Matrice di avvitamento $A_v(z,\theta,d), A_v(x,\alpha,a)$

```
Maxima 5.44.0 http://maxima.sourceforge.net
using Lisp SBCL 2.0.0
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Dedicated to the memory of William Schelter.
The function bug_report() provides bug reporting information.
```

```
(%i1) inverseLaplace(SI,theta):=block([res],
                                M:SI,
                                MC:SI,
                                for i:1 thru 3 do(
                                  for j:1 thru 3 do
                                     (
                                       aC:M[i,j],
                                       b:ilt(aC,s,theta),
                                       MC[i,j]:b
                                      )
                                   ),
                                res:MC

                              )
```

(%o1) inverseLaplace(SI, ϑ) := **block** ([res], M: SI, MC: SI, **for** i **thru** 3 **do for** j **thru** 3 **do** (aC: $M_{i,j}$, b: ilt(aC, s, ϑ), $\mathrm{MC}_{i,j}$: b), res: MC)

```
(%i2) rotLaplace(k,theta):=block([res],
                            S:ident(3),
                            I:ident(3),
                           for i:1 thru 3 do
                             (
                             for j:1 thru 3 do
                                (
                                  if i=j
                                     then S[i][j]:0
                                  elseif j>i
                                     then (
                                    temp:(-1)^(j-i)*k[3-remainder(i+j,3)],
                                           S[i][j]:temp,
                                           S[j][i]:-temp

                                            )
                                )
                              ),
                             res:inverseLaplace(invert(s*I-S),theta)


                           )
```

(%o2) rotLaplace(k, ϑ) := **block** ([res], S: ident(3), I: ident(3),
for i **thru** 3 **do for** j **thru** 3 **do if** $i = j$ **then** $(S_i)_j$: 0 **elseif** $j > i$ **then** (temp: $(-1)^{j-i} k_{3-\mathrm{remainder}(i+j,3)}$, $(S_i)_j$: temp, $(S_j)_i$: $-$temp), res: inverseLaplace(invert($s\,I - S$), ϑ))

```
(%i3) Av(v,theta,d):=block([res],
                           Trot:rotLaplace(v,theta),
                           row:matrix([0,0,0,1]),
                           Atemp:addcol(Trot,d*transpose(v)),
                           A:addrow(Atemp,row),
                           res:trigsimp(trigrat(trigreduce(trigexpand(A))))
                           )
```

(%o3) $\mathrm{Av}(v,\vartheta,d) := \textbf{block}\ ([\mathrm{res}],\ \mathrm{Trot}:\ \mathrm{rotLaplace}(v,\vartheta),\ \mathrm{row}:\ \begin{pmatrix}0&0&0&1\end{pmatrix},\ \mathrm{Atemp}:\ \mathrm{addcol}(\mathrm{Trot},\ d\,\mathrm{transpose}(v)),\ A:\mathrm{addrow}(\mathrm{Atemp},\mathrm{row}),\ \mathrm{res}:\ \mathrm{trigsimp}(\mathrm{trigrat}(\mathrm{trigreduce}(\mathrm{trigexpand}(A)))))$

```
(%i4) A[z](theta,d):=Av([0,0,1],theta,d);
```

(%o4) $A_z(\vartheta,d) := \mathrm{Av}([0,0,1],\vartheta,d)$

Matrice di avvitamento $A_v(z,\theta,d)$:

```
(%i5) A[z](theta,d);
```

(%o5) $$\begin{pmatrix}\cos(\vartheta)&-\sin(\vartheta)&0&0\\ \sin(\vartheta)&\cos(\vartheta)&0&0\\ 0&0&1&d\\ 0&0&0&1\end{pmatrix}$$

Matrice di avvitamento $A_v(x,\theta,d)$

```
(%i6) A[x](alpha,a):=Av([1,0,0],alpha,a);
```

(%o6) $A_x(\alpha,a) := \mathrm{Av}([1,0,0],\alpha,a)$

```
(%i7) A[x](alpha,a);
```

(%o7) $$\begin{pmatrix}1&0&0&a\\ 0&\cos(\alpha)&-\sin(\alpha)&0\\ 0&\sin(\alpha)&\cos(\alpha)&0\\ 0&0&0&1\end{pmatrix}$$

```
(%i8)
```