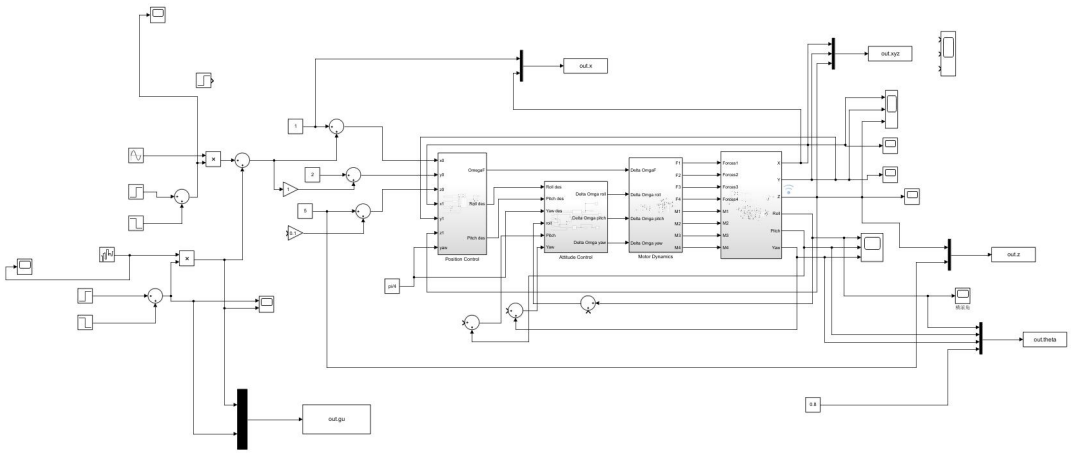
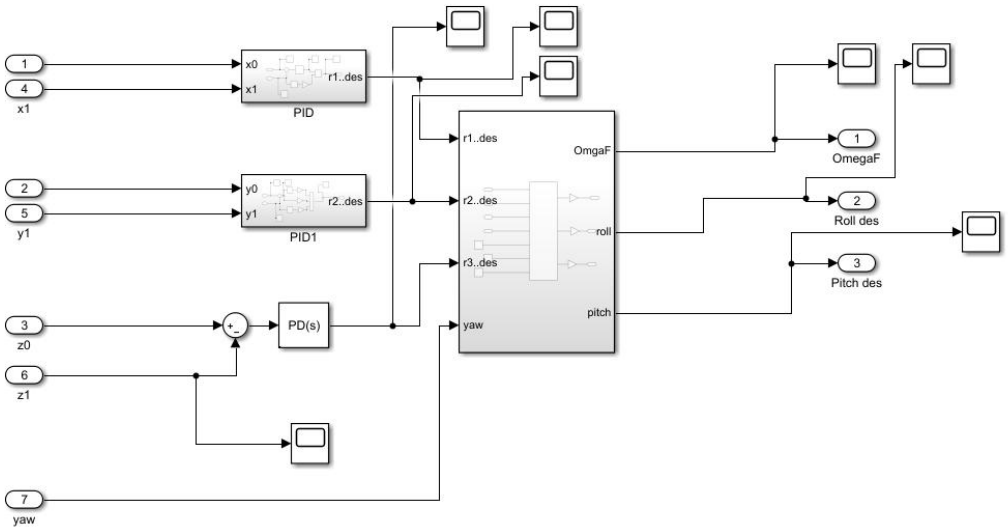
Dear Editor：

The experimental simulation data of this paper were all obtained from the Simulink module built by ourselves, and further results were obtained based on the data. Please review.

