ДОДАТОК А

Лістинг програми

```
I=imread('E:\OF\1.bmp');
I=rgb2gray(I);
Id = double(I);
[b,a]=butter(12,0.5/6)
F=filtfilt(b,a,Id)
F(:,1:18)=[];
surf(F)
shading interp
colormap gray
Table = ones(1,180);
r=0
for g=1:180
Frot=imrotate(F,g);
N1 = length(Frot)
Frot(:,(N1+300)/2:N1)=[];
Frot((N1+300)/2:N1,:)=[];
Frot(1:(N1-300)/2,:)=[];
Frot(:,1:(N1-300)/2)=[];
[r,c,v]=find(Frot);
lindx=sub2ind(size(Frot),r,c);
cy=sum(r.*Frot(lindx))/sum(v)
cx=sum(c.*Frot(lindx))/sum(v)
Fxy1=Frot(ceil(cx),:);
for i=1:150;
```

```
if abs(Fxy1(i))>125;
x1=i
break, end
i=i+1
end;
for i=299:-1:150;
if abs(Fxy1(i))>125;
x2=i
break, end
i=i-1
end;
x=abs(x1-x2)
Table(g) = x;
end
function [fitresult, gof] = createFit1(Table)
%CREATEFIT1(TABLE)
%  Create a fit.
%  Data for 'untitled fit 1' fit:
%      Y Output: Table
%  Output:
%      fitresult : a fit object representing the fit.
%      gof : structure with goodness-of fit info.
%  See also FIT, CFIT, SFIT.
%  Auto-generated by MATLAB on 22-Nov-2020 22:19:02
%% Fit: 'untitled fit 1'.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
```

```
ft = fittype( ‘poly6’ );
% Fit model to data.
[fitresult, gof] = fit( xData, yData, ft, ‘Normalize’, ‘on’ );

% Plot fit with data.
figure( ‘Name’, ‘untitled fit 1’ );
h = plot( fitresult, xData, yData );
legend( h, ‘Table’, ‘untitled fit 1’, ‘Location’, ‘NorthEast’ );
% Label axes
ylabel Table
grid on
function [fitresult, gof] = createFits(Table)
%CREATEFITS(TABLE)
%  Create fits.
%  Data for ‘untitled fit 1’ fit:
%      Y Output: Table
%  Data for ‘untitled fit 2’ fit:
%      Y Output: Table
%  Output:
%      fitresult : a cell-array of fit objects representing the fits.
%      gof : structure array with goodness-of fit info.
%  See also FIT, CFIT, SFIT.
%  Auto-generated by MATLAB on 22-Nov-2020 22:29:45
%% Initialization.
% Initialize arrays to store fits and goodness-of-fit.
fitresult = cell( 2, 1 );
gof = struct( ‘sse’, cell( 2, 1 ), ...
```

```
    'rsquare', [], 'dfe', [], 'adjrsquare', [], 'rmse', [] );
%% Fit: 'untitled fit 1'.
[xData, yData] = prepareCurveData( [], Table );

% Set up fittype and options.
ft = fittype( 'poly6' );
% Fit model to data.
[fitresult{1}, gof(1)] = fit( xData, yData, ft, 'Normalize', 'on' );
% Plot fit with data.
figure( 'Name', 'untitled fit 1' );
h = plot( fitresult{1}, xData, yData );
legend( h, 'Table', 'untitled fit 1', 'Location', 'NorthEast' );
% Label axes
ylabel Table
grid on
%% Fit: 'untitled fit 2'.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( 'poly5' );
% Fit model to data.
[fitresult{2}, gof(2)] = fit( xData, yData, ft, 'Normalize', 'on' );
% Plot fit with data.
figure( 'Name', 'untitled fit 2' );
h = plot( fitresult{2}, xData, yData );
legend( h, 'Table', 'untitled fit 2', 'Location', 'NorthEast' );
% Label axes
ylabel Table
```

```
grid on
function [fitresult, gof] = createFits(Table)
%CREATEFITS(TABLE)
%  Create fits.
%  Data for 'untitled fit 1' fit:
%      Y Output: Table
%  Data for 'untitled fit 2' fit:
%      Y Output: Table
%  Data for 'untitled fit 3' fit:
%      Y Output: Table
%  Output:
%      fitresult : a cell-array of fit objects representing the fits.
%      gof : structure array with goodness-of fit info.
%  See also FIT, CFIT, SFIT.
%  Auto-generated by MATLAB on 22-Nov-2020 22:42:20
%% Initialization.
% Initialize arrays to store fits and goodness-of-fit.
fitresult = cell( 3, 1 );
gof = struct( 'sse', cell( 3, 1 ), ...
    'rsquare', [], 'dfe', [], 'adjrsquare', [], 'rmse', [] );
