

实验四 三维几何变换和投影变换实验报告

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(三维复合变换)

4.1 Matlab 中 plot3 命令的参数及常见图形控制命令

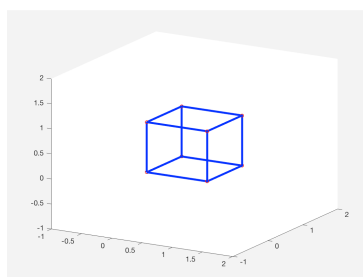
下列语句的作用分别是：

(1) `axis([-1 2 -1 2 -1 2])`

(2) `view(30,20)`

1. 三维坐标系 x-y-z 范围

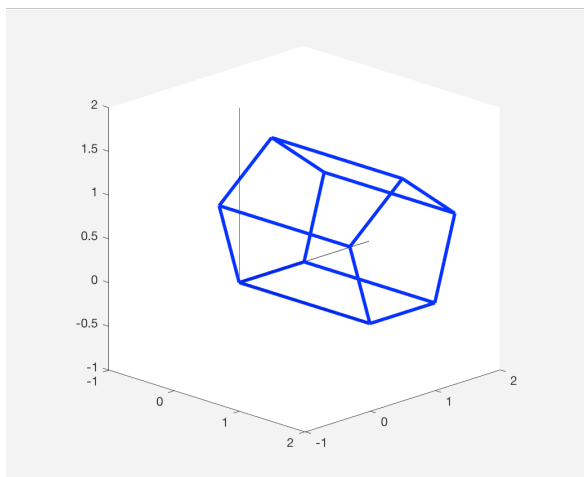
2. `view([方位角,俯视角])`：通过方位角、俯视角设置视点



4.2 生成空间中的 n 棱柱体

生成的棱柱体的截图：

5 棱柱



4.3 三维空间中的复合变换

变换前的顶点坐标 X Y Z

1	2	3
0	0	0
0	1	0
0	1.3090	0.9511
0	0.5000	1.5388
0	-0.3090	0.9511
2	0	0
2	1	0
2	1.3090	0.9511
2	0.5000	1.5388
2	-0.3090	0.9511

变换后的顶点坐标 X1 Y1 Z1

1	2	3
-3	2	1
-3	3	1
-3	3.3090	1.9511
-3	2.5000	2.5388
-3	1.6910	1.9511
-1	2	1
-1	3	1
-1	3.3090	1.9511
-1	2.5000	2.5388
-1	1.6910	1.9511

