

Supplementary Materials:

Matlab Source-Code

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close all; clearvars; clc

% Plz refer Ocean Optics programming module for spectrometer related
commands
spectrometerIndex = 0;
Integration_time = 400000; % integration time

% array to store and display ratio of two fluorescent peaks obtained for 100
time steps
ratio_reading = zeros(1,100);

%counter to keep track of the ratio, i.e. 100 time steps
i = 1;

% opening the two files one for stroing spectrum and ratio
Filename = '<file_name>.csv';
Filename1 = sprintf('file_name1_%.s.csv', datestr(now,'mm-dd-yyyy HH-MM-
SS'));
fid = fopen(Filename, 'a');
fid1 = fopen(Filename1, 'a');
% writing header
fprintf(fid, '%s, %d\n', Integration_time (in sec) =', Integration_time/10^6);
fprintf(fid, 'Time Stamp (HH-MM-SS), Raw_ratio, Ratio_smooth\n');

% accessing driver of the spectrometer
try
    handles.wrapper = com.oceanoptics.omnidriver.api.wrapper.Wrapper();
catch
    javaaddpath('C:\Program Files\Ocean
Optics\OmniDriver\OOI_HOME\OmniDriver.jar');
    handles.wrapper = com.oceanoptics.omnidriver.api.wrapper.Wrapper();
end

handles.wrapper.openAllSpectrometers();

handles.wavelengths = handles.wrapper.getWavelengths(0); %get
wavelengths to form the X axis
handles.wrapper.setIntegrationTime(0, Integration_time);

% capturing dark spectrum
handles.wrapper.setStrobeEnable(spectrometerIndex, 0); %send signal via
spectrometer to turn off LED (pin 13)
handles.wrapper.getSpectrum(0); %get inetesity counts for each wavelength
SpecDark=handles.wrapper.getSpectrum(0);

% capturing bright spectrum
handles.wrapper.setStrobeEnable(spectrometerIndex, 1); %send signal via
spectrometer to turn on LED
handles.wrapper.getSpectrum(0);
SpecOn = handles.wrapper.getSpectrum(0);

SpecResult=SpecOn-SpecDark; % spectrum after removing ambient light (dark)
component from the bright one.
smooth_SpecResult_1 = smooth(handles.wavelengths, SpecResult, 0.015, 'loess');
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% writing spectrum to the file
fprintf(fid1,'%f, %f\n',handles.wavelengths,SpecResult);
fclose(fid1);

% plotting raw and smooth spectrum
figure()
k
plot(handles.wavelengths,SpecResult,handles.wavelengths,smooth_SpecResult_1);
k(1).LineWidth = 4;
k(1).Color = 'R';
k(2).LineWidth = 4;
k(2).Color = 'B';
set ( gca , 'FontSize' , 24 , 'fontweight' , 'b' , 'FontName' , 'Times New Roman' ) ;
xlabel ( 'Wavelength' , 'FontSize' , 24 , 'fontweight' , 'b' , 'FontName' , 'Times New Roman' ) ;
ylabel ( 'Intensity (a.u.)' , 'FontSize' , 24 , 'fontweight' , 'b' , 'FontName' , 'Times New Roman' ) ;
xlim([450 780]);

% plotting the ratio and later using while loop to update it in real time
figure()
Ra = plot(ratio_reading);
Ra(1).LineWidth = 4;
Ra(1).Color = 'R';
set ( gca , 'FontSize' , 24 , 'fontweight' , 'b' , 'FontName' , 'Times New Roman' ) ;
xlabel ( 'Iteration' , 'FontSize' , 24 , 'fontweight' , 'b' , 'FontName' , 'Times New Roman' ) ;
ylabel ( 'Ratio' , 'FontSize' , 24 , 'fontweight' , 'b' , 'FontName' , 'Times New Roman' ) ;
ylim([0 1]);

% loop to calculate the ratio and update the figure in real-time
while (ishandle(Ra))

    % check if array is full
    if i == 100
        i = 1;
        ratio_reading = zeros(1,100);
    end

    % capture dark spectrum
    handles.wrapper.setStrobeEnable(spectrometerIndex,0);
    handles.wrapper.getSpectrum(0);% getSpectrum should be called twice.
    Please refer Ocean Optics manual
    SpecDark=handles.wrapper.getSpectrum(0); % get counts for each wavelength

    % capture bright spectrum
    handles.wrapper.setStrobeEnable(spectrometerIndex,1); % pin 13
    handles.wrapper.getSpectrum(0);
    SpecOn=handles.wrapper.getSpectrum(0);

    SpecResult=SpecOn-SpecDark; % differential on - dark to cancel the outside light
    smooth_SpecResult = smooth(handles.wavelengths,SpecResult,0.015,'loess');

    [indref, ~]= find(handles.wavelengths(:,1) >= 596 & handles.wavelengths(:,1)

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< 610); % parse values of the ref peak
[indsignal, ~]= find(handles.wavelengths(:,1) >= 524 &
handles.wavelengths(:,1) < 544); % parse values of the PH peak
% raw data
Ref=mean(SpecResult(indref)); % integrate counts on ref peak
Signal=mean(SpecResult(indsignal)); % integrate counts on pH peak
ratio_raw=Signal/Ref;

% Ratio of the smoothened curve
Ref_smooth=mean(smooth_SpecResult(indref)); %integrate counts on ref
peak
Signal_smooth=mean(smooth_SpecResult(indsignal)); %integrate counts on
PH peak
ratio_smooth=Signal_smooth/Ref_smooth; %calculate ratio (must be
calibrated to right PH value)

% storing the value in array
ratio_reading(i) = ratio_smooth;

% opening the file to write spectrum
Filename1 = sprintf('file_name1_%s.csv', datestr(now,'mm-dd-yyyy HH-
MM-SS'));
fid1 = fopen(Filename1, 'a');
% wrtiting spectrum to file
fprintf(fid1,'%f, %f\n',handles.wavelengths,SpecResult);
% close the spectrum file
fclose(fid1) ;

% wrtiting the ratio to file with time_stamp
fprintf(fid,'%s, %f, %f\n', datestr(now,'HH-MM-SS'), ratio_raw,
ratio_smooth);

% increasing the counter by 1
i = i+1;

%updates the display
set(Ra,'ydata',ratio_reading);
set(k,'ydata',SpecResult)
drawnow;
end

handles.wrapper.closeAllSpectrometers()
fclose(fid) ; % close the file used for writing ratio

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