(*BeginMDL(the_model, "The Model", "9.0b105")

*SetCurrentSolverMode(MotionSolve)
*Point(p_0, "Point 0")
*Point(p_1, "Point 1")
*Point(p_2, "Point 2")
*Body(b_0, "Body 0", p_0)
*Body(b_1, "Body 1", p_1)
*Body(b_2, "Body 2", p_2)
*Body(b_3, "Body 3", P_Global_Origin)
*Graphic(gra_0, "Graphic 0", CYLINDER, b_0, p_0, MODEL.p_2, 0.005, gra_0.r1, , 0.0, CAPBOTH)
*Graphic(gra_2, "Graphic 3", BOX, b_3, CENTER, P_Global_Origin, ZX, MODEL.V_Global_Z, MODEL.V_Global_X, 2.8, 1, 0.02)
*Graphic(gra_1, "Graphic 1", CYLINDER, b_1, p_1, MODEL.p_2, 0.005, gra_1.r1, , 0.0, CAPBOTH)
*RevJoint(j_1, "Joint 02", MODEL.b_0, MODEL.b_2, MODEL.p_2, MODEL.V_Global_Y)
*RevJoint(j_2, "Joint 12", MODEL.b_1, MODEL.b_2, MODEL.p_2, MODEL.V_Global_Y)
*Sensor(sen_0, "b0_z")
*Sensor(sen_1, "b1_z")
*Template(tmplt_0, "commandset", SOLVER_COMMAND, def_tmplt_0)
*Contact(con_0, "Contact 0", POISSON, ON, 1, MODEL.gra_0, false, 1, MODEL.gra_2, false)
*Contact(con_1, "Contact 1", POISSON, ON, 1, gra_1, false, 1, gra_2, false)
*RevJoint(j_3, "Joint 13", b_1, MODEL.b_3, p_1, MODEL.V_Global_Y)
*Sensor(sen_2, "dx_b0_b1")
*Sensor(sen_3, "b2_vz")
*Marker(m_0, "Marker 0", MODEL.b_0, MODEL.p_0, FLOATING)
*Marker(m_1, "Marker 1", MODEL.b_1, MODEL.p_1, FLOATING)
*Marker(m_2, "Marker 2", b_3, p_0, FLOATING)
*Marker(m_3, "Marker 3", b_3, p_1, FLOATING)
*Output(o_0, "Output 0", EXPR, 'FZ({the_model.m_1.idstring},{the_model.Global_Frame.idstring})', '0', '0', '0', '0', '0', '0', '0', '0', '0', '0', '0')
*Sensor(sen_4, "b1_b3_fz")
*FixedJoint(j_0, "Joint 3G", b_3, B_Ground, P_Global_Origin)
*Template(tmplt_1, "model_statement", SOLVER_INPUT, def_tmplt_1)
*DefineTemplate( def_tmplt_0 )

<H3DOutput
    switch_on           = "TRUE"
    increment           = "1"
    start_time          = "0."
    end_time            = "9999999."
    format_option       = "AUTO"
    stress_option       = "TENSOR"
    strain_option       = "TENSOR"
/>

<Param_Simulation
    constr_tol          = "1.0000E-10"
    implicit_diff_tol   = "1.0000E-06"
/>

<Param_Transient
    integr_tol          = "0.0001"
    integrator_type     = "DSTIFF"
    h_max               = "0.01"
    h0_max              = "0.001"
/>

<Deactivate
    element_type        = "SENSOR"
    element_id          = "301001"
/>

<Deactivate
    element_type        = "SENSOR"
    element_id          = "301002"
/>

<Deactivate
    element_type        = "SENSOR"
    element_id          = "301003"
/>

<Deactivate
    element_type        = "SENSOR"
    element_id          = "301005"
/>

<Deactivate
    element_type = "CONTACT"
    element_id = "301001"
/>

<Deactivate
    element_type = "CONTACT"
    element_id = "301002"
/>

<Deactivate
    element_type = "JOINT"
    element_id = "301005"
/>
<Deactivate
    element_type = "JOINT"
    element_id = "301006"
/>  

<Simulate
    analysis_type       = "Transient"
    end_time            = "15."
    print_interval      = "0.01"
/>  

<Deactivate
    element_type        = "SENSOR"
    element_id          = "301004"
/>  

(if (the_model.b_1.vx == 0))

<Activate
    element_type        = "SENSOR"
    element_id          = "301003"
/>  

<Simulate
    analysis_type       = "Transient"
    end_time            = "15."
    print_interval      = "0.01"
/>  

<Deactivate
    element_type        = "SENSOR"
    element_id          = "301003"
/>  

<Activate
    element_type        = "SENSOR"
    element_id          = "301001"
/>  

<Simulate
    analysis_type       = "Transient"
    end_time            = "15."
    print_interval      = "0.01"
/>  

<Deactivate
    element_type        = "SENSOR"
element_id = "301001"

<Activate
element_type = "JOINT"
element_id = "301005"
/>

<Deactivate
element_type = "JOINT"
element_id = "301003"
/>

<Simulate
analysis_type = "Transient"
end_time = "15"
print_interval = "0.01"
/>

{endif} *EndDefine()

*DefineTemplate( def_tmplt_1 )
<Constraint_Joint
id = "301005"
type = "REVOLUTE"
i_marker_id = "30102021"
j_marker_id = "30105020"
align_meth1 = "VECTOR"
align_vec1 = "V_Global_Y"
/>