%% Fit: 'untitled fit 1'.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( 'poly6' );
% Fit model to data.
[fitresult{1}, gof(1)] = fit( xData, yData, ft, 'Normalize', 'on' );
% Plot fit with data.
```

```
figure( ‘Name’, ‘untitled fit 1’ );
h = plot( fitresult{1}, xData, yData );
legend( h, ‘Table’, ‘untitled fit 1’, ‘Location’, ‘NorthEast’ );
% Label axes
ylabel Table
grid on

%% Fit: ‘untitled fit 2’.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( ‘poly5’ );
% Fit model to data.
[fitresult{2}, gof(2)] = fit( xData, yData, ft, ‘Normalize’, ‘on’ );
% Plot fit with data.
figure( ‘Name’, ‘untitled fit 2’ );
h = plot( fitresult{2}, xData, yData );
legend( h, ‘Table’, ‘untitled fit 2’, ‘Location’, ‘NorthEast’ );
% Label axes
ylabel Table
grid on
%% Fit: ‘untitled fit 3’.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( ‘poly5’ );
% Fit model to data.
[fitresult{3}, gof(3)] = fit( xData, yData, ft, ‘Normalize’, ‘on’ );
% Plot fit with data.
```

```
figure( ‘Name’, ‘untitled fit 3’ );
h = plot( fitresult{3}, xData, yData );
legend( h, ‘Table’, ‘untitled fit 3’, ‘Location’, ‘NorthEast’ );
% Label axes
ylabel Table
grid on


function [fitresult, gof] = createFits(Table)
%CREATEFITS(TABLE)
%  Create fits.
%  Data for ‘untitled fit 1’ fit:
%      Y Output: Table
%  Data for ‘untitled fit 2’ fit:
%      Y Output: Table
%  Data for ‘untitled fit 3’ fit:
%      Y Output: Table
%  Data for ‘untitled fit 4’ fit:
%      Y Output: Table
%  Output:
%      fitresult : a cell-array of fit objects representing the fits.
%      gof : structure array with goodness-of fit info.
%  See also FIT, CFIT, SFIT.
%  Auto-generated by MATLAB on 22-Nov-2020 22:50:16
%% Initialization.
% Initialize arrays to store fits and goodness-of-fit.
fitresult = cell( 4, 1 );
gof = struct( ‘sse’, cell( 4, 1 ), ...
```

```
    'rsquare', [], 'dfe', [], 'adjrsquare', [], 'rmse', [] );
%% Fit: 'untitled fit 1'.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( 'poly6' );
% Fit model to data.
[fitresult{1}, gof(1)] = fit( xData, yData, ft, 'Normalize', 'on' );

% Plot fit with data.
figure( 'Name', 'untitled fit 1' );
h = plot( fitresult{1}, xData, yData );
legend( h, 'Table', 'untitled fit 1', 'Location', 'NorthEast' );
% Label axes
ylabel Table
grid on
%% Fit: 'untitled fit 2'.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( 'poly5' );
% Fit model to data.
[fitresult{2}, gof(2)] = fit( xData, yData, ft, 'Normalize', 'on' );
% Plot fit with data.
figure( 'Name', 'untitled fit 2' );
h = plot( fitresult{2}, xData, yData );
legend( h, 'Table', 'untitled fit 2', 'Location', 'NorthEast' );
% Label axes
ylabel Table
```

```
grid on
%% Fit: ‘untitled fit 3’.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( ‘poly5’ );
% Fit model to data.
[fitresult{3}, gof(3)] = fit( xData, yData, ft, ‘Normalize’, ‘on’ );
% Plot fit with data.
figure( ‘Name’, ‘untitled fit 3’ );
h = plot( fitresult{3}, xData, yData );
legend( h, ‘Table’, ‘untitled fit 3’, ‘Location’, ‘NorthEast’ );
% Label axes
ylabel Table
grid on
%% Fit: ‘untitled fit 4’.
[xData, yData] = prepareCurveData( [], Table );
% Set up fittype and options.
ft = fittype( ‘poly5’ );
% Fit model to data.
[fitresult{4}, gof(4)] = fit( xData, yData, ft, ‘Normalize’, ‘on’ );
% Plot fit with data.
figure( ‘Name’, ‘untitled fit 4’ );
h = plot( fitresult{4}, xData, yData );
legend( h, ‘Table’, ‘untitled fit 4’, ‘Location’, ‘NorthEast’ );
% Label axes
ylabel Table
grid on
```

