

```
clc; clear; close all;
```

```
clear; clc; clf;
```

```
% 加载数据
```

```
load('spo2_data.mat');  
referData = load('spo2_reference.mat');  
spo2_reference = referData.refer4derived;
```

```
% 提取红光 (R) 和红外光 (IR) 信号
```

```
R = trace(1, :);  
IR = trace(3, :);
```

```
% 初始化参数
```

```
fs = 60; % 采样频率 60 Hz  
window_size = 10 * fs; % 窗口大小为 10 秒 (600 个样本点)  
bandpass_range = [0.6 3]; % 带通滤波器的频率范围从 0.6 Hz 到 3 Hz  
[b, a] = butter(4, bandpass_range/(fs/2), 'bandpass'); % 创建带通滤波器
```

```
% 初始化结果存储数组
```

```
results = [];
```

```
% 使用滑动窗口方法计算 SpO2
```

```
for i = 1:window_size:length(R) - window_size
```

```
    % 截取当前窗口的信号
```

```
    R_window = R(i:i+window_size-1);  
    IR_window = IR(i:i+window_size-1);
```

```
    % 应用滤波器
```

```
    R_filtered = filtfilt(b, a, R_window);  
    IR_filtered = filtfilt(b, a, IR_window);
```

```
    % 去除均值
```

```
    R_filtered = R_filtered - mean(R_filtered);  
    IR_filtered = IR_filtered - mean(IR_filtered);
```

```
    % 查找峰值和谷值
```

```
    [pks_R, ~] = findpeaks(R_filtered);  
    [vls_R, ~] = findpeaks(-R_filtered);  
    vls_R = -vls_R;  
    [pks_IR, ~] = findpeaks(IR_filtered);  
    [vls_IR, ~] = findpeaks(-IR_filtered);  
    vls_IR = -vls_IR;
```

```
    % 计算交流成分 (AC)
```

```
    AC_R = median(pks_R) - median(vls_R);  
    AC_IR = median(pks_IR) - median(vls_IR);
```

```

% 计算 Ra 值
Ra = AC_R / AC_IR;

% 根据 Ra 值计算 SpO2
SpO2 = 104 - (100 / 3.4) * Ra;

% 存储结果
results = [results, SpO2];
end

```

```

% 结果绘制
time = (1:length(results)) * (window_size / fs);
reference_time = (1:length(spo2_reference)) * (length(R) / length(spo2_reference) / fs);
figure;
plot(time, results, 'b', 'DisplayName', 'Calculated SpO2');
hold on;
plot(reference_time, spo2_reference, 'r', 'DisplayName', 'Reference SpO2');
xlabel('Time (s)');
ylabel('SpO2 (%)');
legend show;
title('Calculated SpO2 vs Reference SpO2');
hold off;

```