<Constraint_Joint
id = "301006"
type = "REVOLUTE"
i_marker_id = "30103032"
j_marker_id = "30105031"
align_meth1 = "VECTOR"
align_vec1 = "V_Global_Y"
/> *EndDefine()

<<<<<<<<<<<///////////////////////////////////////////////////////////////////////////////////////////
*SetSystem( MODEL ) //The Model

*SetOption( DS_Units.op_length, "METER"
*Set( b_0.usecm, true )
*SetBodyInertia( b_0, 1.0 )
*SetBodyICFlag( b_0, false )
*Set( b_1.usecm, true )
*SetBodyInertia( b_2, 1000.0 )
*Set( b_3.usecm, true )
*SetBodyInertia( b_1, 1 )
*Set( gra_2.is_material_inside, true )
*SetSensor( sen_0, USER, `USER()`, 0.0, EQ, 0.0,
NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, OFF,
NO_YYDUMP )
*SetSensor( sen_0, LIN, 0.0, EQ, 0.0,
NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, OFF,
NO_YYDUMP )
*SetNote( sen_0, )
*SetSensor( sen_1, LIN, 0.02, LE, -le-8, LIN )
*SetEntityId( sen_0, 301001 )
*SetEntityId( sen_1, 301002 )
*SetEntityNumber( `con_1`, DEFAULT )
*SetSensorEvaluate( sen_1, LIN )
*Set( sen_1.do_evaluate, false )
*SetEntityId( gra_0, 90001 )
*SetEntityId( gra_2, DEFAULT )
*SetEntityId( gra_1, DEFAULT )
*SetNote( j_3, )
*SetJointICFlag( j_3, ROT, false )
*SetBodyIC( b_3, , , , , 0.0 )
*SetPoint( p_1, -1.1, , 0.01 )
*SetPoint( p_2, -1.1 - sin(0.08), 0, 0.01 + cos(0.08) )
*SetBodyIC( b_1, , , , , 0.1 )
*SetReal( DS_Gravity.igrav, 1*sin(0.009) )
*SetBodyIC( b_2, 1*0.1*cos(0.08), 0.0, 1*0.1*sin(0.08), , 0.0 )
*SetReal( DS_MotionSolve_Simopts.end_time, 15 )
*SetPoint( p_0, -1.1 - sin(0.08) - sin(0.22), , 0.01 + cos(0.08) - cos(0.22) )
*SetEntityNumber( j_2, DEFAULT )
*SetEntityId( j_2, DEFAULT )
*SetEntityNumber( con_0, DEFAULT )
*SetEntityId( con_0, DEFAULT )
*SetSensor( sen_2, LIN, 0.0, 0.05, EQ, 0.0, DEFAULT )
*SetEntityNumber( sen_3, DEFAULT )
*SetSensorEvaluate( sen_2, LIN )
*SetSensorEvaluate( sen_2, EXPR, \"")
*Set( sen_2.do_evaluate, false )
*SetEntityNumber( sen_0, DEFAULT )
*SetEntityNumber( sen_1, DEFAULT )
*SetSensor( sen_3, USER, `USER()`, 0.0, EQ, 0.0, DEFAULT )
*SetEntityNumber( sen_3, DEFAULT )
*SetSensor( sen_3, LIN, 0.0, 0.0, EQ, 0.0, DEFAULT )
*SetSensor( sen_3, CRV, , , 0.0, EQ, 0.0, DEFAULT )
*SetEntityNumber( sen_3, DEFAULT )
*SetBodyICFlag( b_1, true, false, true )
*SetEntityNumber( m_0, DEFAULT )
*SetEntityNumber( m_1, DEFAULT )
*SetEntityNumber( m_3, DEFAULT )

// MotionSolve Simulation Options

MODEL.DS_MotionSolve_Simopts

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP

NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP
*SetBoolean( use_init_pos_mrf, false )

/******************************************************************************/
*SetSystem( MODEL ) //The Model

*SetReal( DS_MotionSolve_Transient_Simopts.h_max, 0.001 )

/******************************************************************************/
*SetSystem( MODEL.DS_MotionSolve_Transient_Simopts ) //MotionSolve Transient Options

*SetBoolean( dae_vel_ctrl, true )

/******************************************************************************/
*SetSystem( MODEL ) //The Model

*SetOption( DS_MotionSolve_Simopts.harwell_lib, "MA48" )
*SetReal( DS_MotionSolve_Transient_Simopts.integr_tol, 0.001 )
*SetOption( DS_MotionSolve_Transient_Simopts.integrator_type, "MSTIFF" )
*SetSensor( sen_3, EXPR, `VZ({the_model.b_2.cm.idstring},{the_model.B_Ground.cm.idstring})`, 0.0, LE, 0.0, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP )
*SetEntityNumber( m_2, 24 )
*SetSensor( sen_1, EXPR, `DZ({b_1.cm.idstring})`, 0.01, LE, 0, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP )
*SetContact( con_1, 01e8, 0.01, , 0.3, 0.25, 0.001, .01 )
*SetSensor( sen_0, EXPR, `DZ({b_0.cm.idstring})`, 0.01, LE, 0.0, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP )
*SetSensor( sen_4, EXPR, `{the_model.j_3.FZ}`, 0.0, LE, 0.0, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP )
*Set( b_3.useim, false )
*SetBodyIC( b_0, 0.1*cos(0.08) + (3/13.5)*cos(0.22), 0.1*sin(0.08) - (3/13.5 - 0.1) )
*SetBodyICFlag( b_2, false, false, false, false )
*SetReal( DS_Gravity.kgrav, -1*cos(0.009) )
*SetEntityId( sen_3, DEFAULT )
*SetEntityNumber( sen_4, DEFAULT )
*SetEntityId( sen_4, DEFAULT )
*SetSensor( sen_2, EXPR, `DX({the_model.b_0.cm.idstring},{the_model.b_1.cm.idstring})`, 0.25, GE, 0.0, NO_CODGEN, OFF, NO_HALT, PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP )
*SetContact( con_0, 1e8, 0.01, , 0.3, 0.25, 0.001, .01 )
*SetBoolean( DS_MotionSolve_Simopts.use_run_panel_values, true )

*EndMDL()
WARNING: For Contact/301001 normal_trans_vel cannot be zero. It has been reset to 1.