代码:

```
% Q4_3
```

```
function PH = Q4_3(n,Le)
```

```
%Le = 2; % length of the polygon
```

```
Ed = 1; % edge of polygons
```

```
PH(1:2*n,1:4) = zeros; PH(:,4) = 1;
```

```
for i = 1:n-1
```

```
    alpha = (i-1) * 2*pi/n;
```

```
    dy = Ed * cos(alpha);
```

```
    dz = Ed * sin(alpha);
```

```
    PH(i+1,2) = PH(i,2) + dy;
```

```
    PH(i+1,3) = PH(i,3) + dz;
```

```

end
PH(n+1:2*n,1) = Le;
PH(n+1:2*n,2:4) = PH(1:n,2:4);

% StartHere
T1 = [1 0 0 0 ;0 1 0 0 ;0 0 1 0 ;-3 2 1 1];
th1=atan(1/2);
th2=atan(80^0.5/5);
T2 = [cos(th1) sin(th1) 0 0; -sin(th1) cos(th1) 0 0; 0 0 1 0 ;0 0 0 1];
T3 = [1 0 0 0; 0 cos(th2) sin(th2) 0;0 -sin(th2) cos(th2) 0 ;0 0 0 1];
T4 = [0 1 0 0;-1 0 0 0;0 0 1 0;0 0 0 1];
T5 = inv(T3);
T6 = inv(T2);
T7 = inv(T1);
T=T1*T2*T3*T4*T5*T6*T7;
PH2=PH*T1;

% PlantResult
figure; hold on;
plot3([0,Le+1],[0,0],[0,0],'k-');
plot3([0,0],[0,max(PH(:,2)+1)],[0,0],'k-');
plot3([0,0],[0,0],[0,max(PH(:,3)+1)],[0,0],'k-');
for i = 1:n
    plot3([PH(i,1) PH(n+i,1)],[PH(i,2) PH(n+i,2)],...
        [PH(i,3) PH(n+i,3)],'b-','LineWidth',3);
    if i ~= n
        plot3([PH(i,1) PH(i+1,1)],[PH(i,2) PH(i+1,2)],...
            [PH(i,3) PH(i+1,3)],'b-','LineWidth',3);
