Development of a user–friendly and open–source multibody framework with the help of symbolic tools

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References:

Giac/Xcas
Free computer algebra system for Windows, Mac OS X and Linux/Unix
Giac is a free (GPL) C++ library — Computation kernel.

CAGeM
(COMPUTER AIDED GENERATION OF MOTION)
- Transform matrix definition
- Option FLAG Initialization
- Configuration parameters

Read the user file

Testing of an existing relative matrix
- Definition of other types ToGd, RoG, RoGd, MatRot, omega, omega, vs, aG
- Declaration of dependent variables
- Partial velocities definition
- Creation of time dependence

Calculate & simplify kinematics
- (Partial) Velocities
- (Partial) Accelerations

Generation of the application C++ code

main()
- InitEasyDynmbus()
- Create shapes/scence /vanfile (ANIM=1)
- Initial configuration (q,qd,qdd)
- Static Equilibrium (STATIC=1)

- Compute Motion()
  - Compute dependent variables (if nbddep>0)
  - Compute homogeneous transformation matrices
  - Calculate (partial) velocities
  - Calculate (partial) accelerations
  - Add applied efforts (gravity + external efforts)
- Newmark Integration
  - WriteDataHeader(ResFile)
  - NewmarkOneStep()
  - NewmarkIterate(1 while time<ftime)
  - SaveData(ResFile)

Compile & Execute

EasyDyn
(C++ library for the simulation of problems represented by differential equations)

<vec.h> Vector calculus

<vsu.h> Easy creation of files describing scenes composed of moving 3D objects for further visualization

<sim.h> Routines for integration of second–order differential equations

EasyAnim
(Visualize & animate a scene composed of moving objects)

vol. . . var files

Gnuplot

 Compile & Execute