Package 'Thermistor'

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Type Package

Title The Simulation of the Thermistor Network

Version 1.1.0

Description Given the circuit topology, simulating the Voltage vs. Temperature curve with a set of Resistors (R1, R2, R3 and R4) and Thermistors values (TH1 and TH2) for a given thermistor network shown in Seth DeLand (2024) ``Optimal Component Selection Using the Mixed-Integer Genetic Algorithm'' <https://ww2.mathworks.cn/matlabcentral/fileexchange/35810-optimal-component-selection-using-the-mixed-integer-genetic-algorithm> and the application in Mak and Wu (2019) <doi:10.1080/00401706.2019.1593246>.

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Encoding UTF-8

LazyData true

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Imports ggplot2

Depends R (>= 2.10)

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NeedsCompilation no

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R topics documented:

CompValues *Dataset for the standard components values*

Description

A list containing the standard values provided for each component. "Res" corresponds to the values of R1, R2, R3 and R4, The values in the same index of "ThBeta" and "ThVal" provides nine types of (beta, Rb) of a thermistor.

Usage

```
data(CompValues)
```

Format

A named list containing the standard values of each component:

"Res" the standard values of R1, R2, R3 and R4

"ThBeta" the standard values of temperature coefficient

"ThVal" the standard values of nominal thermistor resistances

Examples

```
data(EzGP_data)
```

plot_voltageCurve *Plot the V-DeltaT Curve*

Description

Plot the temperature-change-voltage curve under a particular components setting v.s. the target curve. using `ggplot`.

Usage

```
plot_voltageCurve(Tdata, OnlyTarget = TRUE, Pdata = NULL)
```

Arguments

`Tdata`	a vector of temperature-change values
`OnlyTarget`	logical. If `TRUE`, plot the target curve only.
`Pdata`	the values returning by `voltageCurve` or `tempCompCurve`

Value

the graph

Examples

```
### only target curve
Tdata <- seq(-40, 85, by = 5)
plot_voltageCurve(Tdata)
### a particular curve and the target curve
data(CompValues)
Tdata <- seq(-40, 85, by=5)
R_id <- c(43, 36, 29, 15, 9, 3)
Res <- CompValues$Res
ThVal <- CompValues$ThVal
ThBeta <- CompValues$ThBeta
Vnew <- voltageCurve(Tdata, R_id, Res, ThVal, ThBeta)
plot_voltageCurve(Tdata, OnlyTarget = FALSE, Pdata = Vnew)
```

SquaredLoss *Squared Loss of Objective*

Description

Measuring the difference between the V-DeltaT Curve you get and the target curve under squared loss.

Usage

```
SquaredLoss(x, StdRes, StdTherm_Val, StdTherm_Beta, Tdata)
```

Arguments

x	a vector of the indices of each component
StdRes	a vector of available resistor values
StdTherm_Val	a vector of available nominal thermistor resistances
StdTherm_Beta	a vector of of thermistor temperature coefficients
Tdata	a vector of temperature-change values

Value

the squared loss

Examples

```
data(CompValues)
Tdata <- seq(-40, 85, by=5)
R_id <- c(43, 36, 29, 15, 9, 3)
Res <- CompValues$Res
ThVal <- CompValues$ThVal
ThBeta <- CompValues$ThBeta
SquaredLoss(R_id, Res, ThVal, ThBeta, Tdata)
### 0.04066336
```

tempCompCurve *Calculate V-DeltaT Curve*

Description

Calculating the temperature-change-voltage curve for a particular set of Resistor and Thermistor Values.

Usage

```
tempCompCurve(x, Tdata)
```

Arguments

x	a vector containing the values of R1 R2 R3 R4 Rb1 Beta1 Rb2 Beta2
Tdata	a vector of temperature-change values

Value

the voltage values at Point B

Examples

```
Tdata <- seq(-40, 85, by=5)
R_values <- c(1100, 4300, 560, 1100, 220, 3680, 1000, 3560)
tempCompCurve(x = R_values, Tdata = Tdata)
```

voltageCurve *Calculate V-DeltaT Curve for Given Indices*

Description

Calculating the temperature-change-voltage curve for a particular set of indices for each component corresponding to the values from a standard components space.

Usage

```
voltageCurve(Tdata, x, StdRes, StdTherm_Val, StdTherm_Beta)
```

Arguments

Tdata	a vector of temperature-change values
x	a vector of the indices of each component
StdRes	a vector of available resistor values
StdTherm_Val	a vector of available nominal thermistor resistances
StdTherm_Beta	a vector of of thermistor temperature coefficients

Value

the voltage values at Point B

Examples

```
data(CompValues)
Tdata <- seq(-40, 85, by=5)
R_id <- c(2, 1, 4, 2, 1, 3)
Res <- CompValues$Res
ThVal <- CompValues$ThVal
ThBeta <- CompValues$ThBeta
voltageCurve(Tdata, R_id, Res, ThVal, ThBeta)
```

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