt)
```

Arguments

m	matrix of potential cuts
tt	matrix of log segment which maximize cumulative value

Value

Logical: "True" if whole and "False" if decimal

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

VolumeCalc *VolumeCalc*

Description

Calculates log volume from all diameters as solid volume

Usage

```
VolumeCalc(
  diameterPosition,
  DiameterValue,
  StartPos,
  StopPos,
  DiameterTopPosition,
  DiameterUnderBark = T,
  SpeciesGroupKey = NA,
  SpeciesGroupDefinition = NA,
  DBH = NA,
  LogLength = NA
)
```

Arguments

diameterPosition	numeric vector of diameter positions (cm) of a stem profile; 0,10,...,end
DiameterValue	numeric vector of corresponding diameters (mm)
StartPos	Starting position of log along the stem
StopPos	Ending position of log
DiameterTopPosition	Position from top end of log where top diameter is measured. Cm
DiameterUnderBark	Logical TRUE/FALSE
SpeciesGroupKey	Species ID
SpeciesGroupDefinition	List of species group information, with speciesgroupkey as the name of the elements(see getSpeciesGroupDefinition)
DBH	Optional, in mm (see BarkFunction)
LogLength	Optional, in cm (see BarkFunction)

Value

Log volume in m3

Author(s)

Lennart Noordermeer <lennart.noordermeer@nmbu.no>

See Also

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