

Package ‘imuf’

January 12, 2025

Title Estimate Orientation of an Inertial Measurement Unit

Version 0.5.0

Description Estimate the orientation of an inertial measurement unit (IMU) with a 3-axis accelerometer and a 3-axis gyroscope using a complementary filter. 'imuf' takes an IMU's accelerometer and gyroscope readings, time duration, its initial orientation, and a gain factor as inputs, and returns an estimate of the IMU's final orientation.

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Encoding UTF-8

RoxygenNote 7.3.2

LinkingTo Rcpp, RcppEigen

Imports htmltools, htmlwidgets, Rcpp

Suggests knitr, rmarkdown, testthat (>= 3.0.0), purrr, ggplot2, shiny

Config/testthat/edition 3

URL <https://github.com/gitboosting/imuf>,
<https://gitboosting.github.io/imuf/>

BugReports <https://github.com/gitboosting/imuf/issues>

Depends R (>= 2.10)

LazyData true

VignetteBuilder knitr

NeedsCompilation yes

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Repository CRAN

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animate_imu	<i>Animate movement of an inertial measurement unit</i>
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Description

Create interactive animated movements of an inertial measurement unit

Usage

```
animate_imu(data, dt, width = NULL, height = NULL, elementId = NULL)
```

Arguments

data	A list of numeric 4-vectors each of which a unit quaternion (w,x,y,z)
dt	A numeric of time duration in milli-seconds
width, height	width and height of animate_imu htmlwidget specified in any valid CSS size unit
elementId	string id as a valid CSS element id.

animate_imu-shiny	<i>Shiny bindings for animate_imu</i>
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Description

Output and render functions for using animate_imu within Shiny applications and interactive Rmd documents.

Usage

```
animate_imuOutput(outputId, width = "100%", height = "400px")
renderAnimate_imu(expr, env = parent.frame(), quoted = FALSE)
```

Arguments

outputId	output variable to read from
width, height	Must be a valid CSS unit (like '100%', '400px', 'auto') or a number, which will be coerced to a string and have 'px' appended.
expr	An expression that generates a animate_imu
env	The environment in which to evaluate expr.
quoted	Is expr a quoted expression (with quote())? This is useful if you want to save an expression in a variable.

compUpdate	<i>Update orientation with 3-axis acc and gyr data</i>
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Description

compUpdate() uses complementary filtering to update the orientation, given an initial orientation, readings of a 3-axis accelerometer and a 3-axis gyroscope, time duration, and a gain factor

Usage

```
compUpdate(acc, gyr, dt, initQuat, gain)
```

Arguments

acc	A numeric 3-vector of 3-axis accelerometer readings in g
gyr	A numeric 3-vector of 3-axis gyroscope readings in rad/sec
dt	A numeric of time duration in sec
initQuat	A numeric 4-vector of the starting orientation in quaternion
gain	A numeric gain factor between 0 and 1

Value

A numeric 4-vector of the ending orientation in quaternion

Examples

```
compUpdate(c(0, 0, -1), c(1, 0, 0), 0.1, c(1, 0, 0, 0), 0.1)
```

rotV *Rotate a 3-vector by a quaternion*

Description

rotV() rotates a 3-vector by a quaternion expressed as a unit 4-vector in (w,x,y,z) convention

Usage

```
rotV(quat, vin)
```

Arguments

quat A numeric unit 4-vector (w,x,y,z) for a rotation quaternion
 vin A numeric 3-vector to be rotated by quat

Value

A numeric 3-vector after the rotation

Examples

```
q <- c(cos(pi/4), sin(pi/4), 0, 0)
vin <- c(0, 1, 0)
rotV(q, vin)
```

walking_shin_1 *University of Mannheim Real World Activities*

Description

Accelerations and angular velocities captured by sensors of the mobile device situated on the shin of subject 1 while the subject was walking for 10 minutes

Usage

```
walking_shin_1
```

Format

walking_shin_1:
 A data frame with 31,946 rows and 6 columns of accelerometer and gyroscope measurements at 50 Hz
acc_x, acc_y, acc_z north, east and down acceleration in m/s²
gyr_x, gyr_y, gyr_z angular velocity about north, east and down in rad/sec

Source

<https://www.uni-mannheim.de/dws/research/projects/activity-recognition/dataset/dataset-realworld/s1/>

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