gtm_design: Mfile Documentation

Contents

function appendmws(MWS,model)

```
Appends model workspace with variables
given by the fields of the structure MWS.

! Warning !  Will overwrite indentically named variables without warning!

Inputs:
 MWS   - Model Workspace Structure, contains simulation parameters
 model - Name of model to load into, default is 'gtm_design'
```

function clearmws(model);

```
Clears the current model workspace.

Inputs:
   model   - name of model, defaults to 'gtm_design'
```

function DCM = euler321(p);

```
Creates directional cosine matrix for euler 321 rotation
sequence.

Inputs:
  p    - phi/theta/psi vector, in radians

Outputs:
  DCM  - Directional cosine matrix
```

function expand(structure);

```
Given a data structure this expands each field into
a separate named variable in the callers workspace
```

function MWS = grabmws(model);

```
Grabs current model workspace and returns as
fields in a strucure

Inputs:
   model  - name of model, defaults to 'gtm_design'

Outputs:
   MWS    - simlation parameters from the model workspace
```

function MWS = init_design(vehicle);

```
Creates Model Workspace Structure for gtm_design simulation.

Inputs:
  vehicle     - type of vehicle, either 'GTM' or 'S2' (default = 'GTM')
  sensors_on  - flag for turning sensor models on  (default = 0)
  noise_on    - flag for turning sensor noise models on  (default = 0)
  fuelburn_on - flag for turning fuel burn model on  (default = 0)

Outputs:
  MWS     - Simulation parameters, to be loaded into Model Workspace
            with loadmws(MWS) or appendmws(MWS).
```

function [sys,londyn,latdyn] = linmodel(MWS,vabflag,SplitSurf,Ts)

```
Linearize gtm_design simulation at current trim point

Inputs:
 MWS     -  simulation parameters, defaults to pre-loaded model workspace
 vabflag  - flag to get linear models in terms of V, alpha, beta (0 default)
 SplitSurf- flag for returning independent control surface inputs rather
            than grouped surfaces (0 default)
 Ts       - Sample time, zero for continuous model (0 default)

Outputs:
  sys    - 6dof system with control surface inputs/state outputs
  londyn - Approximate (4th order) longitudinal dynamics
  latdyn - Approximate (4th order) lateral dynamics
```

function loadmws(MWS,model);

```
Clears model workspace and replaces with variables
given by the fields of the structure MWS

Inputs:
 MWS   - Model Workspace Structure, contains simulation parameters
 model - Name of model to load into, default is 'gtm_design'
```

function MWS_out = seteomic(MWS,statename,value,...)

```
This function allows the initial condtions of the gtm_design simulation's
equation of motion (MWS.StatesInp) to be specified by named values.

Specifically statename is one of:
    tas   - total airspeed (knots)
    alpha - angle of attack (deg)
    beta  - sideslip (deg)
    p     - body rate (deg/sec)
    q     - body rate (deg/sec)
    r     - body rate (deg/sec)
    lat   - latitude (deg)
    lon   - longitude (deg)
    alt   - altitude (ft)
    phi   - Euler angle (deg)
    theta - Euler angle (deg)
    psi   - Euler angle (deg)

Values not explictly specified remain at the value they had in MWS

Examples:
    MWS=seteomic(init_design(),'alt',3000);
    MWS=seteomic(MWS,'tas',90,'beta',3,'p',15);
```

function [MWS,Xtrim,Trimcond,Err] = trimgtm(target,PitchSurf,verbose);

```
 Trims gtm_design simulation to target conditions.

 Inputs:
  Target is a structure which has some subset of the following fields:
     eas          - Equivalent air speed (knots)
     tas          - True airspeed (knots)
     alpha        - Angle of attack (deg)
     beta         - Sideslip (deg), defaults to zero
     gamma        - Flight path angle (deg)
     roll         - Roll angle (deg)
     pitch        - Pitch angle (deg)
     yaw          - Heading angle (0-360)
     rollrate     - d/dt(phi) (deg/sec), defaults to zero
     pitchrate    - d/dt(theta) (deg/sec), defaults to zero
     yawrate      - d/dt(psi) (deg/sec), defaults to zero
     pdeg         - Angular velocity (deg/sec)
     qdeg         - Angular velocity (deg/sec)
     rdeg         - Angular velocity (deg/sec)

   PitchSurf    - 'elev' for elevator (default) or 'stab' for stabalizer
   verbose      - 0(quiet), 1(soln disp), or 2(iterations), defaults to 2

Outputs:
   MWS    - simulation parameter set, updated to be at trim condition
   Xtrim    - simulation full-state, at trim
   Trimcond - values of state and control surfaces at trim.
   Err      - max error in trim condition

 Unspecified variables are free, or defaulted to the values shown above.
 To force a defaulted variable to be free define it with an empty matrix.
 For example, by default beta=0  but "target.beta=[];" will allow beta
 to be free in searching for a trim condition.

 Examples:
  MWS=trimAirSTAR(struct('eas',95,'gamma',0));
  [MWS,Xt,Tc,Er]=trimAirSTAR(struct('alpha',3,'gamma',0,'yaw',120),1);
  [MWS,Xt,Tc,Er]=trimAirSTAR(struct('tas',100,'gamma',3,'yawrate',10),0,0);
```