WARNING: For Contact/301002 normal_trans_vel cannot be zero. It has been reset to 1.

54 model elements processed.
Deactivate SENSOR/301001
Deactivate SENSOR/301002
Deactivate SENSOR/301003
Deactivate SENSOR/301005
Deactivate CONTACT/301001
Deactivate CONTACT/301002
Deactivate JOINT/301005
Deactivate JOINT/301006

Checking out license ...
License OK.
Time spent in checking out license: 0.203 sec.

WARNING: Inertia of Part/30102 [mass=1.] is auto-corrected.
The corrected values are:
Ixx = 0.000394766
Iyy = 0.000394766
Izz = 0.000394766

WARNING: Inertia of Part/30103 [mass=1.] is auto-corrected.
The corrected values are:
Ixx = 0.000394766
Iyy = 0.000394766
Izz = 0.000394766

WARNING: Inertia of Part/30104 [mass=1000.] is auto-corrected.
The corrected values are:
Ixx = 39.476663
Iyy = 39.476663
Izz = 39.476663

WARNING: Part/30105 is given a nonzero dummy mass/inertia.
The values are:
mass = 0.005
Ixx = 1.1543E-06
Iyy = 1.1543E-06
Izz = 1.1543E-06

The model was found to have non-physically low inertia. They were corrected
and assigned the inertia of a solid sphere made of steel with density=7700 kg/m^3.
To disable inertia correction, set Model attribute inertia_correction to FALSE.

Set Model attribute zero_mass to control its magnitude.
Note the zero-mass must be specified in KILOGRAM.

Model unit: length - METER
time   - SECOND
force  - NEWTON
mass   - KILOGRAM
Sending off 27 markers ...
Sending off 5 rigid bodies ...
Sending off 2 spherical joints ...
Sending off 1 fixed joints ...
Sending off 3 revolute joints ...
Sending off gravity vector ...
Sending off 5 event sensors ...
Sending off 1 user-expressions requests ...
Sending off 3 graphics ...
Sending off 2 contact force elements ...

< Kinematic Connectivity >

Ground -- Part/30105 DOF= 0 [Fixed Joint]
Part/30102 -- Part/30104 DOF= 1 [Revolute Joint]
Part/30103 -- Part/30104 DOF= 1 [Revolute Joint]
Part/30103 -- Part/30105 DOF= 1 [Revolute Joint]
Number of Edge(s): 4

< Directional Connectivity (Parent -> Child) >

Spanning Tree 1 of 1:
---------------------------------------------
Ground  -> Part/30105 [Fixed Joint]
Part/30103 -> Part/30104 [Revolute Joint]
Part/30104  -> Part/30102 [Revolute Joint]
Part/30105  -> Part/30103 [Revolute Joint]
Number of Cut Joint(s): 0

< Model Summary >

Total Number of Generalized Coordinates = 30
  Number of Body Coordinates = 30
    (including ground body)
    Number of Control/Diff States = 0

Total Number of Kinematic Constraints = 27
  Number of Joint/Ground Constraints = 27
  Number of Motion Constraints = 0

Net Degrees of Freedom of the Mechanism = 3
Number of Velocity Initial Conditions = 18

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 3
Solving Initial Velocities ...

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time : 0.000E+00
End Time   : 1.500E+01
Print Interval : 1.000E-02
Integrator : DSTIFF
Error Tolerance : 1.000E-04
Maximum Step Size : 1.000E-02
Minimum Step Size : 1.000E-06
DAE Index : 3
DAE Constraint Tolerance : 1.000E-03

WARNING: MAX_ORDER for DSTIFF is reduced to 5!
Time=2.406E-06; Order=1; H=2.406E-06 [Max Phi=5.811E-16]
Invoking action [RETURN] triggered by sensor [id=301004] ...

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------------
Number of solution steps = 113
Number of residue evaluations = 154
Number of jacobian computations = 14
Number of delta calculations = 154
Number of error test failures = 0
Number of nonlinear convergence failures = 0
Number of nonlinear iterations = 154
-----------------------------------------------------

Analysis return activated by sensor. [time=1.019E+00]

CUMULATIVE COMPUTE TIME INFORMATION
-----------------------------------------------------
Preprocessing Model : 1.500E-02 sec
Core Analysis : 6.300E-02 sec
Postprocessing/Messaging : 0.000E+00 sec
Total Elapsed Time : 7.800E-02 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.xml]

Results written to animation/plotting file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.mrf]

Compute info/messages written to log file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.log]

ANALYSIS COMPLETED

Deactivate SENSOR/301004
Activate SENSOR/301003

Checking out license ...
License OK.
Time spent in checking out license: 0.281 sec.
< Model Summary >

Total Number of Generalized Coordinates  = 30
    Number of Body Coordinates       = 30
        (including ground body)
    Number of Control/Diff States    = 0