        plot3([PH(i+n,1) PH(i+n+1,1)],[PH(i+n,2) PH(i+n+1,2)],...
            [PH(i+n,3) PH(i+n+1,3)],'b-','LineWidth',3);
    else
        plot3([PH(1,1) PH(n,1)],[PH(1,2) PH(n,2)],...
            [PH(1,3) PH(n,3)],'b-','LineWidth',3);
        plot3([PH(n+1,1) PH(2*n,1)],[PH(n+1,2) PH(2*n,2)],...
            [PH(n+1,3) PH(2*n,3)],'b-','LineWidth',3);
    end
end
end

plot3([0,Le+1],[0,0],[0,0],'k-');
plot3([0,0],[0,max(PH2(:,2)+1)],[0,0],'k-');
plot3([0,0],[0,0],[0,max(PH2(:,3)+1)],[0,0],'k-');
for i = 1:n
    plot3([PH2(i,1) PH2(n+i,1)],[PH2(i,2) PH2(n+i,2)],...
        [PH2(i,3) PH2(n+i,3)],'r-','LineWidth',3);

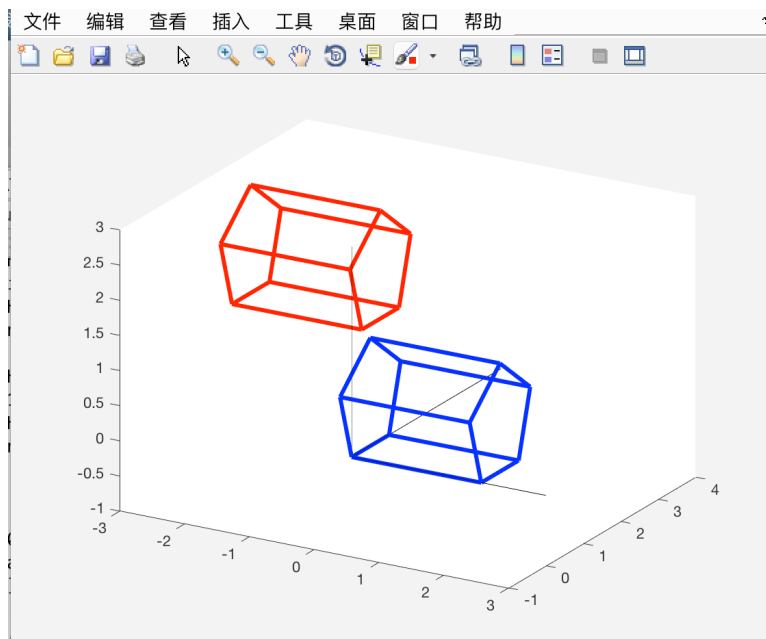
```

```

if i ~= n
    plot3([PH2(i,1) PH2(i+1,1)],[PH2(i,2) PH2(i+1,2)],...
        [PH2(i,3) PH2(i+1,3)],'r','LineWidth',3);
    plot3([PH2(i+n,1) PH2(i+n+1,1)],[PH2(n+i,2) PH2(n+i+1,2)],...
        [PH2(n+i,3) PH2(n+i+1,3)],'r','LineWidth',3);
else
    plot3([PH2(1,1) PH2(n,1)],[PH2(1,2) PH2(n,2)],...
        [PH2(1,3) PH2(n,3)],'r','LineWidth',3);
    plot3([PH2(n+1,1) PH2(2*n,1)],[PH2(n+1,2) PH2(2*n,2)],...
        [PH2(n+1,3) PH2(2*n,3)],'r','LineWidth',3);
end
end
hold off; axis equal
axis([-3 3 -1 4 -1 3]);
view(30,20);

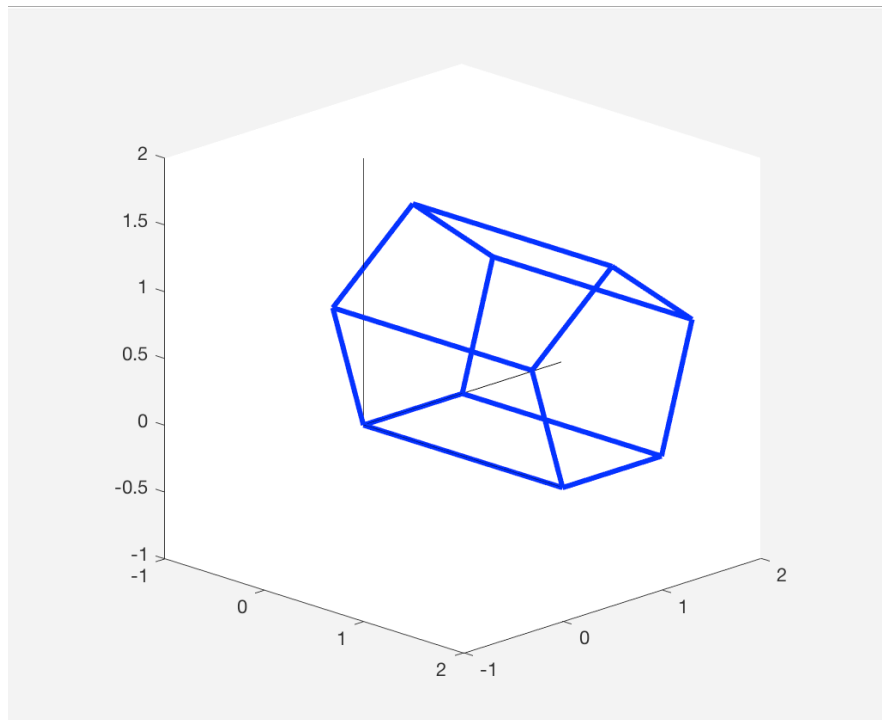
```

