### igloo v.01

### Generated by Doxygen 1.8.6

Fri Aug 24 2018 13:35:22



Online web application: http://igloo.uni-goettingen.de



# **Contents**

1	Nam	espace	Index		1
	1.1	Names	space List		. 1
2	Clas	s Index			3
	2.1	Class I	List		. 3
3	File	Index			5
	3.1	File Lis	st		. 5
4	Nam	nespace	Documer	ntation	7
	4.1	demo l	Namespac	ce Reference	. 7
		4.1.1		Documentation	
			4.1.1.1	modObj	. 7
	4.2	IGLOC	) Namespa	ace Reference	. 7
	4.3		•	olation Namespace Reference	
		4.3.1		Documentation	
			4.3.1.1	calcParameters	. 8
			4.3.1.2	durFunc	. 8
			4.3.1.3	durFuncLarva	. 8
			4.3.1.4	gauss	. 8
			4.3.1.5	hillDouble	. 9
			4.3.1.6	hillDown	. 9
			4.3.1.7	hillUp	. 9
			4.3.1.8	linear	. 9
			4.3.1.9	poly2	. 10
			4.3.1.10	poly3	. 10
			4.3.1.11	poly4	. 10
			4.3.1.12	ratio	
				velFunc	
				velFuncLarva	
	4.4	locomo		wData Namespace Reference	
		4.4.4		Decumentation	11

iv CONTENTS

			4.4.1.1	findValue	11
			4.4.1.2	pickDataSet	11
5	Clas	s Docur	nentation		13
	5.1			lass Reference	13
		5.1.1	Construc	tor & Destructor Documentation	14
			5.1.1.1	init	14
		5.1.2	Member	Function Documentation	14
			5.1.2.1	calcHistogram	14
			5.1.2.2	drosoTbyConduction	15
			5.1.2.3	make_txt_header	15
			5.1.2.4	move	16
			5.1.2.5	plotHistogram	16
			5.1.2.6	plotSingleTrace	16
			5.1.2.7	resetTempTrace	16
			5.1.2.8	save4MatlabAll	16
			5.1.2.9	save4MatlabHistogram	17
			5.1.2.10	save4MatlabPopulation	17
			5.1.2.11	save4MatlabSingleTra	18
			5.1.2.12	save4TXTHistogram	18
			5.1.2.13	save4TXTPopulation	19
			5.1.2.14	save4TXTSingleTra	19
			5.1.2.15	simulateFlyPopulation	19
			5.1.2.16	simulateSingleFly	20
			5.1.2.17	stepFunc	20
			5.1.2.18	updateAmbientTemp	20
			5.1.2.19	updatePosition	20
		5.1.3	Member	Data Documentation	20
			5.1.3.1	allData	20
			5.1.3.2	ambientT	20
			5.1.3.3	bins	20
			5.1.3.4	degPerMM	20
			5.1.3.5	direction	20
			5.1.3.6	dParams	20
			5.1.3.7	drosoT	20
			5.1.3.8	durData	20
			5.1.3.9	flyPop	20
			5.1.3.10	gradientDist	21
			5.1.3.11	gradientExt	21
			5.1.3.12	histData	21

CONTENTS

		5.1.3.13	position	21
		5.1.3.14	rearingT	21
		5.1.3.15	selfTestData	21
		5.1.3.16	simulationType	21
		5.1.3.17	sps	21
		5.1.3.18	startPosition	21
		5.1.3.19	step	21
		5.1.3.20	tempTrace	21
		5.1.3.21	time $\ldots$	21
		5.1.3.22	velData	21
		5.1.3.23	walkDur	21
6	File	Documentation		23
	6.1	/home/bgeurten/F	PyProjects/Igloo/demo.py File Reference	23
	6.2	/home/bgeurten/F	PyProjects/Igloo/IGLOO.py File Reference	23
	6.3	/home/bgeurten/F	PyProjects/Igloo/locomotionInterpolation.py File Reference	23
	6.4	/home/bgeurten/F	PyProjects/Igloo/locomotionOnRawData.py File Reference	24
Inc	lex			25

# Namespace Index

### 1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

demo	. 7
IGLOO	. 7
locomotionInterpolation	. 7
locomotionOnRawData	. 11

2 Namespace Index

# **Class Index**

2.1	1		20		ı	ist	
7	l	G	135	SS	L	IST	

Here are the classes, structs, unions and interfaces with brief descriptions:					
IGLOO.IGLOO	13				

