Package 'flying'

February 13, 2020

Type Package

Title Simulation of Bird Flight Range

Version 0.1.3

Description Functions for range estimation in birds based on Pennycuick (2008) and Pennycuick (1975), 'Flight' program which compliments Pennycuick (2008) requires manual entry of birds which can be tedious when there are thousands of birds to estimate. Implemented are two ODE methods discussed in Pennycuick (1975) and time-marching computation method ``constant muscle mass'' as in Pennycuick (1998). See Pennycuick (1975, ISBN:978-0-12-249405-5), Pennycuick (1998) <doi:10.1006/jtbi.1997.0572>, and Pennycuick (2008, ISBN:9780080557816).

License Apache License

Encoding UTF-8

LazyData true

Imports utils, Rcpp (>= 1.0.2), knitr, kableExtra, rmarkdown

Suggests testthat, covr

RoxygenNote 7.0.0

Depends R (>= 2.10)

VignetteBuilder knitr

Collate 'RcppExports.R' 'birds_documentation.R' 'constant_muscle_mass.R' 'constant_specific_power.R' 'constant_specific_work.R' 'control.R' 'method_2.R' 'method_1.R' 'input_match.R' 'lookup_table2.R' 'misc_functions.R' 'flight_simulation.R' 'flying.R' 'migrate.R' 'zzz.R'

LinkingTo Rcpp

NeedsCompilation yes

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Repository CRAN

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R topics documented:

`birds` *Sample 28 birds*

Description

Preset birds data, extracted from Flight program. Fat mass percentage generated randomly where zero.

Usage

```
birds
```

Format

A data frame with 28 observations and 5 variables not counting the name.

Scientific.name Name of bird species

Empty.mass Body mass in Kg. Includes fuel. All-up mass with crop empty. Not to be confused with lean mass.

Wing.span Length of wings spread out in metres

Fat.mass Mass of fat that is consumable as fuel in Kg

Order Order of the spicies (passerine vs non-passerine)

Wing.area Area of both wing projected on a flat surface in metres squared

Muscle.mass Mass in Kg. of flight muscles

`flysim` *Range Estimation*

Description

Practical range estimation of birds using methods in Pennycuik (1975) Mechanics of Flight. These methods are based on Breguet equations.

Usage

```
flysim(file, header = TRUE, sep = ",", quote = "\"", dec = ".",
             fill = TRUE, comment.char = "", ..., data = NULL,
             settings = list())
```

Arguments

file	Arguments for path to data.
header	Logical. If TRUE use first row as column headers
sep	separator
quote	The set of quoting characters. see read.csv
dec	The character used in the file for decimal points.
fill	See read.csv
comment.char	For more details see read.csv
...	further arguments see read.csv
data	A data frame.
settings	A list for re-defining constants. See details.

Details

The option *settings takes the arguments (those particulary required by this function)

- ppc: Profile power constant
- eFat: Energy content of fuel from fat
- g: Accelaration due to gravity
- mce: Mechanical conversion efficiency [0,1]
- ipf: Induced power factor
- vcp: Ventilation and circulation power
- airDensity: Air density at cruising altitude
- bdc: Body drag coefficient
- alpha: Basal metabolism factors in passerines and non passerines
- delta: Basal metabolism factors in passerines and non passerines alpha*bodyMass^delta

Value

S3 class object with range estimates based on methods defined and settings used

- range estimates (Km)
- settings used
- data

Author(s)

Brian Masinde

Examples

```
flysim(data = birds, settings = list(eFat = 3.89*10^7))
flysim(data = birds,  settings = list(airDensity = 0.905))
```

migrate *Range Estimation*

Description

Practical range estimation of birds using methods in Pennycuick (1998) and Pennycuick (2008).

Usage

```
migrate(file, header = TRUE, sep = ",", quote = "\"", dec = ".",
               fill = TRUE, comment.char = "", ...,
               data = NULL, settings = list(), method = "cmm",
               speed_control = "constant_speed", protein_met = 0)
```

Arguments

file	The name of the file which the data are to read from
header	Logical. If TRUE use first row as column headers
sep	separator
quote	The set of quoting characters. see read.csv
dec	The character used in the file for decimal points
fill	See read.csv
comment.char	For more details see read.csv
...	further arguments see read.csv
data	A data frame
settings	A list for re-defining constants. See details
method	Methods for fuel management
speed_control	One of two speed control methods. By default *constant_speed* is used. *vvmp_constant* is the alternative. The former holds the true airspeed constant while the latter holds the ratio of true airspeed and minimum power speed constant
protein_met	Percentage of energy attributed to protein and metabolism

Details

The option *control takes the folowing arguments

- ppc: Profile power constant
- eFat: Energy content of fuel from fat
- eProtein: Energy content of protein
- g: Accelaration due to gravity
- mce: Mechanical conversion efficiency [0,1]
- ipf: Induced power factor

- vcp: Ventilation and circulation power
- airDensity: Air density at cruising altitude
- bdc: Body drag coefficient
- alpha: Basal metabolism factors in passerines and non passerines
- delta: Basal metabolism factors in passerines and non passerines alpha*bodyMass^delta
- invPower
- speedRatio: True air speed to minimum power speed ratio
- muscDensity: Density of the flight muscles.
- phr: Protein hydration ratio

Value

S3 class object with range estimates based on methods defined and settings

- data as a data frame
- range estimates (Km)
- fuel
- settings (named vector)

Author(s)

Brian Masinde

Examples

```
migrate(data = birds, settings = list(eFat = 3.89*10^7))
migrate(data = birds,  method = "cmm", settings = list(airDensity = 0.905))
```

Index