截图：

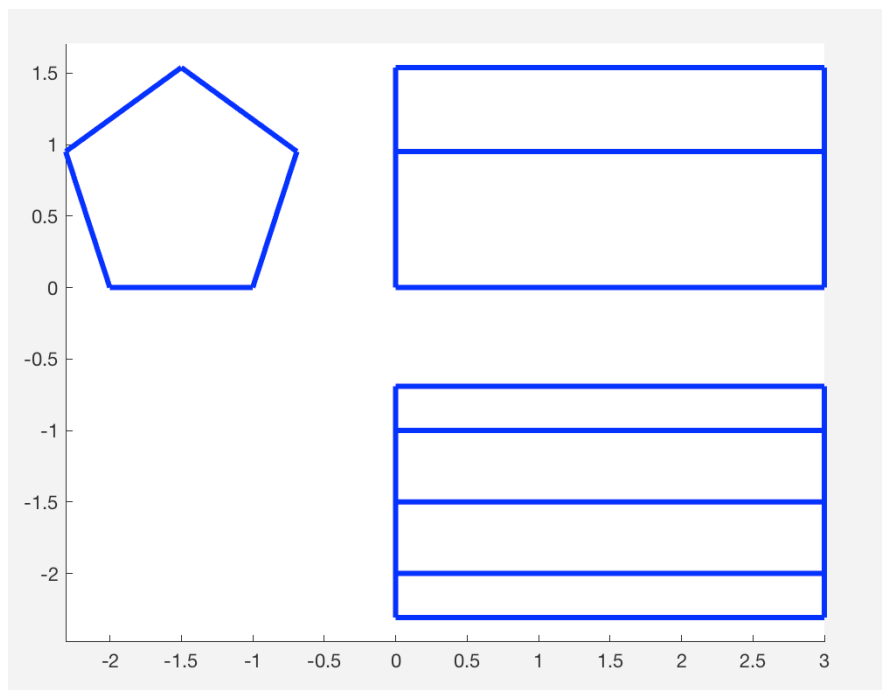


4.4 正投影 — 三视图

选取的棱柱体：

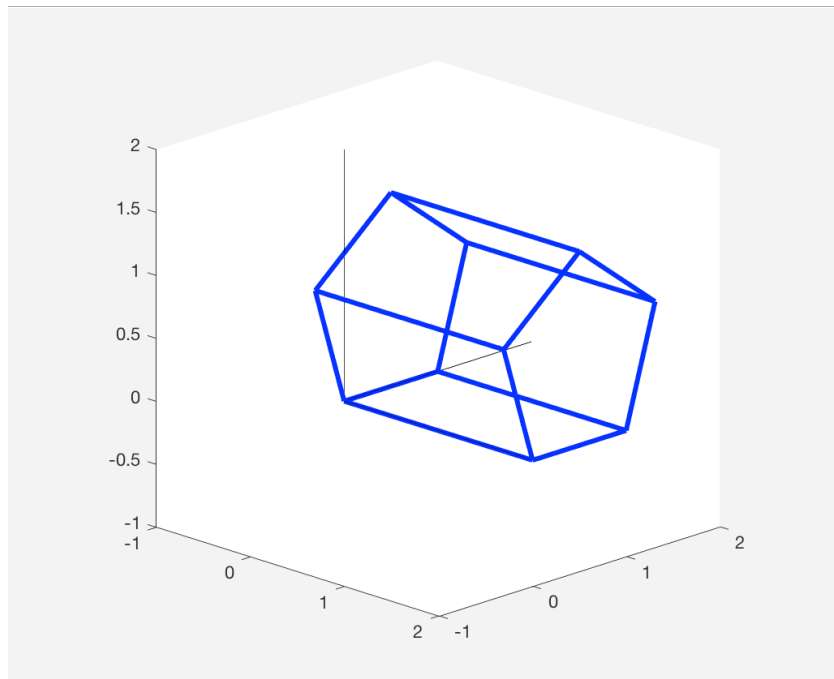


生成的三视图：

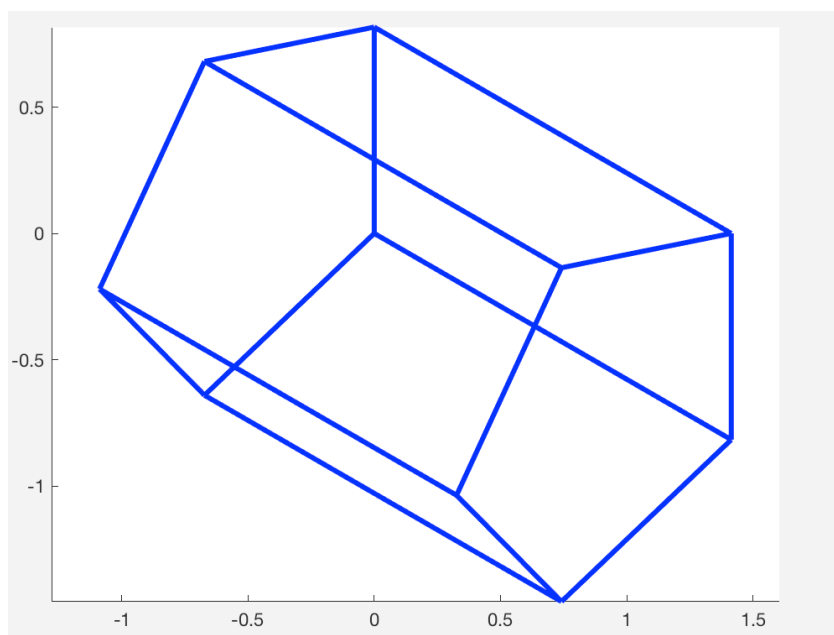


4.5 正投影 — 正等测图

选取的棱柱体：

