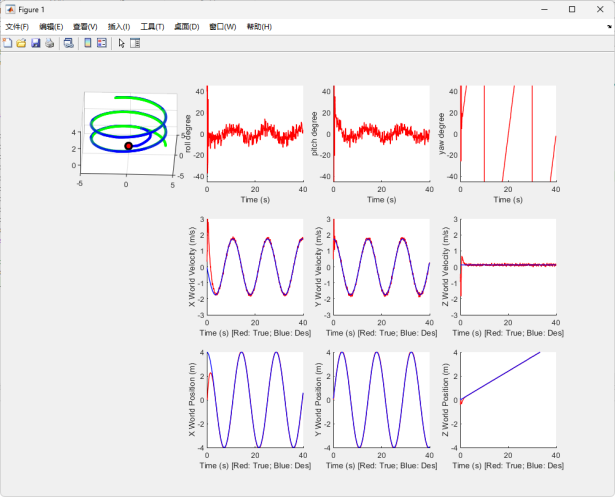
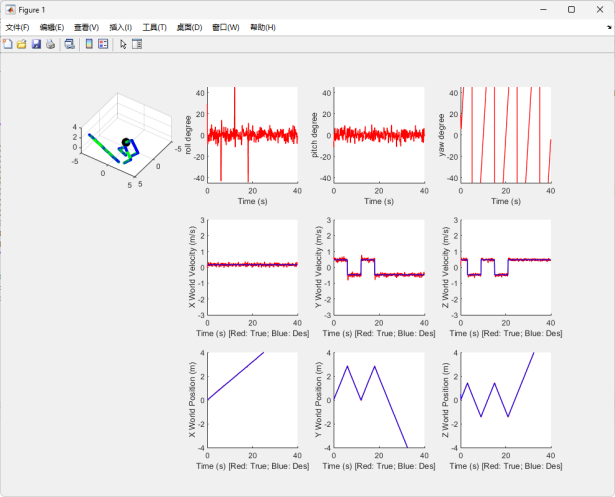
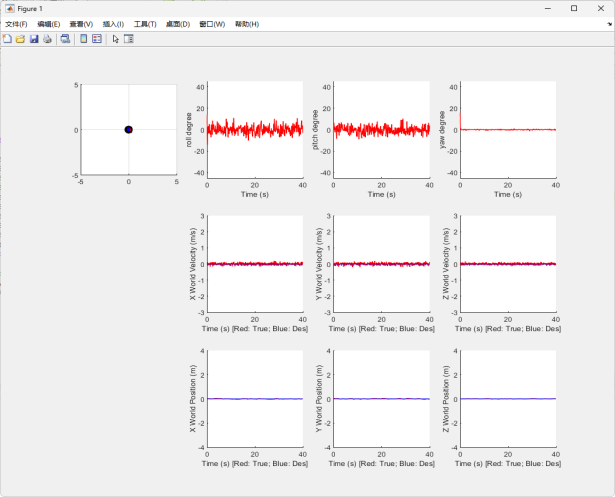
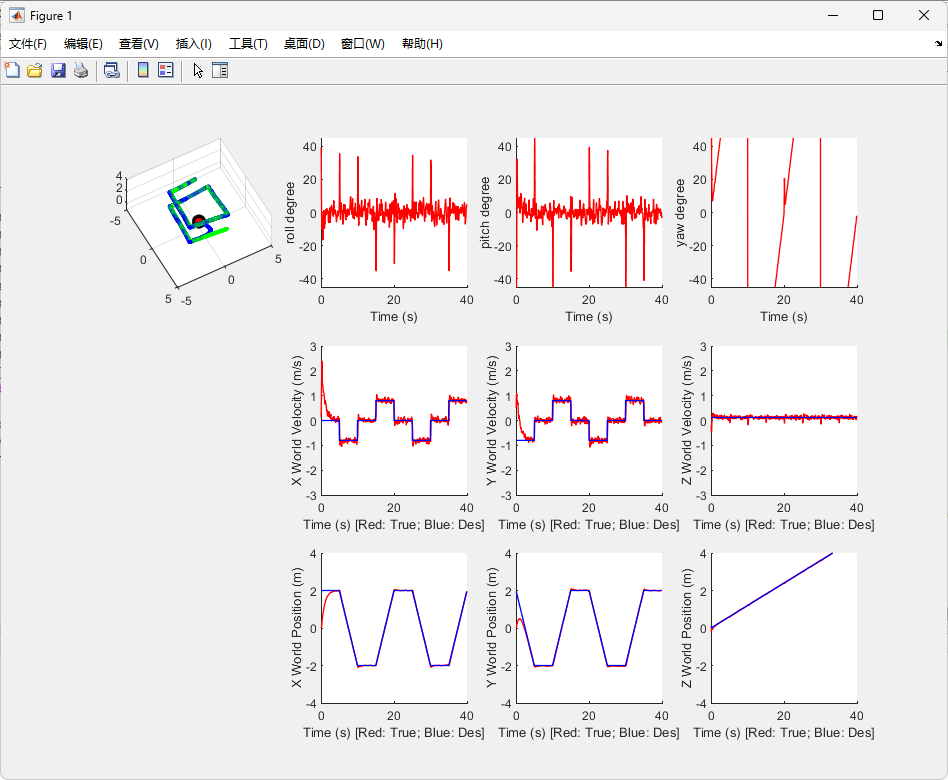
proj1phase1-徐涵-202293010207