Class Index

# File Index

## 3.1 File List

Here	ic a	list of	all fi	les with	hrief	descriptions
Hele	is a	1151 01	all II	ies willi	Dilei	descriptions

/home/bgeurten/PyProjects/Igloo/demo.py	23
/home/bgeurten/PyProjects/Igloo/IGLOO.py	23
/home/bgeurten/PyProjects/Igloo/locomotionInterpolation.py	23
/home/bgeurten/PyProjects/Igloo/locomotionOnRawData.py	24

6 File Index

# **Namespace Documentation**

### 4.1 demo Namespace Reference

#### **Variables**

- tuple modObj
- 4.1.1 Variable Documentation
- 4.1.1.1 tuple demo.modObj

#### Initial value:

### 4.2 IGLOO Namespace Reference

#### Classes

• class IGLOO

### 4.3 locomotionInterpolation Namespace Reference

#### **Functions**

- def gauss
- def ratio
- def linear
- def poly2
- def poly3
- def poly4
- def hillUp
- def hillDown
- def hillDouble
- def velFunc
- def durFunc

- · def velFuncLarva
- · def durFuncLarva
- def calcParameters

#### 4.3.1 Function Documentation

#### 4.3.1.1 def locomotionInterpolation.calcParameters ( T )

This function returns the rearing temperature depending parameters to adjust the velocity and step duration functions. Most parameters can be fit with a 2nd degree polynom. As only 3 different rearing temperatures were used the fits might not be to reliable and it is saver to stay with the three measured rearing temperatures:  $18,25,30\,^{\circ}\text{C}$ 

#### 4.3.1.2 def locomotionInterpolation.durFunc ( $x_p$ , $x_t$ , d )

This function calculates the fit of the fit duration in dependence of the temperature and rearing temperature of the ADULT animal. The function consitits of two gaussian fits for the temperature domain and a 2nd degree polynom for the p Values. In this case both the temperature domain and the p-values are dependent on the rearing temperature.

#### 4.3.1.3 def locomotionInterpolation.durFuncLarva ( $x_p$ , $x_t$ )

This function calculates the fit of the step duration in dependens of the temperature of the LARVAL animal (reared at  $18^{\circ}$ C). The function consitits of two Gaussian fits for the temperature domain and two Gaussian fits for the p Values.

<code>@param x\_p</code> float random value between 0 and 1 <code>@param x\_t</code> float Drosophila body temperature <code>@return list</code> of floats with new step duration values

#### 4.3.1.4 def locomotionInterpolation.gauss ( x, a, x0, sigma )

Implementation of a Gaussian distribution

#### 4.3.1.5 def locomotionInterpolation.hillDouble ( x, o, n, s, s2, b)

Implementation of a Hill function

 $\ensuremath{\text{@}}\text{return}$  list of floats with the results corresponding to the x-values

#### 4.3.1.6 def locomotionInterpolation.hillDown ( x, o, n, s, b )

Implementation of the falling slope of a hill equation

$$f(x) = \frac{b}{n}$$
 $f(x) = \frac{x}{n}$ 
 $f(x)$ 
 $f(x) = \frac{x}{n}$ 

n

@param b

```
@param x    float x - value(s as list)
@param o     float see above
@param n     float see above
@param s     float see above
@param b     float see above
@return list of floats with the results corresponding to the x-values
```

#### 4.3.1.7 def locomotionInterpolation.hillUp (x, o, n, s, b)

Implementation of the rising slope of a hill equation

@return list of floats with the results corresponding to the x-values

#### 4.3.1.8 def locomotionInterpolation.linear ( x, a, b)

float see above

Implementation of a simple linear function

#### 4.3.1.9 def locomotionInterpolation.poly2 ( x, a, b, c)

Implementation of a 2nd degree polynom

```
f(x) = a x + b x + c

General x float x - value(s as list)

General a float see above

General b float see above

General c float see above
```

#### 4.3.1.10 def locomotionInterpolation.poly3 ( x, a, b, c, d )

Implementation of a 3rd degree polynom

#### 4.3.1.11 def locomotionInterpolation.poly4 ( x, a, b, c, d, e)

Implementation of a 4th degree polynom

```
f(x) = a x + b x + c x + d x + e

General x float x - value(s as list)
General a float see above
General b float see above
General c float see above
General d float see above
```

#### 4.3.1.12 def locomotionInterpolation.ratio ( x, a, b )

Implementation of a simple ratio function

#### 4.3.1.13 def locomotionInterpolation.velFunc ( $x_p$ , $x_t$ , v )

This function calculates the fit of the velocity in dependens of the temperature and rearing temperature of the ADULT animal. The function consitits of two gaussian fits for the temperature domain and a 2nd degree polynom for the p Values. This 2nd degree polyom changes with the rearing temperature.

