9.4   Mission Profile

9.4.1   MATLAB Code

```
function
[t1,drill,getCamera,stop,currentState,elevSetpoint,pitchSetpoint,travelSetpoint,flyMod
e,satur,timeSet,distIROut,distTopOut,boardTravelOut,initialAngleOut] =
fcn(t1i,t,timeSetIn,flyModeIn,elevIn,pitchIn,TravelIn,drillin,cam1,cam2,cam3,ELEV_SLF,
ELEV_MAX,state,decrease,encoder1,encoder2,encoder3,IR,distIRIn,distTopIn,boardTravelIn
,initialAngleIn,drillButt)
%initialize variables
    stop = 0;
    currentState = state;
    drill = drillin;
    getCamera = 0;
    elevSetpoint = elevIn;
    pitchSetpoint = pitchIn;
    travelSetpoint = TravelIn;
    flyMode = flyModeIn;
    timeSet = timeSetIn;
    distIROut = distIRIn;
    distTopOut=distTopIn;
    initialAngleOut = initialAngleIn;
    boardTravelOut = boardTravelIn;
    distanceToStart = 0.01;
    t1=t1i;
    satur = 2;
switch state
    case 0
        drill = 0;
        timeSet = 1;
    case 1  %State1: Record initial angles + zero
        initialAngleOut = encoder3;
        currentState = 2;
    case 2  %State 2: Takeoff, lift to SLF, stabilize.
        flyMode = 1; %mode 1 is pitch control
        elevSetpoint = ELEV_SLF;
        pitchSetpoint = 0;
        timeSet = 5; %setting timeset will automatically transition state to next
           t1 = t;
    case 3 %State 3: go to distIR
        satur = 3;
        flyMode = 0;
        elevSetpoint = ELEV_SLF;
        if(IR)
        %pitchSetpoint = 3; %degrees
        if (t-t1i >0.01)
            t1 = t;
            travelSetpoint = TravelIn - 0.03
        end

        distIROut = encoder3*180/pi;
```

```matlab
        else
        flyMode = 0; % travel mode

        currentState = 4;
        end
    case 4 %stabilize at distIR
        flyMode = 0;
        travelSetpoint = distIRIn
        timeSet = 4;
    case 5 %go closer to board
        travelSetpoint = distIRIn-(0.02/0.43)*180/pi; % change this to equivalent of 5
cm
        timeSet = 5;
    case 6 %stabilize at 5cm point
         elevSetpoint = ELEV_SLF;
        timeSet = 4;
    case 7 %find top of board

        if(~IR)
            elevSetpoint = elevIn-0.1;
            distTopOut = encoder1*180/pi
        else
            currentState = 8;
        end
    case 8 %stabilize at top of board
        elevSetpoint = distTopIn;
        timeSet = 5;
    case 9 % go down 2 cm
        % elevSetpoint = distTopIn + (0.02/0.43)*180/pi % change to 2 cm
        flyMode = 1;
      pitchSetpoint = 5;
      timeSet = 3;
        %currentState = 10;
        %timeSet = 1;
    case 10 % go and hit the wall
        % idk
        % logic should be if the encoder starts to decrease (bounce) or
        % doesnt change /// idk
        %%%%% how do we know that we crashed into the wall?

      %  if(decrease)
            boardTravelOut = encoder3;
            pitchSetpoint = -20;
            timeSet = 1;
        % else

        %end

    case 11 %
            satur = 15;
```

```matlab
            flyMode = 0;
            travelSetpoint = distIRIn+90;
            elevSetpoint = ELEV_SLF;
            timeSet = 5;
    case 12 % clear the way for the camera
        %travelSetpoint = distIRIn+90; %degrees
        travelSetpoint = distIRIn+90;
        drill = 1;
        timeSet = 16;
        t1 = t;
        %currentState = 13;
    case 13 % ask camera politely for data
        getCamera = 1;
        satur = 3;
        if (t-t1i >0.01)
            t1 = t;
            if(TravelIn < distIRIn)
                travelSetpoint = distIRIn
            else
            travelSetpoint = TravelIn - 0.03

            end
        end
        %travelSetpoint = distIRIn;
        timeSet = 60;
    case 14
        travelSetpoint = encoder3*180/pi
        currentState = 15;
        % this part goes and does the loops
        % loop 1
        % timeSet = 10;



