```
clear;close all; clc;
A = imread("Siakam.png");
A = im2double(rgb2gray(A));
figure("Name","原图"); imshow(A); % 查看灰度图像创建情况

lambda = 0.5; % 压缩力度

[m, n] = size(A);
% 先扩展为2的整次幂大小
tempm = ceil2(m); tempn = ceil2(n);
A = [A, 255*ones(m, tempn-n); 255*ones(tempm - m, n),
255*ones(tempm - m, tempn-n)];
figure("Name","拓展图"); imshow(A);
M1 = basevecM_D(tempm); % 建立单位正交基
M2 = basevecM_D(tempn);
W = M1*A*(M2'); % 系数矩阵

W = W.*(abs(W) > lambda); % 压缩
B = (M1')*W*M2;
figure("Name","压缩拓展图"); imshow(B);
B = B(1:m, 1:n);
figure("Name","压缩图"); imshow(B);


function AnsM = basevecM_D(num) % Unitization

    AnsM = orthvecM_D(num);
    len = size(AnsM, 1);
    for i = 1:len
        AnsM(i,:) = AnsM(i,:)./sqrt(AnsM(i,:)*(AnsM(i,:)'));
    end

end


function AnsM = orthvecM_D(num) % Get an orthogonal basis
    AnsM = orthvecM_D1(num);
    AnsM = [ones(1, num); AnsM];
end

function AnsM = orthvecM_D1(num)

    if num == 2
        AnsM = [1, -1];
    else
        tempM1 = orthvecM_D1(num/2);
        tempM2 = zeros(size(tempM1, 1), num/2);
        tempM3 = ones(1, num/2);
        AnsM = [tempM3, -tempM3; tempM1, tempM2; tempM2, tempM1];
    end
end
```

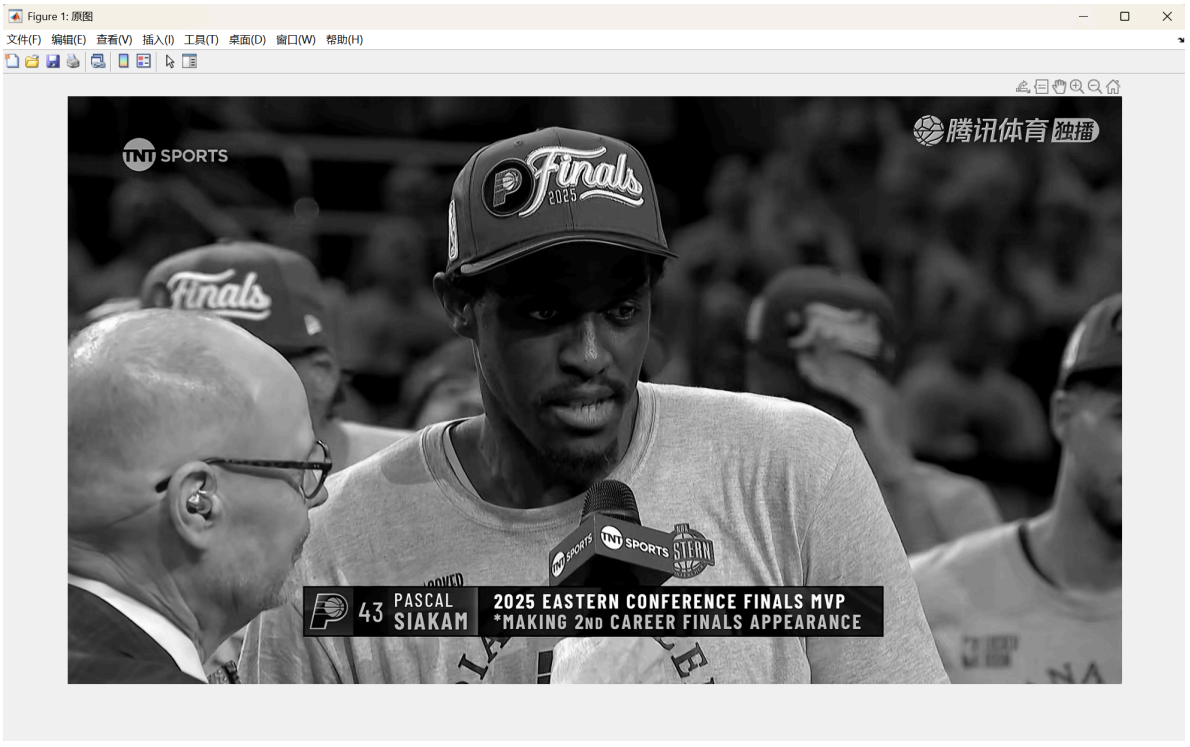
```
function ans1 = ceil2(x)
    ans1 = log2(x);
    ans1 = ceil(ans1);
    ans1 = pow2(ans1);
end
```

代码详解

初始化

```
clear;close all; clc;
A = imread("Siakam.png"); % 读取图片
A = im2double(rgb2gray(A));
figure("Name","原图"); imshow(A); % 查看灰度图像创建情况

lambda = 0.5; % 压缩力度
```



拓展图像

```
[m, n] = size(A);
% 先扩展为2的整次幂大小
tempm = ceil2(m); tempn = ceil2(n);
A = [A, 255*ones(m, tempn-n); 255*ones(tempm - m, n),
255*ones(tempm - m, tempn-n)]; % 拓展部分为白色
figure("Name","拓展图"); imshow(A);
```

相关函数：

```
function ans1 = ceil2(x) % 找到不小于x的2的整数次幂数
    ans1 = log2(x);
    ans1 = ceil(ans1);
    ans1 = pow2(ans1);
end
```

建立$\mathbb{R}^m, \mathbb{R}^n$ 的规范正交基

```
M1 = basevecM_D(tempm); % 建立单位正交基
M2 = basevecM_D(tempn);
```

相关函数：

```
function AnsM = basevecM_D(num) % 单位化

    AnsM = orthvecM_D(num);
    len = size(AnsM, 1);
    for i = 1:len
        AnsM(i,:) = AnsM(i,:)./sqrt(AnsM(i,:)*(AnsM(i,:)')); % 每行除以该行向量的二范数
    end

end


function AnsM = orthvecM_D(num) % 获得一组正交基
    AnsM = orthvecM_D1(num);
    AnsM = [ones(1, num); AnsM];
end

function AnsM = orthvecM_D1(num) % 由递归求得内部和为0的一组正交组
```

```
    if num == 2
        AnsM = [1, -1];
    else
        tempM1 = orthvecM_D1(num/2);
        tempM2 = zeros(size(tempM1, 1), num/2);
        tempM3 = ones(1, num/2);
        AnsM = [tempM3, -tempM3; tempM1, tempM2; tempM2, tempM1];
    end
end
```

求解压缩系数矩阵

```
W = M1*A*(M2'); % 系数矩阵
W = W.*(abs(W) > lambda); % 压缩, 将小于lambda项的压缩为0
B = (M1')*W*M2; % 得到压缩图
figure("Name","压缩拓展图"); imshow(B);
B = B(1:m, 1:n);
figure("Name","压缩图"); imshow(B);
```


Figure 4: 压缩图
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)
TNT SPORTS
Finals
2025
腾讯体育 独播
43 PASCAL SIAKAM
2025 EASTERN CONFERENCE FINALS MVP
*MAKING 2ND CAREER FINALS APPEARANCE