#### 4.3.1.14 def locomotionInterpolation.velFuncLarva ( $x_p$ , $x_t$ )

This function calculates the fit of the velocity in dependens of the temperature of the LARVAL animal (reared at  $18\,^{\circ}\text{C}$ ). The function consitits of a 4th degree polynom for the temperature domain and a 3rd degree polynom for the p Values.

```
<code>@param x_p</code> float random value between 0 and 1 <code>@param x_t</code> float <code>Drosophila</code> body temperature <code>@return list</code> of floats with new velocity values
```

```
f(x) = (-4.71) x + 167.91 x - 2568.55 x + 9292.99 x + 0.05
```

### 4.4 locomotionOnRawData Namespace Reference

#### **Functions**

- · def pickDataSet
- def findValue

#### 4.4.1 Function Documentation

#### 4.4.1.1 def locomotionOnRawData.findValue ( t, p, dataSet )

This is the central function that finds the closest combination of original data and the momentary values in the simulation.

#### 4.4.1.2 def locomotionOnRawData.pickDataSet ( rearTemp, probVec )

This function picks the correct dataset for the rearing temperature.

```
@param rearTemp mixed can be int 18,25,30 or string 'larval'
@param probVec list of list containing the data
@return velocity and durationlists with the data, will be empty if rearTemp
    is not as expected.
```

Names	pace	Docur	mentatior

## **Class Documentation**

#### 5.1 IGLOO.IGLOO Class Reference

#### **Public Member Functions**

- def \_\_init\_\_
- def resetTempTrace
- def stepFunc
- def move
- def updatePosition
- def updateAmbientTemp
- def drosoTbyConduction
- · def simulateSingleFly
- def simulateFlyPopulation
- def calcHistogram
- def plotSingleTrace

- · def plotHistogram
- def save4MatlabSingleTra

- def save4TXTSingleTra
- · def save4TXTPopulation
- def save4MatlabPopulation
- def save4TXTHistogram
- def save4MatlabHistogram
- def save4MatlabAll
- def make\_txt\_header

#### **Public Attributes**

- startPosition
- position
- gradientExt
- gradientDist
- sps
- walkDur
- rearingT

14 Class Documentation

- · simulationType
- ambientT
- drosoT
- degPerMM
- step
- histData
- selfTestData
- flyPop
- allData
- durData
- velData
- time
- tempTrace
- direction
- dParams
- bins

#### 5.1.1 Constructor & Destructor Documentation

```
5.1.1.1 def IGLOO.IGLOO.__init__ ( self, startPos = 25., gradientExt = (12., 32., gradientDist = 50., walkDur = 300., rearingT = 25., sps = 50, simulationType = 'interpolate')
```

This function intialises the monte carlo random walk class. Here most of the simulation task will be done. Each fly is represented by 3 values its position [mm], the environment temperature at this position [°C] and its body temperature [°C]. The gradient is a one dimensional strip of x mm length that has a linear temperature gradient with gradientExt as the gradient extreme temperatures. The lower extreme temperature is situated at 0 mm the hotter extreme temperature at the far end of the gradient. The fly is further described by ots rearing temperature (default:  $25^{\circ}$ C) and its preferred temperature (default:  $21^{\circ}$ C). The original null model is a random walk.

```
float default: 25
@param startPos
   start position of the fly in mm on the gradient
@param gradientExt
                      tuple default: (12.,32.)
   temperature extremes of the linear gradient in °C
@param gradiantDist
                      float default: 50.0
   total length of the gradient in mm
                       float default: 300.0
@param walkDur
   total duration of the simulation in seconds
@param rearingT
                       float default: 25.0
   rearing temperature of the fly in °C if you simulate on the
   original data only 18.0, 25.0 and 30.0 can be used. If instead of
   float rearingT is set as 'larval' larvae reared at 25°C are
   simulated.
@param sps
                       int
                              default: 50
   Samples per second. After the walking duration is reached. The whole
    trajectory will be resampled with this framerate.
@param simulationType string default: 'interpolate'
   String that defines if the simulation is run on the original data
   set or on the interpolation functions. The later is much faster and
   allows to set the rearing temperature to any value between 18 and
   30. To run on the original data set this string to "onData"
```

