Package ‘polyhedralCubature’

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Title Multiple Integration over Convex Polyhedra
Version 1.1.0
Description Evaluation of multiple integrals over convex polyhedra. This is useful when the bounds of the integrals are some linear combinations of the variables.
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getAb

_Easily get the matrix \( A \) and the vector \( b \)_

**Description**

Get the matrix \( A \) and the vector \( b \) representing the linear inequalities with a user-friendly syntax.

**Usage**

getAb(model)

**Arguments**

- **model**
  a "MIP model"; see the example

**Value**

A list with the matrix \( A \) and the vector \( b \) for usage in `integrateOverPolyhedron`.

**Examples**

```r
library(ompr)
model <- MIPModel() %>%
  add_variable(x) %>% add_variable(y) %>% add_variable(z) %>%
  add_constraint(-5 <= x) %>% add_constraint(x <= 4) %>%
  add_constraint(-5 <= y) %>% add_constraint(y <= 3 - x) %>%
  add_constraint(-10 <= z) %>% add_constraint(z <= 6 - x - y)
getAb(model)
```

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`integrateOverPolyhedron`

_Multiple integral over a polyhedron_

**Description**

Multiple integral over a convex polyhedron given by a set of linear inequalities. See the vignette for explanations and examples.

**Usage**

`integrateOverPolyhedron(f, A, b)`
**Arguments**

- **f**: either a function, a **spray** polynomial, or a **qspray** polynomial; its number of variables must match the number of columns of the matrix A
- **A, b**: matrix and vector defining the linear inequalities which must be in numeric mode or, for exactness, in character mode, with an integer or a fraction as each entry; if f is a **qspray** polynomial, then A and b will be converted to character mode if they are in numeric mode, with the function d2q

**Value**

There are three possible values: an output of **adaptIntegrateSimplex** if f is a function, an output of **integrateSimplexPolynomial** if f is a **spray** polynomial, or a character representing the value of the integral as a fraction if f is a **qspray** polynomial.

**Examples**

```r
A <- rbind(
  c(-1, 0, 0), # -x
  c( 1, 0, 0), # x
  c( 0,-1, 0), # -y
  c( 1, 1, 0), # x+y
  c( 0, 0,-1), # -z
  c( 1, 1, 1)  # x+y+z
)
b <- c(
  5, 4, # -5 < x < 4 <=> -x < 5 & x < 4
  5, 3, # -5 < y < 3-x <=> -y < 5 & x+y < 3
  10, 6 # -10 < z < 6-x-y <=> -z < 10 & x+y+z < 6
)
f <- function(x, y, z) {
  x*y + 5*cos(z)
}
integrateOverPolyhedron(f, A, b)
```

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**pipe-operator**  
**Pipe operator**

**Description**

This is the ‘magrittr’ pipe operator. We import it in this package in order to help the user to construct the model argument of the **getAb** function.
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