MATLAB Assignment 3

Due Date: October 6, 2011

When working on this assignment you might want to take a look at MATLAB code that was put together by students who took ME451 last Fall. The students back then did not come up with identical solutions. Take a look at their solutions (look under Assignment 3), and develop your own.

`http://sbel.wisc.edu/Courses/ME451/2010/SimEngine2D/index.htm`

Turning in your homework: place all your files in a directory called "lastNameDate"; zip that directory and drop it in the mailbox at Learn@UW.

Problem 1. Implement MATLAB code that opens a file, called "model.adm" (adm comes for "analysis data for the model") and parses the text below in order to generate all the information required to fully characterize a revolute joint in the context of 2D Kinematics and Dynamics analysis when the joint is specified as shown. Note that a motion can be prescribed on this joint, something that we will discuss in class. Just like in the previous assignment, anything that follows a "%" on a line in the file must be considered a comment and as such ignored during parsing. In other words, the rest of a line following a "%" character is there only for the purpose of clarifying a construct and can be ignored when parsed.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
RevoluteJoint: 23              % id of this constraint
BodyI: 1                       % id of body I
BodyJ: 9                       % id of body J
xPprimeI: 1.4                  % x of point P on body I
yPprimeI: 11.1                 % y of point P on body I
xPprimeJ: -12                  % x of point P on body J
yPprimeJ: 12.3                 % y of point P on body J
CmotionFunction: sin(t + pi/3)  % provides expression for C(t)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Important Observation: Note that sometimes no motion is applied to a revolute joint. The keyword "NONE" should be used to indicate this. Otherwise, any other string is interpreted as a time-dependent function which prescribes a motion on that mechanism and handled as such. For the example above, this time function would be $\sin(t + \pi/3)$.

Problem 2. Implement a MATLAB routine to generate all the information required to fully characterize a absolute angle constraint in the context of 2D Kinematics and Dynamics analysis when the constraint is specified like below.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
AbsoluteAngle: 3               % id of this constraint
Body: 4                        % id of body the constraint refers to
CmotionFunction: 0.1*t+1/9     % provides expression for C(t)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Problem 3. Implement a MATLAB routine to generate all the information required to fully characterize a absolute distance constraint in the context of 2D Kinematics and Dynamics analysis when the constraint is specified in an adm file like below.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
AbsoluteDistance: 4            % id of this constraint
Body: 1                        % id of participating body
xPprime: 2.1                   % x of point P on moving body, expressed in LRF
yPprime: 1.3                   % y of point P on moving body, expressed in LRF
xPground: 0.65                 % x of point P on ground
yPground: -1.3                 % y of point P on ground
CmotionFunction: t^2+3*t+1     % provides expression for C(t)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Problem 4. Implement a MATLAB routine to generate all the information required to fully characterize a relative distance constraint in the context of 2D Kinematics and Dynamics analysis when the constraint is specified in an adm file like below.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
RelativeDistance: 1             % id of this constraint
BodyI: 1                        % id of body I
BodyJ: 4                        % id of body J
xPprimeI: 1.2                   % x of point P on body I
yPprimeI: -1.3                  % y of point P on body I
xPprimeJ: 4.1                   % x of point P on body J
yPprimeJ: 10.2                  % y of point P on body J
CmotionFunction: 2.3            % provides expression for C(t)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```