#### 5.1.2 Member Function Documentation

#### 5.1.2.1 def IGLOO.IGLOO.calcHistogram ( self, tempFlag )

This function calculates a position histogram for every fly in the population and normalises it to its surface. Afterwards it calculates mean  $\pm$ 1- SEM of all histograms and normalises again.

The result is saved in self.histData a tupel consisting of the number of samples normalised to their total and the bins of the histogram. The number of samples variable has two rows 1st is mean and the 2nd is the SEM of each bin

#### 5.1.2.2 def IGLOO.IGLOO.drosoTbyConduction ( self )

This function calculates the temperature change for animals in our TLM model. It uses Newtons law for convection and models the Drosophila as an 3 by 0.5 mm cylinder walking in a 3 mm wide cylinder. Internally the values given will be transferred to the correct dimensions. The following values are set conductance:

air 0.0262  $W/(m^2 \star K)$  David R. Lide (Hrsg.): CRC Handbook of Chemistry and Physics. 90. Auflage. (Internet-Verswater 0.6  $W/(m^2 \star K)$  https://de.wikipedia.org/wiki/Eigenschaften\_des\_Wassers#W.C3.A4rmeleitf.C3.A4higkeit

The formula for rate of heat flow is: dQ T1-T2 
$$Q = -- = lambda * A* ---- dt D$$

where D is the wallt to wall thickness of the object lambda is its conductance A its surface T1, T2 the temperature of the object and its surroundings.

Drosophila surface' as a cylinder would be for the cylinders hull: 2\*pi\*r\*1 and the two disks: (2\*pi\*r\*\*2)\*2. If the cylinder has an r=0.5mm and a length of 1=2mm the resulting surface is  $7.85~mm^2$ 

To calculate the temperature change we have to know the conductance of our fly which we approximate as a cylinder of water lambda 0.6. A cylinder of that size would have a mass of  $1.57~\mathrm{mg}$ 

Model limits: Drosophila is a 1 times 2 mm cylinder consisting of  $1.58\ \mathrm{mg}$  of water suspended in air.

The result is saved in self.drosoT

#### 5.1.2.3 def IGLOO.IGLOO.make\_txt\_header ( self )

All our txt output files have to record the environmental data of the simulation as shown below. These are put in a single string variable and saved as the header of the text file.

startPos

start position of the fly in mm on the gradient  $\ensuremath{\mbox{\tt gradientExt}}$ 

temperature extremes of the linear gradient in  ${}^{\circ}\text{C}$  gradiantDist

total length of the gradient in  $\ensuremath{\mathsf{mm}}$ 

sps

Samples per second. After the walking duration is reached.

The whole trajectory will be resampled with this framerate.

walkDur

total duration of the simulation in seconds

rearingT

rearing temperature of the fly in  $^{\circ}\text{C}$  if you simulate on the original data only 18.0, 25.0 and 30.0 can be used. If instead of float rearingT is set as 'larval' larvae reared at 25 $^{\circ}\text{C}$  are simulated.

simulationType

String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

16 Class Documentation

@return headStr a string carrying the above information and written into all text files.

#### 5.1.2.4 def IGLOO.IGLOO.move ( self )

This is a subroutine of the step function. This function updates the fly position. This can be done using the original data (simulation: 'onData') or interpolation functions (simulation: 'interpolated').

The results are saved in self.step and self.time

#### 5.1.2.5 def IGLOO.IGLOO.plotHistogram ( self, fHandle = -1 )

This function calculates a temperature histogram and plots it as bar plots to the figure handle provided by the user  $\$ 

@param fHandle int default: -1 figure handle if set to default a new figure will be opend. Otherwise the figure with this handle will be cleared and the data plotted there.