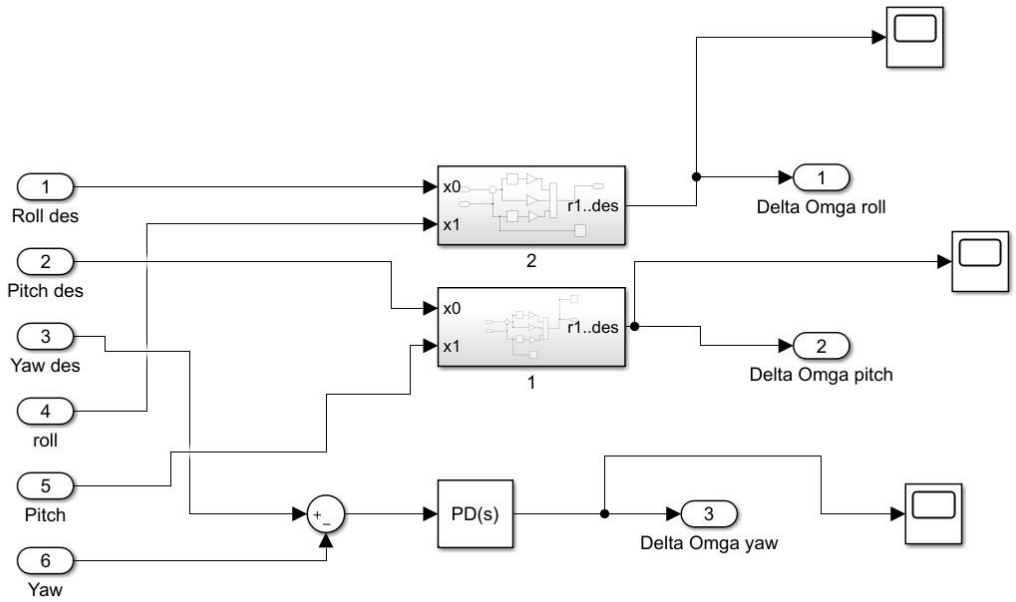
Simulation Model：



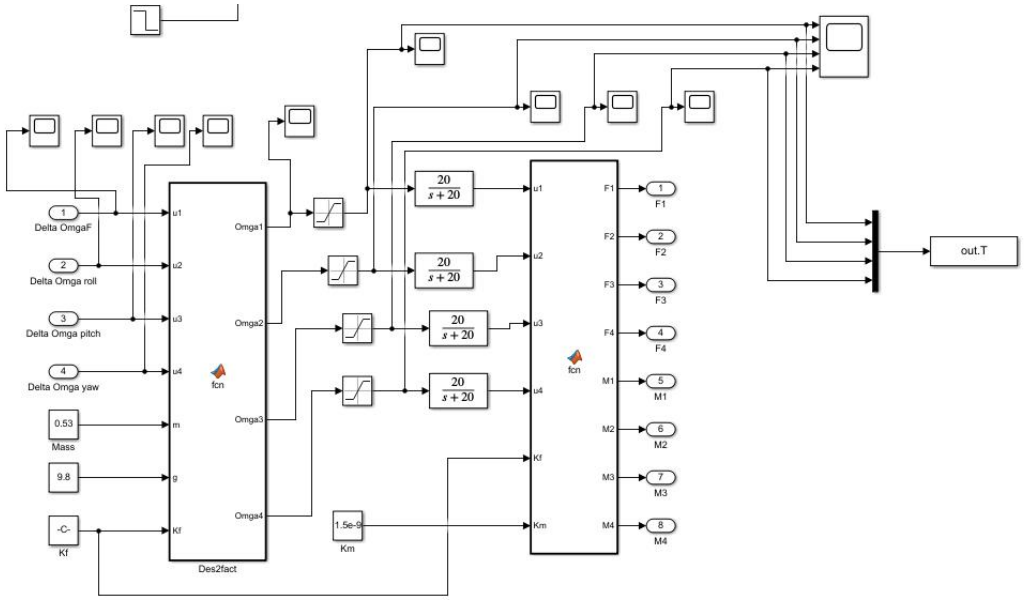
Position control model：



Attitude control model：



Motor model:



Main program code:

```
function [Omga1,Omga2,Omga3,Omga4] = fcn(u1,u2,u3,u4,m,g,Kf)
Omgah = sqrt(m*g/4/Kf);
Omga1 = Omgah+u1+u3-u4;
Omga2 = Omgah+u1+u2+u4;
Omga3 = Omgah+u1-u3-u4;
Omga4 = Omgah+u1-u2+u4;

function [F1,F2,F3,F4,M1,M2,M3,M4] = fcn(u1,u2,u3,u4,Kf,Km)
Omga1 = u1;
```

```
Omga2 = u2;
Omga3 = u3;
Omga4 = u4;
F1 = Kf*(Omga1)^2;
F2 = Kf*(Omga2)^2;
F3 = Kf*(Omga3)^2;
F4 = Kf*(Omga4)^2;
M1 = Km*(Omga1)^2;
M2 = Km*(Omga2)^2;
M3 = Km*(Omga3)^2;
M4 = Km*(Omga4)^2;

function [x,y,z] = fcn(r1,r2,r3,fai,k,m,g)
  Omga = sqrt(m*g/4/k);
  x = -1/g*(r1*sin(fai) - r2*cos(fai));
  y = -1/g*(r1*cos(fai) + r2*sin(fai));
  z = -m*r3/8/k/Omga;
%    x = mod(x1,pi/4);
%    y = mod(y1,pi/4);
%    z = mod(z1,pi/4);
```

Simulation result:

Figure 1. Disturbance observer estimation capability

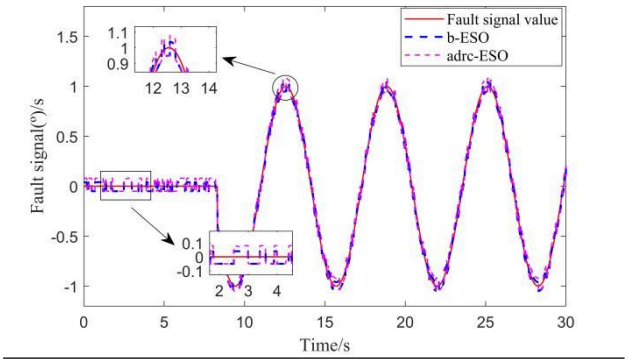


Figure 2. Position variation curve

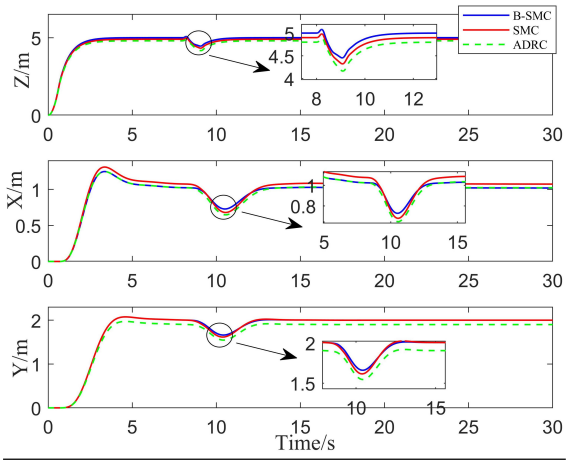


Figure 3. Position error curve

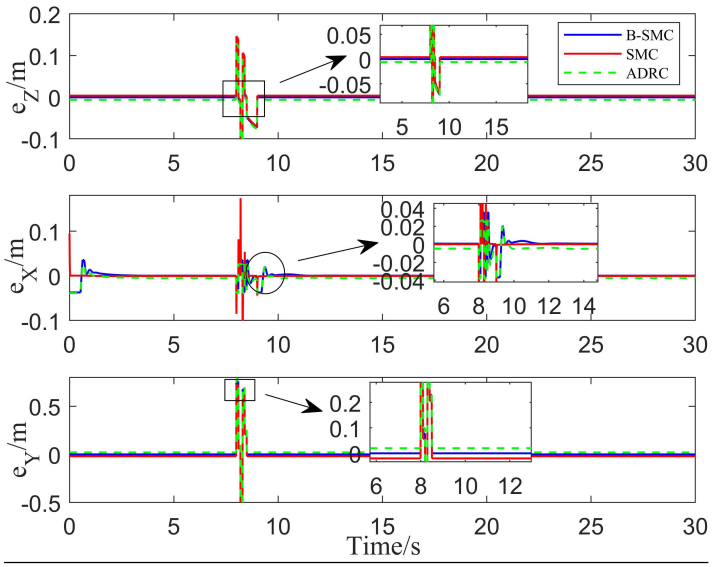


Figure 4. Attitude variation curve