Total Number of Kinematic Constraints = 27
    Number of Joint/Ground Constraints = 27
    Number of Motion Constraints      = 0

Net Degrees of Freedom of the Mechanism  = 3
Number of Velocity Initial Conditions   = 18

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 3

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time                   : 1.019E+00
End   Time                   : 1.500E+01
Print Interval               : 1.000E-02

Integrator                   : DSTIFF
Error Tolerance              : 1.000E-04
Maximum Step Size            : 1.000E-02
Minimum Step Size            : 1.000E-06
DAE Index                    : 3
DAE Constraint Tolerance     : 1.000E-03
-----------------------------------------------

WARNING: MAX_ORDER for DSTIFF is reduced to 5!
Invoking action [PRINT] triggered by sensor [id=301003] ...
Invoking action [RETURN] triggered by sensor [id=301003] ...

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------
Number of solution steps       = 58
Number of residue evaluations  = 95
Number of jacobian computations = 13
Number of delta calculations   = 95
Number of error test failures  = 0
Number of nonlinear convergence failures = 0
Number of nonlinear iterations = 95
-----------------------------------------------

Analysis return activated by sensor. [time=1.448E+00]
CUMULATIVE COMPUTE TIME INFORMATION
-----------------------------------------------------
Preprocessing Model : 1.500E-02 sec
Core Analysis : 1.260E-01 sec
Postprocessing/Messaging : 0.000E+00 sec
Total Elapsed Time : 1.410E-01 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.xml]

Results written to animation/plotting file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.mrf]

Compute info/messages written to log file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.log]

ANALYSIS COMPLETED

Deactivate SENSOR/301003
Activate SENSOR/301001

Checking out license ...
License OK.
Time spent in checking out license: 0.188 sec.

< Model Summary >

Total Number of Generalized Coordinates = 30
   Number of Body Coordinates = 30
      (including ground body)
   Number of Control/Diff States = 0

Total Number of Kinematic Constraints = 27
   Number of Joint/Ground Constraints = 27
   Number of Motion Constraints = 0

Net Degrees of Freedom of the Mechanism = 3
Number of Velocity Initial Conditions = 18

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 3
Starting dynamic analysis ...
DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time                   : 1.448E+00
End   Time                   : 1.500E+01
Print Interval               : 1.000E-02
Integrator                   : DSTIFF
Error Tolerance              : 1.000E-04
Maximum Step Size            : 1.000E-02
Minimum Step Size            : 1.000E-06
DAE Index                    : 3
DAE Constraint Tolerance     : 1.000E-03
-----------------------------------------------
WARNING: MAX_ORDER for DSTIFF is reduced to 5!
Time=2.823E+00; Order=3; H=1.000E-02 [Max Phi=2.881E-09]
Invoking action [RETURN] triggered by sensor [id=301001] ...

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------------
Number of solution steps                 = 158
Number of residue evaluations            = 244
Number of jacobian computations          = 14
Number of delta calculations             = 244
Number of error test failures            = 1
Number of nonlinear convergence failures = 0
Number of nonlinear iterations           = 244
-----------------------------------------------------

Analysis return activated by sensor. [time=2.863E+00]

CUMULATIVE COMPUTE TIME INFORMATION
-----------------------------------------------------
Preprocessing Model      : 3.100E-02 sec
Core Analysis            : 1.730E-01 sec
Postprocessing/Messaging : 4.700E-02 sec
Total Elapsed Time       : 2.510E-01 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and
Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.xml]

Results written to animation/plotting file:
[C:/Documents and
Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.mrf]

Compute info/messages written to log file:
[C:/Documents and
Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.log]

ANALYSIS COMPLETED
Deactivate SENSOR/301001
Activate JOINT/301005
Deactivate JOINT/301003

Checking out license ...
License OK.
Time spent in checking out license: 0.281 sec.

< Model Summary >

Total Number of Generalized Coordinates = 30  
  Number of Body Coordinates = 30  
  (including ground body)  
  Number of Control/Diff States = 0

Total Number of Kinematic Constraints = 25  
  Number of Joint/Ground Constraints = 25  
  Number of Motion Constraints = 0

Net Degrees of Freedom of the Mechanism = 5
Number of Velocity Initial Conditions = 18

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 5

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time                     : 2.863E+00
End Time                       : 1.500E+01
Print Interval                 : 1.000E-02
Integrator                     : DSTIFF
Error Tolerance                : 1.000E-04
Maximum Step Size              : 1.000E-02
Minimum Step Size              : 1.000E-06
DAE Index                      : 3
DAE Constraint Tolerance       : 1.000E-03
-----------------------------------------------

Maximum initial residual=7.612E-01, idx=132, Phi 0

WARNING: MAX_ORDER for DSTIFF is reduced to 5!
ERROR: [DASPK] The nonlinear system solver in the time integration could not converge
.....
ERROR: [DASPK] The nonlinear system solver in the time integration could not converge
.....
**DAE SOLVER STATISTICS (DASPK-Index3)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of solution steps</td>
<td>0</td>
</tr>
<tr>
<td>Number of residue evaluations</td>
<td>20</td>
</tr>
<tr>
<td>Number of jacobian computations</td>
<td>10</td>
</tr>
<tr>
<td>Number of delta calculations</td>
<td>20</td>
</tr>
<tr>
<td>Number of error test failures</td>
<td>0</td>
</tr>
<tr>
<td>Number of nonlinear convergence failures</td>
<td>10</td>
</tr>
<tr>
<td>Number of nonlinear iterations</td>
<td>20</td>
</tr>
</tbody>
</table>

At time=2.863E+00 the integrator failed to proceed.