#### 5.1.2.6 def IGLOO.IGLOO.plotSingleTrace ( self, fHandle = -1, showNow = False )

This plots the last calculated trace as line plots. There are 3 subplots 1) Time vs Position 2) Time vs Ambient Temperature 3) Time vs Body Temperature

#### 5.1.2.7 def IGLOO.IGLOO.resetTempTrace ( self )

This function resets the fly and gradient so that a new simulation trial can begin, e.g. fly returns to original position and default temperature time is reset to zero.

The results are saved in self.position .drosoT .time and .tempTrace

self.tempTrace is a nx4 vector, where column 1) time [s], 2) position [mm], 3) ambient temperature [°C], 4) body temperature [°C]

#### 5.1.2.8 def IGLOO.IGLOO.save4MatlabAll ( self, fPos )

This function saves the following variables to a Matlab file:

@return lastTra is a nx4 vector, where column 1) time [s], 2) position [mm], 3) ambient temperature [°C], 4) body temperature [°C] and n is self.walkDur\*self.sps 
@return histData a tupel consisting of the number of samples

normalised to their total and the bins of the histogram. The number of samples variable has two rows 1st is mean and the 2nd is the SEM of each bin

@return time a vetor of self.walkDur\*self.sps length holding the time in seconds

@return flyPop a list of vectors nx3 vector, where column 1) position
[mm], 2) ambient temperature [°C], 3) body temperature [°C] and
n is self.walkDur\*self.sps. Each fly is saved in a single entry
of the list.

@return startPos start position of the fly in mm on the gradient @return gradientExt temperature extremes of the linear gradient in °C @return gradiantDist total length of the gradient in mm @return sps Samples per second. After the walking duration is reached. The wholetrajectory will be resampled with this framerate. @return walkDur total duration of the simulation in seconds @return rearingT rearing temperature of the fly in °C if you simulate on the original data only 18.0, 25.0 and 30.0 can be used. If instead of float rearingT is set as 'larval' larvae reared at 25°C are simulated.

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

 $\ensuremath{\mathtt{Qparam}}$  fPos string the absolute position of the file you want to save data to.

#### 5.1.2.9 def IGLOO.IGLOO.save4MatlabHistogram ( self, fPos )

This function saves the following variables to a Matlab file:

@return histData a tupel consisting of the number of samples normalised to their total and the bins of the histogram. The number of samples variable has two rows 1st is mean and the 2nd is the SEM of each bin

Oreturn startPos start position of the fly in mm on the gradient Greturn gradientExt temperature extremes of the linear gradient in °C Greturn gradiantDist total length of the gradient in mm Greturn sps Samples per second. After the walking duration is reached. The wholetrajectory will be resampled with this framerate. Greturn walkDur total duration of the simulation in seconds Greturn rearingT rearing temperature of the fly in °C if you simulate on the original data only 18.0, 25.0 and 30.0 can be used. If instead of float rearingT is set as 'larval' larvae reared at 25°C are simulated.

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

 $\ensuremath{\mathtt{Qparam}}$  fPos string the absolute position of the file you want to save data to.

#### 5.1.2.10 def IGLOO.IGLOO.save4MatlabPopulation ( self, fPos )

This function saves the following variables to a Matlab file:

 $\begin{tabular}{ll} \tt @return time a vetor of self.walkDur*self.sps length holding the time in seconds \\ \end{tabular}$ 

@return flyPop a list of vectors nx4 vector, where column
1) position [mm], 2) ambient temperature [°C], 3) body temperature
[°C] and n is self.walkDur\*self.sps. Each fly is saved in a single
entry of the list.

entry of the list @return startPos start position of the fly in mm on the gradient @return gradientExt temperature extremes of the linear gradient in °C @return gradiantDist total length of the gradient in mm @return sps Samples per second. After the walking duration is reached. The wholetrajectory will be resampled with this framerate. @return walkDur total duration of the simulation in seconds @return rearingT rearing temperature of the fly in °C if you simulate on the original data only 18.0, 25.0 and 30.0 can be used. If

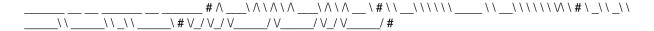
18 Class Documentation

instead of float rearingT is set as 'larval' larvae reared at  $25^{\circ}$ C are simulated.

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

 $\ensuremath{\mathtt{Qparam}}$  fPos string the absolute position of the file you want to save data to.

