实验四 用高斯消去法解线性方程组

# 实验目的

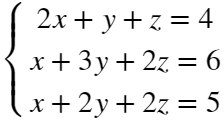
1. 掌握顺序高斯消去法
2. 掌握列主元高斯消去法
3. 掌握高斯-约当消去法
4. 掌握归一化的高斯-约当消去法

# 实验环境

1. 计算机
2. MATLAB集成环境

# 实验内容与代码

## 用高斯消去法求解下列方程组：



高斯消去法编程算法如此实时脚本末尾所示。

clc;clear;

coef=[2,1,1,4;1,3,2,6;1,2,2,5]

coef = 3×4

2 1 1 4

1 3 2 6

1 2 2 5

res=gauss\_res(coef)

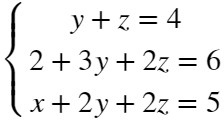
res = 3×1

1

1

1

## 用列主元高斯消去法求解下列方程组：



clear;clc;

coef=[0,1,1,4;1,3,2,6;1,2,2,5]

coef = 3×4

0 1 1 4

1 3 2 6

1 2 2 5

res = gauss\_MCP(coef)

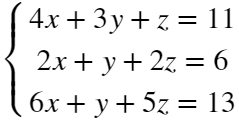
res = 3×1

-3

1

3

## 用高斯-约当消去法求解方程组：



clear;clc;

coef = [4 3 1 11; 2 1 2 6; 6 1 5 13]

coef = 3×4

4 3 1 11

2 1 2 6

6 1 5 13

res = gauss\_jordan(coef)

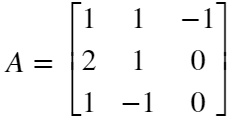
res = 3×1

1

2

1

# 用归一化的高斯-约当消去法求矩阵的逆矩阵：



clear;clc;

A = [1 1 -1; 2 1 0; 1 -1 0]

A = 3×3

1 1 -1

2 1 0

1 -1 0

inv\_A = gauss\_jordan\_inv(A)

inv\_A = 3×3

0 0.3333 0.3333

0 0.3333 -0.6667

-1.0000 0.6667 -0.3333

## 此实时脚本中使用的函数：

function [x] = gauss\_res(coef)

[r,c] = size(coef);

for i = 1 : r - 1

for j = i + 1:r

a = coef(j, i) / coef(i, i);

coef(j, :) = coef(j, :) - a \* coef(i, :);

end

end

x=zeros(r,1);

for i = r: -1: 1

for j = r: -1: 1

coef(i, c) = coef(i, c) - x(j, 1) \* coef(i, j);

end

x(i, 1) = coef(i, c) / coef(i, i);

end

end

function [x]=gauss\_MCP(coef)

[r,c]=size(coef);

for i=1:r

[~,ti]=max(coef(i:r,i));

coef([ti+i-1,i],:)=coef([i,ti+i-1],:);

for j=i+1:r

a=coef(j,i)/coef(i,i);

coef(j,:)=coef(j,:)-a\*coef(i,:);

end

end

x=zeros(r,1);

for i=r:-1:1

for j=r:-1:1

coef(i,c)=coef(i,c)-x(j,1)\*coef(i,j);

end

x(i,1)=coef(i,c)/coef(i,i);

end

end

function [x]=gauss\_jordan(coef)

[r,c]=size(coef);

for i=1:r

for j=1:r

if j==i

a=0;

else

a=coef(j,i)/coef(i,i);

end

coef(j,:)=coef(j,:)-a\*coef(i,:);

end

end

x=zeros(r,1);

for i=1:r

x(i,1)=coef(i,c)/coef(i,i);

end

end

function [x]=gauss\_jordan\_inv(coef)

[r,~]=size(coef);

x=eye(r);

for i=1:r

[~,ti]=max(coef(i:r,i));

coef([ti+i-1,i],:)=coef([i,ti+i-1],:);

x([ti+i-1,i],:)=x([i,ti+i-1],:);

for j=1:r

if j==i

a=0;

else

a=coef(j,i)/coef(i,i);

end

coef(j,:)=coef(j,:)-a\*coef(i,:);

x(j,:)=x(j,:)-a\*x(i,:);

end

x(i,:)=x(i,:)/coef(i,i);

coef(i,:)=coef(i,:)/coef(i,i);

end

end

# 实验小结

通过此次实验，掌握了高斯消去法、列主元高斯消去法、高斯-约当消去法、归一化的高斯-约当消去法，并编程实现了各方法功能。