------- Possible Causes -------------------------------------------

(1) The integration has become unstable. Tighten (decrease) integr_tol, h_max, or both in Param_Transient can help stabilize the integration. If the simulation contains distinctive phases, use multiple Simulate, each with its own proper integrator parameter setting, to selectively tighten the tolerance during the period where instability is encountered. If the simulation was terminated because stepsize has diminished consistently below h_min, reduce h_min in Param_Transient to force integration to continue.

(2) Numerical singularity in constraint Jacobian matrix. This may indicate a mechanism design problem such as a lock up, or a bifurcation situation. Try options in linsolver (MA28/MA48). This can sometimes get around singularity.

(3) Non-physical inertia properties, such as mass=100 Kg and Ixx=Iyy=Izz=1 Kg*mm^2, or extremely small inertia on a part with an unconstrained degree of freedom. Make sure the modeling data, in particular the part inertia and the gravity, are specified in proper units consistent with the units given in Param_Unit element.

(4) Beam, flexible body goes out of linear range, bushing has large rotation along more than one axis, curve goes out of its interpolation range, higher-pair joint goes out of the range of U or V, etc. Make sure fundamental modeling assumptions, such as rigid contact assumption used in Force_Contact, are not violated.

(5) Motion displacement defined using LINSPL, AKISPL in dynamic analysis, or as a function of model states (DX, VX etc), as well as forces defined as a function of other forces, can cause hard convergence and integrator failure. Avoid these modeling practices wherever possible.
CUMULATIVE COMPUTE TIME INFORMATION

Preprocessing Model : 4.600E-02 sec
Core Analysis : 2.200E-01 sec
Postprocessing/Messaging : 4.700E-02 sec
Total Elapsed Time : 3.130E-01 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.xml]

Results written to animation/plotting file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.mrf]

Compute info/messages written to log file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/walker_simult.log]

Error encountered in analysis!

Forced termination from API_SendOffCommandSimulate!
--- solver log closed on 23-JUN-2008 18:49:31 ---

3) simplest_walker.mdl

Altair HyperWorks


Model : The Model

Customer ID :

Date : 06/24/08 19:07:48

*BeginMDL(the_model, "The Model", "9.0b105")

*SetCurrentSolverMode(MotionSolve)
*Point( p_0, "Point 0" )
*Point( p_1, "Point 1" )
*Point( p_2, "Point 2" )
*Body( b_0, "Body 0", p_0 )
*Body( b_1, "Body 1", p_1 )
*Body( b_2, "Body 2", p_2 )
*Body( b_3, "Body 3", P_Global_Origin )
*Graphic( gra_0, "Graphic 0", CYLINDER, b_0, p_0, MODEL.p_2, 0.005, gra_0.r1, , 0.0, CAPBOTH )
*Graphic( gra_2, "Graphic 3", BOX, b_3, CENTER, P_Global_Origin, ZX, MODEL.V_Global_Z, MODEL.V_Global_X, 2.8, 1.0, 0.02 )
*Graphic( gra_1, "Graphic 1", CYLINDER, b_1, p_1, MODEL.p_2, 0.005, gra_1.r1, , 0.0, CAPBOTH )
*FixedJoint( j_0, "Joint 3G", MODEL.b_3, MODEL.B_Ground, MODEL.P_Global_Origin )
*RevJoint( j_1, "Joint 02", b_0, b_2, p_2, MODEL.V_Global_Y )
*RevJoint( j_2, "Joint 12", b_1, b_2, p_2, MODEL.V_Global_Y )
*Sensor( sen_0, "b0_z" )
*Sensor( sen_1, "b1_z" )
*Template( tmplt_0, "commandset", SOLVER_COMMAND, def_tmplt_0 )
*RevJoint( j_3, "Joint 13", MODEL.b_1, MODEL.b_3, MODEL.p_1, MODEL.V_Global_Y )
*Contact( con_0, "Contact 0", POISSON, ON, 1, gra_0, false, 1, gra_2, false )
*Contact( con_1, "Contact 1", POISSON, ON, 1, gra_1, false, 1, gra_2, false )
*Sensor( sen_2, "dx_b0_b1" )
*Sensor( sen_3, "b2_vz" )
*Sensor( sen_4, "b1_b3_fz" )
*Template( model_statement, "model_statement", SOLVER_INPUT, def_model_statement )
*Marker( m_0, "Marker 0", b_0, p_0, FLOATING )
*Marker( m_1, "Marker 1", b_1, p_1, FLOATING )
*Marker( m_2, "Marker 2", b_3, p_0, FLOATING )
*Marker( m_3, "Marker 3", b_3, p_1, FLOATING )
*Sensor( sen_5, "b0_vz" )

*DefineTemplate( def_tmplt_0 )

<H3DOutput
  switch_on           = "TRUE"
  increment           = "1"
  start_time          = "0."
  end_time            = "9999999."
  format_option       = "AUTO"
  stress_option       = "TENSOR"
  strain_option       = "TENSOR"
 />

<Param_Simulation
  constr_tol          = "1.0000E-10"
  implicit_diff_tol   = "1.0000E-06"
 />

<Param_Transient
  integr_tol          = "0.0001"
  integrator_type     = "DSTIFF"
  h_max               = "0.01"
  h0_max              = "0.001"
/>
<Deactivate
    element_type = "SENSOR"
    element_id    = "301001"
/>