#### 5.1.2.11 def IGLOO.IGLOO.save4MatlabSingleTra ( self, fPos )



This function saves the following variables to a Matlab file:

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

 $\ensuremath{\mathtt{Qparam}}$  fPos string the absolute position of the file you want to save data to.

#### 5.1.2.12 def IGLOO.IGLOO.save4TXTHistogram ( self, fPos )

This function saves the histogram data to disk. The resulting file has three columns:

- 1) The middle temperature of each bin
- 2) The mean of the histograms of all flies / normalised to an integral of one
- 3) The standard error of the mean of the histograms of all flies  $% \left( 1\right) =\left( 1\right) \left( 1\right)$

@return startPos start position of the fly in mm on the gradient @return gradientExt temperature extremes of the linear gradient in °C @return gradiantDist total length of the gradient in mm @return sps Samples per second. After the walking duration is reached. The wholetrajectory will be resampled with this framerate. @return walkDur total duration of the simulation in seconds @return rearingT rearing temperature of the fly in °C if you simulate on the original data only 18.0, 25.0 and 30.0 can be used. If instead of float rearingT is set as 'larval' larvae reared at 25°C are simulated.

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

 $\ensuremath{\mathtt{Qparam}}$  fPos string the absolute position of the file you want to save data to.

#### 5.1.2.13 def IGLOO.IGLOO.save4TXTPopulation ( self, dirName, prefix = ' IGLOO' )

This function saves the following variables for each fly into a single ASCII text file with 4 digits before and 5 after the point. :

@return lastTra is a nx4 vector, where column 1) time [s],
2) position [mm], 3) ambient temperature [°C], 4) body temperature
[°C] and n is self.walkDur\*self.sps. in a 4.5 float format
@return startPos start position of the fly in mm on the gradient
@return gradientExt temperature extremes of the linear gradient in °C
@return gradiantDist total length of the gradient in mm
@return sps Samples per second. After the walking duration is reached.
The wholetrajectory will be resampled with this framerate.
@return walkDur total duration of the simulation in seconds
@return rearingT rearing temperature of the fly in °C if you simulate
on the original data only 18.0, 25.0 and 30.0 can be used. If
instead of float rearingT is set as 'larval' larvae reared at
25°C are simulated.

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

@param dirName string the absolute position of the director you want to save your single fly trace to. @param prefix string with the prefix for all fly trajectory files. Example: if set to 'cantonS' and you simulated one hundred flies the files will be called cantonS\_0000.txt to cantonS\_0099.txt default: 'IGLOO'

#### 5.1.2.14 def IGLOO.IGLOO.save4TXTSingleTra ( self, fpos, trace = " )

This function saves the following variables to a txt file:

@return simulationType String that defines if the simulation is run on the original data set or on the interpolation functions. The later is much faster and allows to set the rearing temperature to any value between 18 and 30. To run on the original data set this string to "onData"

 $\ensuremath{\mathtt{Qparam}}$  fPos string the absolute position of the file you want to save data to.

#### 5.1.2.15 def IGLOO.IGLOO.simulateFlyPopulation ( self, flyN, plotFlag = False )

This function wraps the simualteSingleFly function and itereates it for the number of flies given by flyN.

@param flyN int number of flies to be simulated
@param plotFlag bool default: 0 if set to 1 all trajectories are
 plotted

The result is saved in self.flypop

20 Class Documentation

#### 5.1.2.16 def IGLOO.IGLOO.simulateSingleFly ( self )

This function simulates the random walk of a single fly. For the duration given by self.walkDur in [s] on the gradient defined by self.gradientExt and self.gradientDist
To simulate more than one fly, please use simulateFlyPopulation

The result is saved in self.tempTrace

self.tempTrace is a nx4 vector, where column 1) time [s], 2) position [mm], 3) ambient temperature [°C], 4) body temperature [°C] and n is self.walkDur\*self.sps

#### 5.1.2.17 def IGLOO.IGLOO.stepFunc ( self )

This function creates a step during random walk. The direction is randomly determined. Velocity and step duration are determined by the subroutine self.move()

#### 5.1.2.18 def IGLOO.IGLOO.updateAmbientTemp ( self )

This subroutine updates the ambient temperature to the spot where the fly arrived after the position was updated. This is trivial.