结果展示：

Matlab的fig文件以及完整截图保存在assets目录中。

circle轨迹 diamond轨迹

hover轨迹 自定义轨迹

均方根误差统计：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | x | y | z | dx | dy | dz |
| circle | 0.5097 | 0.0545 | 0.0465 | 0.4821 | 0.1204 | 0.1337 |
| diamond | 0.0146 | 0.0219 | 0.0136 | 0.0597 | 0.0962 | 0.0592 |
| hover | 0.0155 | 0.0156 | 0.0075 | 0.0545 | 0.0610 | 0.0411 |
| custom | 0.2385 | 0.2268 | 0.0153 | 0.2711 | 0.2612 | 0.0626 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | q1 | q2 | q3 | q4 | dphi | dtheta | dpsi |
| circle | 1.0371 | 0.0626 | 0.0660 | 1.0097 | 3.1034 | 3.1145 | 1.2748 |
| diamond | 0.9981 | 0.0391 | 0.0400 | 0.9850 | 0.9849 | 1.282 | 0.7232 |
| hover | 0.0013 | 0.0305 | 0.026 | 0.0051 | 0.8870 | 0.7929 | 0.3196 |
| custom | 1.0360 | 0.0592 | 0.0627 | 1.0089 | 1.7972 | 1.8890 | 0.8234 |

参数以及代码解释：

代码遵循向量化操作。

1. PD控制参数

*kp\_xyz = [10.5; 10.5; 30.5]; % Position gain  
kd\_xyz = [10.5; 10.5; 15.5]; % Velocity gain  
kp\_angle = [900; 900; 900]; % Attitude gain  
kd\_angle = [50; 50; 50]; % Angular velocity gain*

1. 数据读取部分：

*x = s(1:3); % 当前位置  
d\_x = s(4:6); % 当前速度  
quat = s(7:10); % 当前四元数  
d\_angle = s(11:13); % 当前角速度*  
*x\_c = s\_des(1:3); % 期望位置  
d\_x\_c = s\_des(4:6); % 期望速度  
quat\_c = s\_des(7:10); % 期望四元数  
d\_angle\_c = s\_des(11:13); % 期望角速度*

1. 计算输出F和M：

*x\_error = x\_c - x;  
d\_x\_error = d\_x\_c - d\_x;  
dd\_x\_c = [0;0;0];  
dd\_x = dd\_x\_c + kp\_xyz .\* x\_error + kd\_xyz .\* d\_x\_error;  
F = m \* (dd\_x(3) + g);  
% ---------------- 姿态控制 ----------------  
[phi\_c,theta\_c,psi\_c] = RotToRPY\_ZXY(QuatToRot(quat\_c));  
[phi,theta,psi] = RotToRPY\_ZXY(QuatToRot(quat));  
% refactor phi\_c and theta\_c  
phi\_c = 1/g \* (dd\_x(1) \* sin(psi) - dd\_x(2) \* cos(psi));  
theta\_c = 1/g \* (dd\_x(1) \* cos(psi) + dd\_x(2) \* sin(psi));  
phi\_error = phi\_c-phi;  
theta\_error = theta\_c-theta;  
psi\_error = psi\_c-psi;  
psi\_error = mod(psi\_error, 2\*pi);  
if(psi\_error<=-pi)  
 psi\_error=psi\_error + 2 \* pi;  
elseif(psi\_error>=pi)  
 psi\_error=psi\_error - 2 \* pi;  
end  
angle\_error = [phi\_error;theta\_error;psi\_error];  
d\_angle\_error = d\_angle\_c - d\_angle;  
Rotation = QuatToRot(quat);  
dd\_angle = kp\_angle .\* angle\_error + kd\_angle .\* (d\_angle\_error);  
M = I \* dd\_angle + cross(Rotation \* d\_angle, (I \* Rotation \* d\_angle));*

1. 自定义轨迹说明：

自定义轨迹文件是custom\_trajectory.m，定义了一个在xOy平面沿正方形轨迹，z方向线性上升的轨迹。