<Deactivate
    element_type = "SENSOR"
    element_id    = "301002"
/>

<Deactivate
    element_type = "SENSOR"
    element_id    = "301003"
/>

<Deactivate
    element_type = "SENSOR"
    element_id    = "301005"
/>

<Deactivate
    element_type = "SENSOR"
    element_id    = "301006"
/>

<Deactivate
    element_type = "CONTACT"
    element_id    = "301001"
/>

<Deactivate
    element_type = "CONTACT"
    element_id    = "301002"
/>

<Deactivate
    element_type = "JOINT"
    element_id    = "301005"
/>

<Deactivate
    element_type = "JOINT"
    element_id    = "301006"
/>

<Simulate
    analysis_type       = "Transient"
    end_time            = "15."
    print_interval      = "0.01"
/>
{if (the_model.b_1.vx == 0)}

<Activate
    element_type = "SENSOR"
    element_id = "301003"
/>

<Simulate
    analysis_type = "Transient"
    end_time = "15."
    print_interval = "0.01"
/>

<Deactivate
    element_type = "SENSOR"
    element_id = "301003"
/>

<Activate
    element_type = "SENSOR"
    element_id = "301006"
/>

<Simulate
    analysis_type = "Transient"
    end_time = "15."
    print_interval = "0.01"
/>

<Deactivate
    element_type = "SENSOR"
    element_id = "301006"
/>

<Activate
    element_type = "JOINT"
    element_id = "301005"
/>

<Deactivate
    element_type = "JOINT"
    element_id = "301003"
/>

<Simulate
    analysis_type = "Transient"
    end_time = "15."
    print_interval = "0.01"
/>
*EndDefine()

*DefineTemplate( def_model_statement )

<Constraint_Joint
  id              = "301005"
  type            = "SPHERICAL"
  i_marker_id     = "30102021"
  j_marker_id     = "30105020"
/>

<Constraint_Joint
  id              = "301006"
  type            = "SPHERICAL"
  i_marker_id     = "30103032"
  j_marker_id     = "30105031"
/>  *EndDefine()

/////////////////////////////////////////////////////////////////

*SetSystem( MODEL )  //The Model

*SetOption( DS_Units.op_length,         "METER" )
*SetBodyInertia( b_0,                        1.0 )
*SetBodyICFlag( b_0,                        false )
*Set( b_1.usecm, true )
*SetBodyInertia( b_2,                        1000.0 )
*Set( b_2.usecm, true )
*Set( b_3.usecm, true )
*SetBodyInertia( b_1,                        1 )
*Set( gra_2.is_material_inside, true )
*SetSensor( sen_0,                      USER, `USER()`, 0.0, EQ, 0.0, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP )
*SetSensor( sen_0,                      LIN, , 0.0, EQ, 0.0, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, NO_RETURN, OFF, NO_YYDUMP )
*SetNote( sen_0,                     )
*SetSensor( sen_1,                      LIN, , 0.02, LE, -1e-8, NO_CODGEN, OFF, NO_HALT, NO_PRINT, NO_RESTART, RETURN, OFF, NO_YYDUMP )
*SetEntityId( sen_0,                      301001 )
*SetEntityNumber( sen_1,                      1 )
*SetEntityId( sen_1,                      301002 )
*SetBodyIC( b_3,                        , , , , 0.0 )
*SetReal( DS_MotionSolve_Simopts.end_time,       15 )
*SetPoint( p_1,                        -1.1, , 0.01 )
*SetPoint( p_0,  -1.1 - sin(0.08) - sin(0.22),
  , 0.01 + cos(0.08) - cos(0.22) )
*SetPoint( p_2,  -1.1 - sin(0.08), 0, 0.01 +
  cos(0.08) )
*SetBodyIC( b_1,                        , , , , 0.1 )
*SetBodyICFlag( b_2,                        , false, , false, , false )
*SetBodyIC( b_2,                        1*0.1*cos(0.08), 0.0,
  1*0.1*sin(0.08), , 0.0 )
*SetReal( DS_Gravity.kgrav,           -1*cos(0.009) )
*SetReal( DS_Gravity.igrav,           1*sin(0.009) )
*SetSensor( sen_4,                      LIN, 0.0, 0.0, EQ, 0.0,
**EndMDL()**
WARNING: For Contact/301001 normal_trans_vel cannot be zero. It has been reset to 1.

WARNING: For Contact/301002 normal_trans_vel cannot be zero. It has been reset to 1.

52 model elements processed.
Deactivate SENSOR/301001
Deactivate SENSOR/301002
Deactivate SENSOR/301003
Deactivate SENSOR/301005
Deactivate SENSOR/301006
Deactivate CONTACT/301001
Deactivate CONTACT/301002
Deactivate JOINT/301005
Deactivate JOINT/301006

Checking out license ...
License OK.
Time spent in checking out license: 0.234 sec.

WARNING: Inertia of Part/30102 [mass=1.] is auto-corrected.
The corrected values are:
Ixx = 0.000394766
Iyy = 0.000394766
Izz = 0.000394766

WARNING: Inertia of Part/30103 [mass=1.] is auto-corrected.
The corrected values are:
Ixx = 0.000394766
Iyy = 0.000394766
Izz = 0.000394766

WARNING: Inertia of Part/30104 [mass=1000.] is auto-corrected.
The corrected values are:
Ixx = 39.476663
Iyy = 39.476663
Izz = 39.476663

WARNING: Part/30105 is given a nonzero dummy mass/inertia.
The values are:
mass = 0.005
Ixx = 1.1543E-06
Iyy = 1.1543E-06
Izz = 1.1543E-06

The model was found to have non-physically low inertia. They were corrected
and assigned the inertia of a solid sphere made of steel with density=7700 kg/m^3.
To disable inertia correction, set Model attribute inertia_correction to FALSE.