    case 15 % go to elevation of 2nd dot
        elevSetpoint = distTopIn+cam2+2.5/2+0.03;
        timeSet = 5;
    case 16 % go into board
        flyMode = 1;
        pitchSetpoint = 2;
        % travelSetpoint = boardTravelIn;
        timeSet = 9;
        t1 = t;
    case 17 % set max pitch by ramping

        if (t-t1i >0.01)
            t1 = t;
            if(pitchSetpoint > 40)
                pitchSetpoint = 40;
            else
```

```
                pitchSetpoint = pitchIn + 0.076
            end
        end
    % pitchSetpoint = 40;
      timeSet = 10;
  case 18 % set pitch to 0 again
      pitchSetpoint = 40;
      if(~drillButt)
          t1 = t;
          currentState = 19;
          pitchSetpoint = 0;
      end
  case 19 % return to distIR & hold for drill
      flyMode = 0;
      drill = 0;
       if (t-t1i >0.01)
          t1 = t;
          if(travelSetpoint > distIRIn)
              travelSetpoint = distIRIn;
          else
              travelSetpoint = TravelIn + 0.02
          end
       end


      timeSet = 15;


  case 20
       drill = 1;
       timeSet = 14;



   case 21 % go to elevation of 3rd dot
      elevSetpoint = distTopIn+cam3+2.5/2+0.1;
      timeSet = 5;
  case 22 % go into board
      flyMode = 1;
      pitchSetpoint = 2;
    % travelSetpoint = boardTravelIn;
      timeSet = 9;
      t1 = t;
  case 23 % set max pitch by ramping

      if (t-t1i >0.01)
          t1 = t;
          if(pitchSetpoint > 40)
              pitchSetpoint = 40;
          else
              pitchSetpoint = pitchIn + 0.076
          end
      end
```

```matlab
        % pitchSetpoint = 40;
        timeSet = 10;
    case 24 % set pitch to 0 again
            pitchSetpoint = 40;
        if(~drillButt)
            t1 = t;
            currentState = 25;
            pitchSetpoint = 0;
        end
    case 25 % return to distIR & hold for drill
            flyMode = 0;
        drill = 0;
         if (t-t1i >0.01)
            t1 = t;
            if(travelSetpoint > distIRIn)
                travelSetpoint = distIRIn;
            else
                travelSetpoint = TravelIn + 0.02;
            end
         end
        timeSet = 15;

    case 26
        drill = 1;
         timeSet = 14;
         %%%%%

    case 27 % go to elevation of 1st dot
        elevSetpoint = distTopIn+cam1+2.5/2+0.2;
        timeSet = 5;
    case 28 % go into board
        flyMode = 1;
        pitchSetpoint = 2;
      % travelSetpoint = boardTravelIn;
        timeSet = 9;
        t1 = t;
    case 29 % set max pitch by ramping

        if (t-t1i >0.01)
            t1 = t;
            pitchSetpoint = pitchIn + 0.076
        end
      % pitchSetpoint = 40;
        timeSet = 5;
    case 30 % set pitch to 0 again
        pitchSetpoint = 40;
        if(~drillButt)
            t1 = t;
            currentState = 31;
        end
```

```matlab
    case 31 % return to distIR & hold for drill
        flyMode = 1;
        pitchSetpoint = -3
        timeSet = 2;
    case 32
        pitchSetpoint = 0;
        flyMode = 0;
        distanceToStart = encoder3*180/pi;
        currentState = 33;
        t1 = t;
    case 33
      if (t-t1i >0.01)
            t1 = t;
            if(travelSetpoint > 0)
                travelSetpoint = 0;
                currentState = 34;
            else
                travelSetpoint = TravelIn + 0.02;
            end
         end
    case 34
        if (t-t1i >0.01)
            t1 = t;
            if(elevSetpoint <1)
                elevSetpoint = 0;
                currentState = 35;
            else
                elevSetpoint = elevIn - 0.01;
            end
         end
    case 35
        stop = 1;
end

end
```
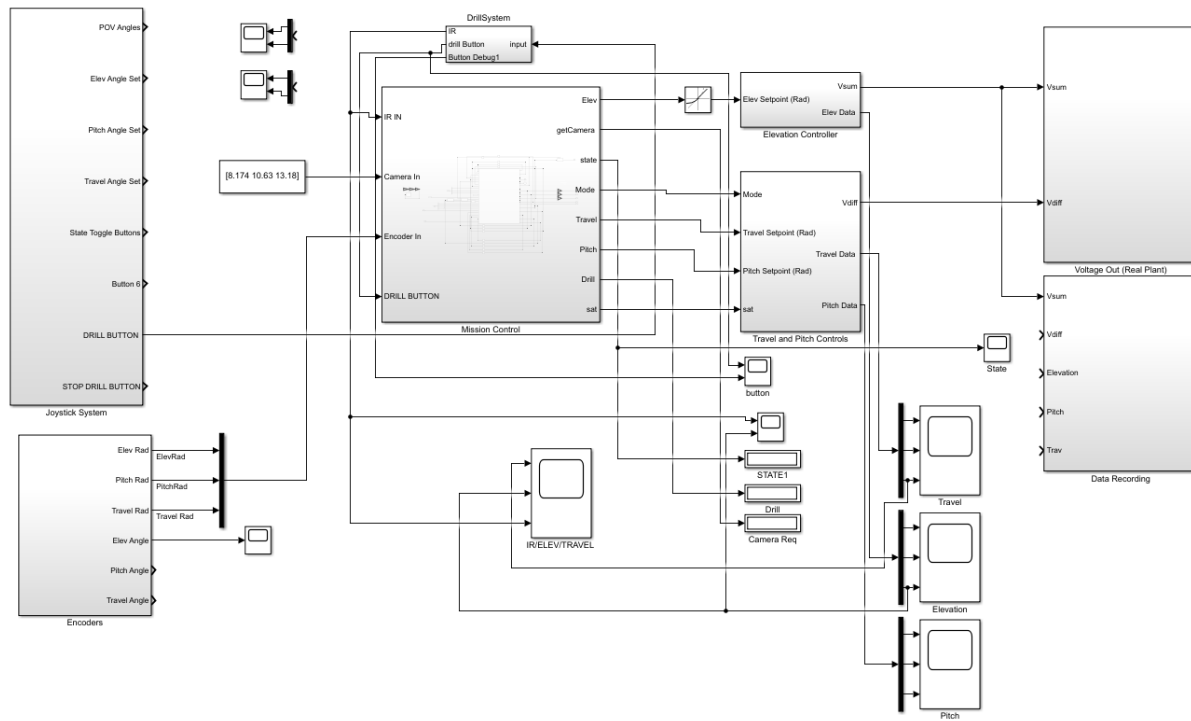
9.4.2   Mission Simulink Model

Figure 92: Mission Simulink Model