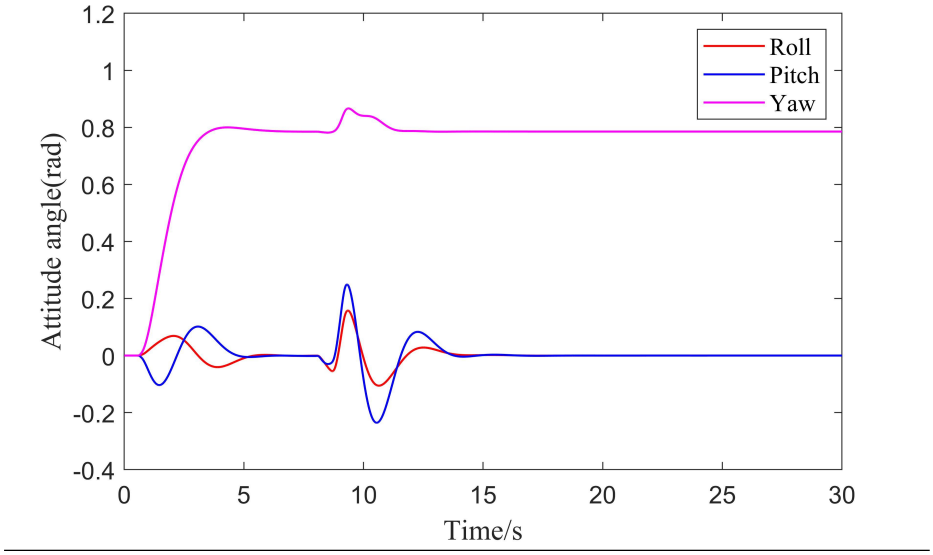


Figure5. Attitude error curve

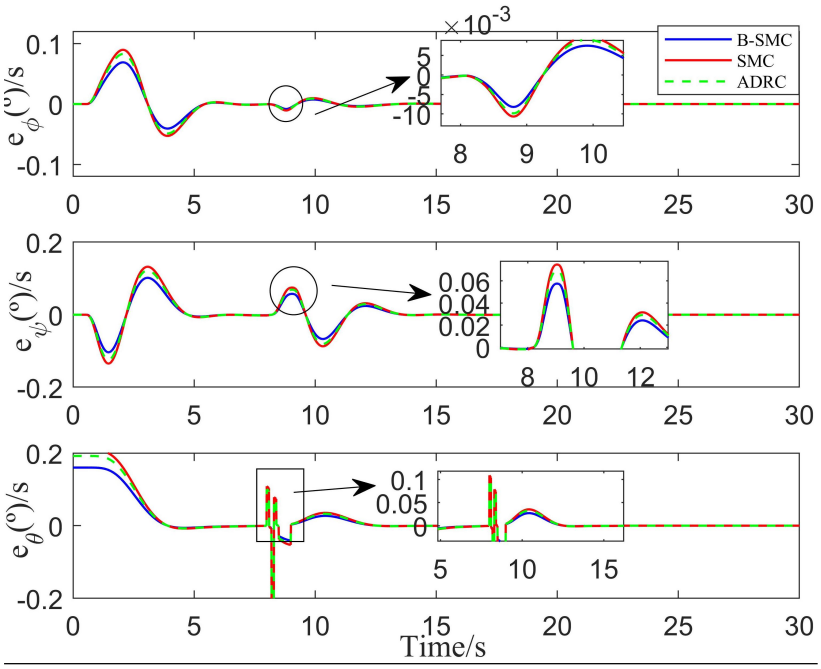


Figure6. Comparison of roll angle variation curves

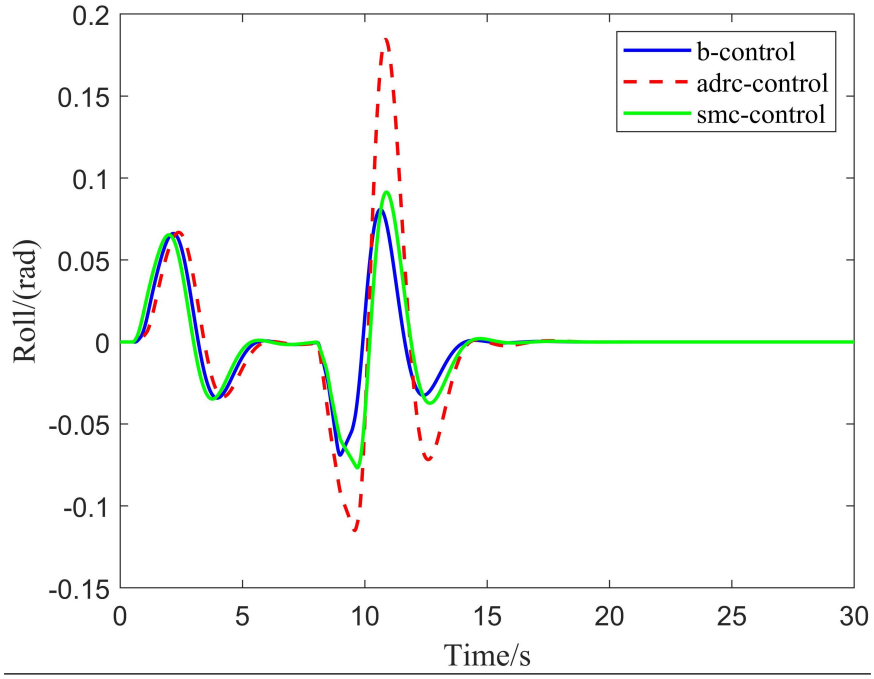


Figure7. Comparison of pitch angle variation curves