Set Model attribute zero_mass to control its magnitude.
Note the zero-mass must be specified in KILOGRAM.

Model unit: length - METER
time   - SECOND
force  - NEWTON
mass   - KILOGRAM
Sending off 25 markers ...
Sending off 5 rigid bodies ...
Sending off  2 spherical joints ...
Sending off  1 fixed joints ...
Sending off  3 revolute joints ...
Sending off gravity vector ...
Sending off  6 event sensors ...
Sending off  3 graphics ...
Sending off  2 contact force elements ...

< Kinematic Connectivity >

Ground     -- Part/30105 DOF=  0 [Fixed Joint]
Part/30102 -- Part/30104 DOF=  1 [Revolute Joint]
Part/30103 -- Part/30104 DOF=  1 [Revolute Joint]
Part/30103 -- Part/30105 DOF=  1 [Revolute Joint]
Number of Edge(s):  4

< Directional Connectivity (Parent -> Child) >

Spanning Tree 1 of 1:
-----------------------------------------------
Ground     -> Part/30105 [Fixed Joint]
Part/30103 -> Part/30104 [Revolute Joint]
Part/30104 -> Part/30102 [Revolute Joint]
Part/30105 -> Part/30103 [Revolute Joint]
Number of Cut Joint(s):  0

< Model Summary >

Total Number of Generalized Coordinates  = 30
Number of Body Coordinates         = 30
   (including ground body)
Number of Control/Diff States      = 0

Total Number of Kinematic Constraints    = 27
Number of Joint/Ground Constraints = 27
Number of Motion Constraints       = 0

Net Degrees of Freedom of the Mechanism = 3
Number of Velocity Initial Conditions    = 17

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates  = 3
Solving Initial Velocities ...

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time                   : 0.000E+00
End   Time                   : 1.500E+01
Print Interval              : 1.000E-02
Integrator                   : DSTIFF
Error Tolerance              : 1.000E-04
Maximum Step Size            : 1.000E-02
Minimum Step Size            : 1.000E-06
DAE Index                    : 3
DAE Constraint Tolerance     : 1.000E-03

-----------------------------------------------

Time=2.406E-06; Order=1; H=2.406E-06 [Max Phi=5.811E-16]
Invoking action [RETURN] triggered by sensor [id=301004] ...

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------------
Number of solution steps                 = 113
Number of residue evaluations            = 154
Number of jacobian computations          = 14
Number of delta calculations             = 154
Number of error test failures            = 0
Number of nonlinear convergence failures = 0
Number of nonlinear iterations           = 154
-----------------------------------------------------

Analysis return activated by sensor. [time=1.019E+00]

CUMULATIVE COMPUTE TIME INFORMATION
-----------------------------------------------------
Preprocessing Model      : 1.600E-02 sec
Core Analysis            : 4.700E-02 sec
Postprocessing/Messaging : 3.100E-02 sec
Total Elapsed Time       : 9.400E-02 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and
Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker
.xml]

Results written to animation/plotting file:
[C:/Documents and
Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker
.mrf]

Compute info/messages written to log file:
[C:/Documents and
Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker
.log]

ANALYSIS COMPLETED

Deactivate SENSOR/301004
Activate SENSOR/301003

Checking out license ...
License OK.
Time spent in checking out license: 0.312 sec.
Total Number of Generalized Coordinates = 30
   Number of Body Coordinates = 30
      (including ground body)
   Number of Control/Diff States = 0

Total Number of Kinematic Constraints = 27
   Number of Joint/Ground Constraints = 27
   Number of Motion Constraints = 0

Net Degrees of Freedom of the Mechanism = 3
Number of Velocity Initial Conditions = 17

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 3

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time : 1.019E+00
End Time : 1.500E+01
Print Interval : 1.000E-02

Integrator : DSTIFF
Error Tolerance : 1.000E-04
Maximum Step Size : 1.000E-02
Minimum Step Size : 1.000E-06
DAE Index : 3
DAE Constraint Tolerance : 1.000E-03
-----------------------------------------------

Invoking action [RETURN] triggered by sensor [id=301003] ...

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------
Number of solution steps = 151
Number of residue evaluations = 322
Number of jacobian computations = 13
Number of delta calculations = 322
Number of error test failures = 0
Number of nonlinear convergence failures = 0
Number of nonlinear iterations = 322
-----------------------------------------------

Analysis return activated by sensor. [time=2.378E+00]

CUMULATIVE COMPUTE TIME INFORMATION
-----------------------------------------------
Preprocessing Model : 3.200E-02 sec
Core Analysis : 1.250E-01 sec
Postprocessing/Messaging : 3.100E-02 sec
Total Elapsed Time : 1.880E-01 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.xml]

Results written to animation/plotting file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.mrf]

Compute info/messages written to log file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.log]

ANALYSIS COMPLETED

Deactivate SENSOR/301003
Activate SENSOR/301006

Checking out license ...
License OK.
Time spent in checking out license: 0.328 sec.