The result is saved in self.ambientT

#### 5.1.2.19 def IGLOO.IGLOO.updatePosition ( self )

This function updates the position of the animal. This is important, as the ends of the gradient are reflective, e.g.: The gradient is 50~mm long the fly is at 47~mm and makes a 10~mm step towards the near end. In this case the animal walk 3~mm to the near end and gets reflected for 7~mm. The new fly position would be 43~mm.

The result is saved in self.position

#### 5.1.3 Member Data Documentation

- 5.1.3.1 IGLOO.IGLOO.allData
- 5.1.3.2 IGLOO.IGLOO.ambientT
- 5.1.3.3 IGLOO.IGLOO.bins
- 5.1.3.4 IGLOO.IGLOO.degPerMM
- 5.1.3.5 IGLOO.IGLOO.direction
- 5.1.3.6 IGLOO.IGLOO.dParams
- 5.1.3.7 IGLOO.IGLOO.drosoT
- 5.1.3.8 IGLOO.IGLOO.durData
- 5.1.3.9 IGLOO.IGLOO.flyPop

 5.1.3.10
 IGLOO.IGLOO.gradientDist

 5.1.3.11
 IGLOO.IGLOO.gradientExt

 5.1.3.12
 IGLOO.IGLOO.histData

 5.1.3.13
 IGLOO.IGLOO.position

 5.1.3.14
 IGLOO.IGLOO.rearingT

 5.1.3.15
 IGLOO.IGLOO.selfTestData

 5.1.3.16
 IGLOO.IGLOO.simulationType

 5.1.3.17
 IGLOO.IGLOO.sps

 5.1.3.18
 IGLOO.IGLOO.startPosition

 5.1.3.19
 IGLOO.IGLOO.step

 5.1.3.20
 IGLOO.IGLOO.tempTrace

 5.1.3.21
 IGLOO.IGLOO.time

 5.1.3.22
 IGLOO.IGLOO.velData

5.1.3.23 IGLOO.IGLOO.walkDur

The documentation for this class was generated from the following file:

• /home/bgeurten/PyProjects/Igloo/IGLOO.py

22 Class Documentation

## **File Documentation**

6.1	/home/bgeurten/P	Projects/Igloo/demo.py	File Reference

#### **Namespaces**

• demo

#### **Variables**

• tuple demo.modObj

### 6.2 /home/bgeurten/PyProjects/Igloo/IGLOO.py File Reference

#### Classes

• class IGLOO.IGLOO

#### **Namespaces**

• IGLOO

### 6.3 /home/bgeurten/PyProjects/Igloo/locomotionInterpolation.py File Reference

#### **Namespaces**

• locomotionInterpolation

#### **Functions**

- · def locomotionInterpolation.gauss
- def locomotionInterpolation.ratio
- · def locomotionInterpolation.linear
- def locomotionInterpolation.poly2
- def locomotionInterpolation.poly3
- def locomotionInterpolation.poly4
- def locomotionInterpolation.hillUp

24 File Documentation

- def locomotionInterpolation.hillDown
- def locomotionInterpolation.hillDouble
- def locomotionInterpolation.velFunc
- def locomotionInterpolation.durFunc
- def locomotionInterpolation.velFuncLarva
- def locomotionInterpolation.durFuncLarva
- def locomotionInterpolation.calcParameters