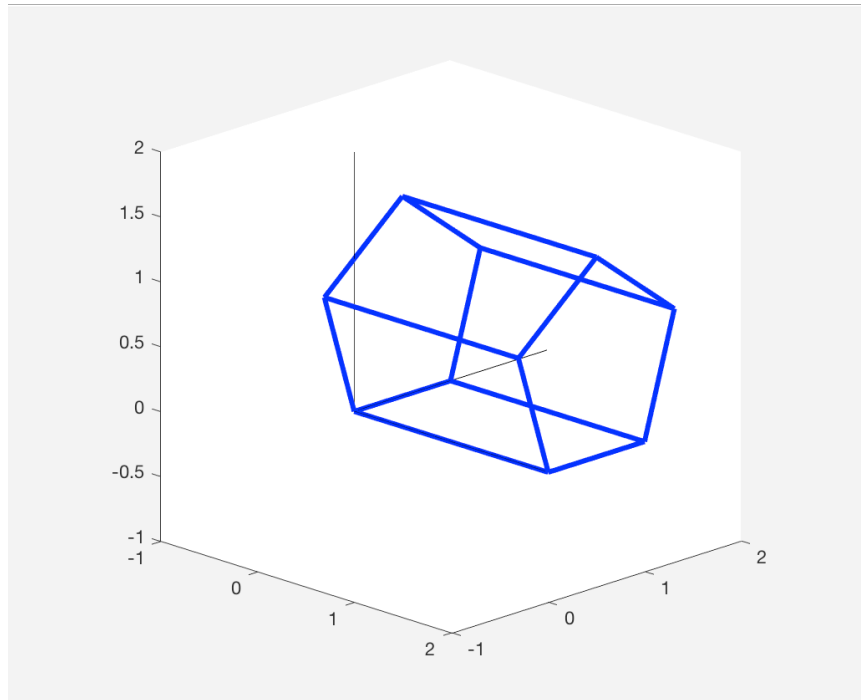


生成的正等测图：

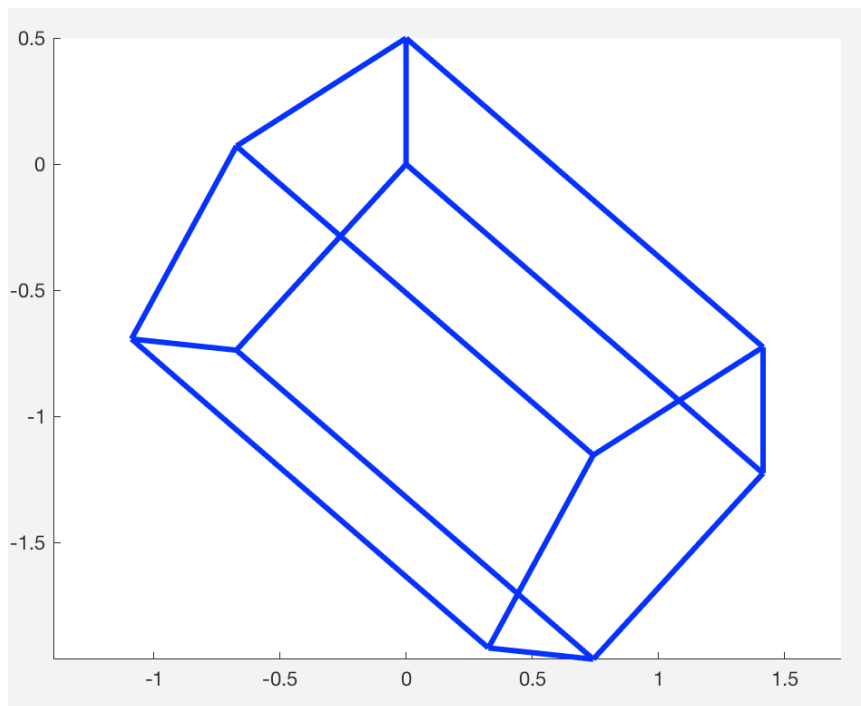


4.6 正投影 — 正二测图

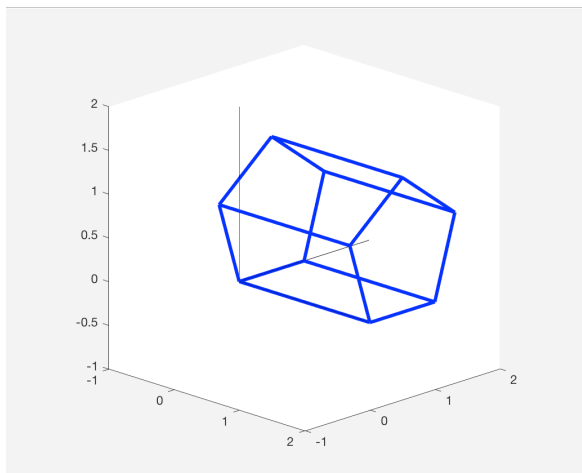
选取的棱柱体：



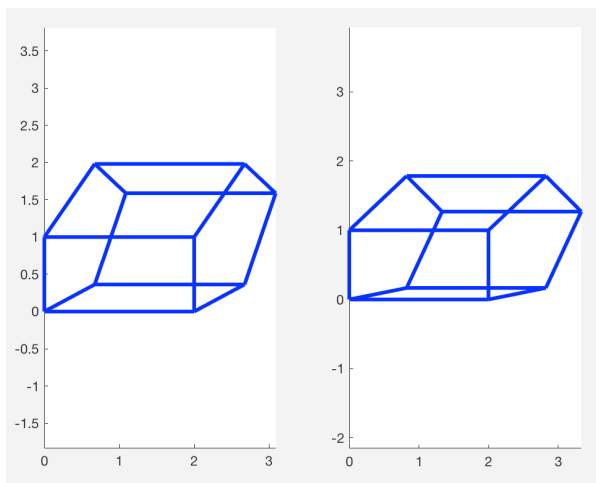