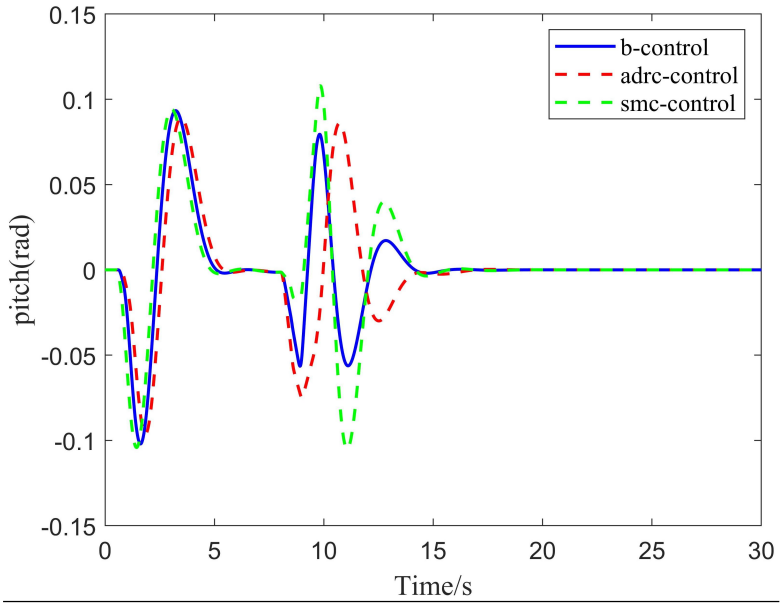


Figure8. Comparison of yaw angle variation curve

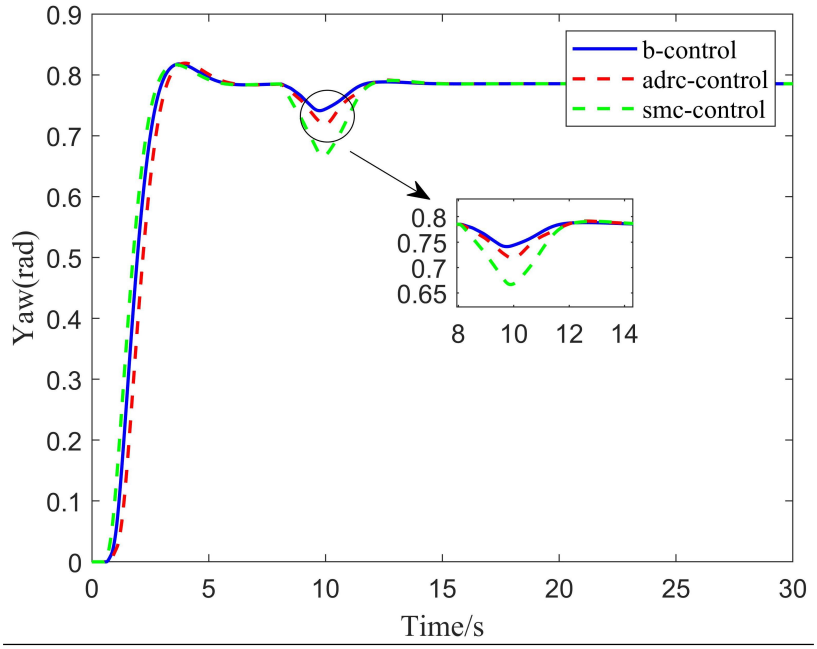


Figure 9. Comparison of height variation curve

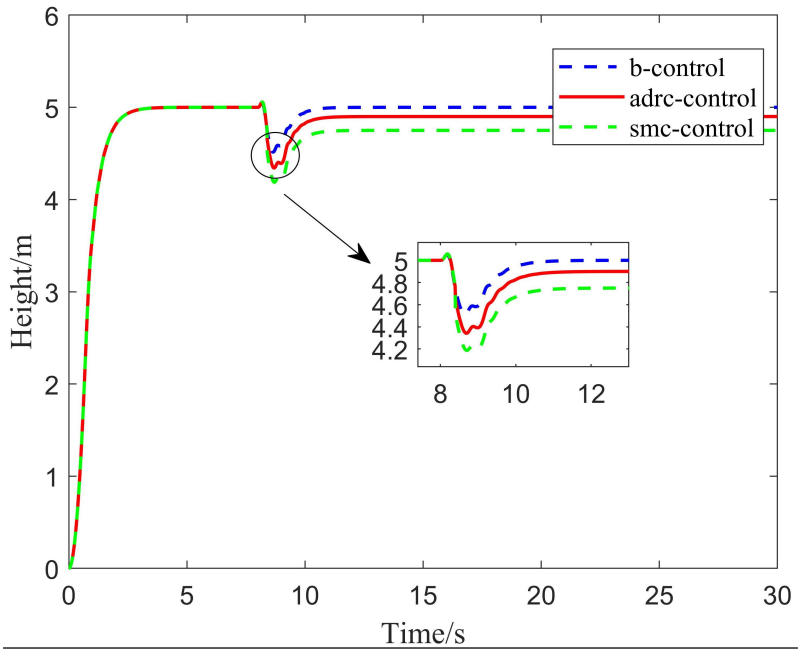


Figure 10. Propeller speed variation curve