## 6.4 /home/bgeurten/PyProjects/Igloo/locomotionOnRawData.py File Reference

#### **Namespaces**

locomotionOnRawData

#### **Functions**

- def locomotionOnRawData.pickDataSet
- def locomotionOnRawData.findValue

# Index

/home/bgeurten/PyProjects/Igloo/IGLOO.py, 23 /home/bgeurten/PyProjects/Igloo/demo.py, 23	IGLOO::IGLOO, 21
/home/bgeurten/PyProjects/Igloo/locomotionInterpolation	<sub></sub> hillDouble
py, 23	locomotionInterpolation, 8
/home/bgeurten/PyProjects/Igloo/locomotionOnRaw-	hillDown
Data.py, 24	locomotionInterpolation, 9
init	hillUp
IGLOO::IGLOO, 14	locomotionInterpolation, 9
	histData
allData	IGLOO::IGLOO, 21
IGLOO::IGLOO, 20	
ambientT	IGLOO, 7
IGLOO::IGLOO, 20	IGLOO.IGLOO, 13
	IGLOO::IGLOO
bins	init, 14
IGLOO::IGLOO, 20	allData, 20
1.18	ambientT, 20
calcHistogram	bins, 20
IGLOO::IGLOO, 14	calcHistogram, 14
calcParameters	dParams, 20
locomotionInterpolation, 8	degPerMM, 20
dD	direction, 20
dParams	drosoT, 20
IGLOO::IGLOO, 20	drosoTbyConduction, 15
degPerMM	durData, 20
IGLOO::IGLOO, 20	flyPop, 20
demo, 7	gradientDist, 20
modObj, 7	gradientExt, 21
direction	histData, 21
IGLOO::IGLOO, 20	make_txt_header, 15
drosoT	move, 16
IGLOO::IGLOO, 20	plotHistogram, 16
drosoTbyConduction	plotSingleTrace, 16
IGLOO::IGLOO, 15	position, 21
durData	rearingT, 21
IGLOO::IGLOO, 20	resetTempTrace, 16
durFunc	save4MatlabAll, 16
locomotionInterpolation, 8	save4MatlabHistogram, 17
durFuncLarva	save4MatlabPopulation, 17
locomotionInterpolation, 8	save4MatlabSingleTra, 18
	save4tXTHistogram, 18
findValue	<b>5</b> ,
locomotionOnRawData, 11	save4TXTPopulation, 18
flyPop	save4TXTSingleTra, 19
IGLOO::IGLOO, 20	selfTestData, 21
	simulateFlyPopulation, 19
gauss	simulateSingleFly, 19
locomotionInterpolation, 8	simulationType, 21
gradientDist	sps, 21
IGLOO::IGLOO, 20	startPosition, 21
gradientExt	step, 21

26 INDEX

stepFunc, 20	IGLOO::IGLOO, 16
tempTrace, 21	save4MatlabHistogram
time, 21	IGLOO::IGLOO, 17
updateAmbientTemp, 20	save4MatlabPopulation
updatePosition, 20	IGLOO::IGLOO, 17
velData, 21	save4MatlabSingleTra
walkDur, 21	IGLOO::IGLOO, 18
	save4TXTHistogram
linear	IGLOO::IGLOO, 18
locomotionInterpolation, 9	save4TXTPopulation
locomotionInterpolation, 7	IGLOO::IGLOO, 18
calcParameters, 8	save4TXTSingleTra
durFunc, 8	IGLOO::IGLOO, 19
durFuncLarva, 8	selfTestData
gauss, 8	IGLOO::IGLOO, 21
hillDouble, 8	simulateFlyPopulation
hillDown, 9	IGLOO::IGLOO, 19
hillUp, 9	simulateSingleFly
linear, 9	IGLOO::IGLOO, 19
poly2, 9	simulationType
poly3, 10	IGLOO::IGLOO, 21
poly4, 10	sps
ratio, 10	IGLOO::IGLOO, 21
velFunc, 10	startPosition
velFuncLarva, 11	IGLOO::IGLOO, 21
locomotionOnRawData, 11	step
findValue, 11	IGLOO::IGLOO, 21
pickDataSet, 11	stepFunc
	IGLOO::IGLOO, 20
make_txt_header	
IGLOO::IGLOO, 15	tempTrace
modObj	IGLOO::IGLOO, 21
demo, 7	time
move	IGLOO::IGLOO, 21
IGLOO::IGLOO, 16	
	updateAmbientTemp
pickDataSet	IGLOO::IGLOO, 20
locomotionOnRawData, 11	updatePosition
plotHistogram	IGLOO::IGLOO, 20
IGLOO::IGLOO, 16	velData
plotSingleTrace	10.00
IGLOO::IGLOO, 16	IGLOO::IGLOO, 21
poly2	velFunc
locomotionInterpolation, 9	locomotionInterpolation, 10 velFuncLarva
poly3	
locomotionInterpolation, 10	locomotionInterpolation, 11
poly4	walkDur
locomotionInterpolation, 10	IGLOO::IGLOO, 21
position	102000200, 21
IGLOO::IGLOO, 21	
ratio	
locomotionInterpolation, 10	
rearingT	
IGLOO::IGLOO, 21	
resetTempTrace	
IGLOO::IGLOO, 16	
save4MatlabAll	
3avc+ivialiau/Ali	