< Model Summary >

Total Number of Generalized Coordinates = 30
Number of Body Coordinates = 30
(including ground body)
Number of Control/Diff States = 0

Total Number of Kinematic Constraints = 27
Number of Joint/Ground Constraints = 27
Number of Motion Constraints = 0

Net Degrees of Freedom of the Mechanism = 3
Number of Velocity Initial Conditions = 17

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 3

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS

-----------------------------------------------
Start Time                   : 2.378E+00
End   Time                   : 1.500E+01
Print Interval               : 1.000E-02

Integrator                   : DSTIFF
Error Tolerance              : 1.000E-04
Maximum Step Size            : 1.000E-02
Minimum Step Size            : 1.000E-06
DAE Index                    : 3
DAE Constraint Tolerance     : 1.000E-03

-----------------------------------------------------------------------------------------

Invoking action [RETURN] triggered by sensor [id=301006] ...

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------------------------------------------------
| Number of solution steps | 1 |
| Number of residue evaluations | 2 |
| Number of jacobian computations | 1 |
| Number of delta calculations | 2 |
| Number of error test failures | 0 |
| Number of nonlinear convergence failures | 0 |
| Number of nonlinear iterations | 2 |
-----------------------------------------------------------------------------------------

Analysis return activated by sensor. [time=2.378E+00]

CUMULATIVE COMPUTE TIME INFORMATION
-----------------------------------------------------------------------------------------
| Preprocessing Model | 4.800E-02 sec |
| Core Analysis       | 1.720E-01 sec |
| Postprocessing/Messaging | 3.100E-02 sec |
| Total Elapsed Time  | 2.510E-01 sec |

Parallel processing was disabled.

Solver input file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.xml]

Results written to animation/plotting file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.mrf]

Compute info/messages written to log file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.log]

ANALYSIS COMPLETED

Deactivate SENSOR/301006
Activate JOINT/301005
Deactivate JOINT/301003
Checking out license ...
License OK.
Time spent in checking out license: 0.312 sec.

< Model Summary >

Total Number of Generalized Coordinates = 30
   Number of Body Coordinates = 30
      (including ground body)
   Number of Control/Diff States = 0

Total Number of Kinematic Constraints = 25
   Number of Joint/Ground Constraints = 25
   Number of Motion Constraints = 0

Net Degrees of Freedom of the Mechanism = 5
Number of Velocity Initial Conditions = 17

Initializing model ...
Analysis model processed
Partitioning generalized coordinates ...

Total Number of Independent Coordinates = 5

Starting dynamic analysis ...

DYNAMIC SIMULATION PARAMETERS
-----------------------------------------------
Start Time : 2.378E+00
End   Time : 1.500E+01
Print Interval : 1.000E-02

Integrator : DSTIFF
Error Tolerance : 1.000E-04
Maximum Step Size : 1.000E-02
Minimum Step Size : 1.000E-06
DAE Index : 3
DAE Constraint Tolerance : 1.000E-03
-----------------------------------------------

Maximum initial residual=7.476E-01, idx=132, Phi 0

ERROR: [DASPK] The nonlinear system solver in the time integration could not converge
......
ERROR: [DASPK] The nonlinear system solver in the time integration could not converge
......

DAE SOLVER STATISTICS (DASPK-Index3)
-----------------------------------------------
Number of solution steps = 0
Number of residue evaluations = 20
Number of jacobian computations = 10
Number of delta calculations = 20
Number of error test failures = 0
Number of nonlinear convergence failures = 10
Number of nonlinear iterations = 20

At time=2.378E+00 the integrator failed to proceed.

---------- Possible Causes ---------------------------------------------
(1) The integration has become unstable. Tighten (decrease) integr_tol, h_max, or both in Param_Transient can help stabilize the integration. If the simulation contains distinctive phases, use multiple Simulate, each with its own proper integrator parameter setting, to selectively tighten the tolerance during the period where instability is encountered. If the simulation was terminated because stepsize has diminished consistently below h_min, reduce h_min in Param_Transient to force integration to continue.
(2) Numerical singularity in constraint Jacobian matrix. This may indicate a mechanism design problem such as a lock up, or a bifurcation situation. Try options in linsolver (MA28/MA48). This can sometimes get around singularity.
(3) Non-physical inertia properties, such as mass=100 Kg and Ixx=Iyy=Izz=1 Kg*mm^2, or extremely small inertia on a part with an unconstrained degree of freedom. Make sure the modeling data, in particular the part inertia and the gravity, are specified in proper units consistent with the units given in Param_Unit element.
(4) Beam, flexible body goes out of linear range, bushing has large rotation along more than one axis, curve goes out of its interpolation range, higher-pair joint goes out of the range of U or V, etc. Make sure fundamental modeling assumptions, such as rigid contact assumption used in Force_Contact, are not violated.
(5) Motion displacement defined using LINSPL, AKISPL in dynamic analysis, or as a function of model states (DX, VX etc), as well as forces defined as a function of other forces, can cause hard convergence and integrator failure. Avoid these modeling practices wherever possible.

----------------------------------------------
CUMULATIVE COMPUTE TIME INFORMATION
Preprocessing Model : 6.400E-02 sec
Core Analysis : 2.340E-01 sec
Postprocessing/Messaging : 3.100E-02 sec
Total Elapsed Time : 3.290E-01 sec

Parallel processing was disabled.

Solver input file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.xml]

Results written to animation/plotting file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.mrf]

Compute info/messages written to log file:
[C:/Documents and Settings/Robots/Desktop/rohit_hyperworks/MotionViewWork/simplest_walker.log]

Error encountered in analysis!

Forced termination from API_SendOffCommandSimulate!
--- solver log closed on 24-JUN-2008 19:07:54 ---