生成的正二测图：



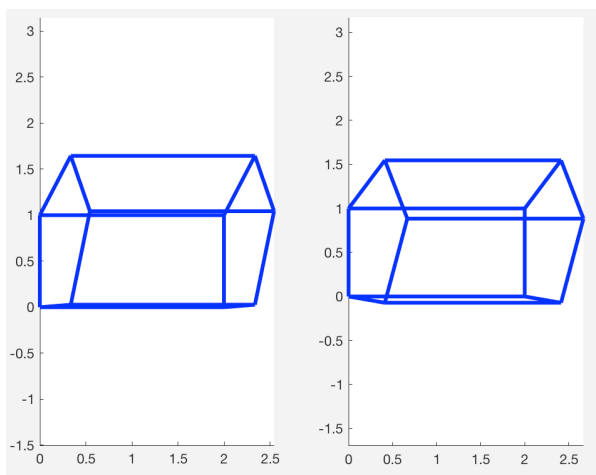
4.7 斜投影 — 斜等测图与斜二测图 选取的棱柱体：



生成的斜等测图：

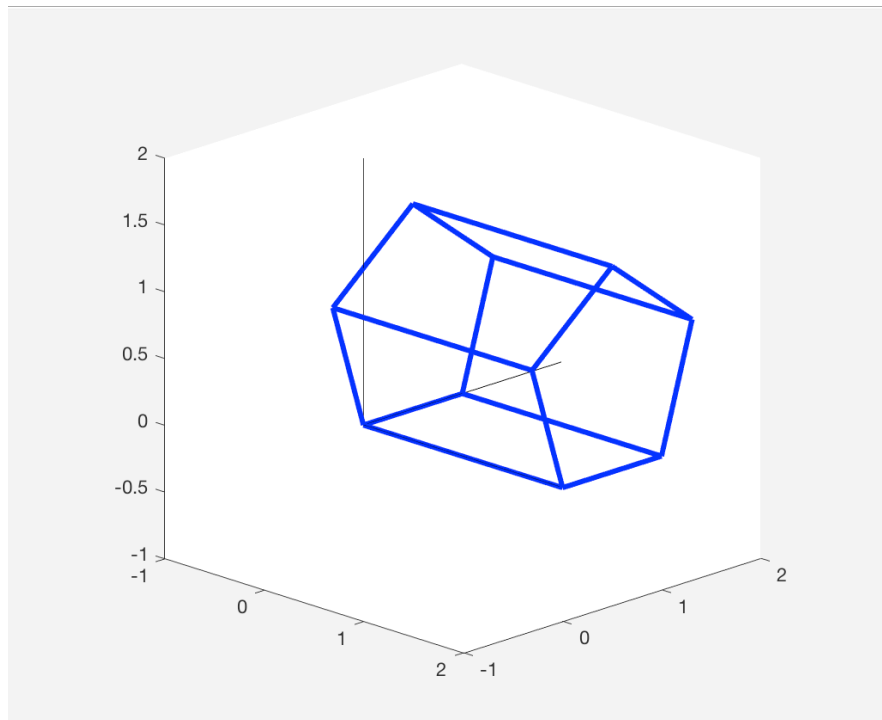


生成的斜二测图：



4.8 透视投影

选取的棱柱体：



生成的透视投影图：