ДОДАТОК Б

Результати апроксимації

1. Модель оптичного волокна 1 (рис. 3.2, *а*)

Linear model Poly6:

f(x) = p1*x^6 + p2*x^5 + p3*x^4 + p4*x^3 + p5*x^2 + p6*x + p7

where x is normalized by mean 90.5 and std 52.11

Coefficients (with 95% confidence bounds):

p1 = 0.3623 (-0.1606, 0.8853)

p2 = -0.1589 (-0.6119, 0.2941)

p3 = -1.898 (-4.061, 0.2651)

p4 = 0.3133 (-1.226, 1.853)

p5 = 3.152 (0.7917, 5.512)

p6 = 0.4259 (-0.7432, 1.595)

p7 = 145.3 (144.7, 145.9)

Goodness of fit:

SSE: 567.3

R-square: 0.1563

Adjusted R-square: 0.1271

RMSE: 1.811

2. Модель оптичного волокна 2 (рис. 3.2, *б*)

Linear model Poly5:

f(x) = p1*x^5 + p2*x^4 + p3*x^3 + p4*x^2 + p5*x + p6

where x is normalized by mean 90.5 and std 52.11

Coefficients (with 95% confidence bounds):

p1 = -0.8927 (-1.352, -0.4335)

p2 = 2.333 (1.934, 2.731)

p3 = 4.496 (2.935, 6.057)

p4 = -10.61 (-11.68, -9.551)

p5 = -7.01 (-8.195, -5.825)

p6 = 145.9 (145.4, 146.4)

Goodness of fit:

SSE: 586.4

R-square: 0.8919

Adjusted R-square: 0.8888

RMSE: 1.836

3. Модель оптичного волокна 3 (рис. 3.2, *в*)

Linear model Poly5:

f(x) = p1*x^5 + p2*x^4 + p3*x^3 + p4*x^2 + p5*x + p6

where x is normalized by mean 90.5 and std 52.11

Coefficients (with 95% confidence bounds):

p1 = 1.229 (0.6977, 1.759)

p2 = -0.3876 (-0.8482, 0.07303)

p3 = -8.198 (-10, -6.393)

p4 = 0.6097 (-0.6193, 1.839)

p5 = 13.66 (12.29, 15.03)

p6 = 142 (141.4, 142.6)

Goodness of fit:

SSE: 783.8

R-square: 0.8487

Adjusted R-square: 0.8443

RMSE: 2.122

4. Модель оптичного волокна 4 (рис. 3.2, *г*)

Linear model Poly5:

f(x) = p1*x^5 + p2*x^4 + p3*x^3 + p4*x^2 + p5*x + p6

where x is normalized by mean 90.5 and std 52.11

Coefficients (with 95% confidence bounds):

p1 = 0.8946 (0.3311, 1.458)

p2 = -1.303 (-1.792, -0.8144)

p3 = -1.499 (-3.414, 0.4159)

p4 = 11.15 (9.849, 12.46)

p5 = -3.067 (-4.521, -1.613)

p6 = 149.4 (148.8, 150)

Goodness of fit:

SSE: 882.8

R-square: 0.9197

Adjusted R-square: 0.9174

RMSE: 2.252

ДОДАТОК В

Демонстраційний матеріал

№	Позначення	Найменування	Дод. відомості
		Текстові документи	
1	ГЮИК. 757810.02 ПЗ	Пояснювальна записка	87 с., ф. А4
		ДОДАТКИ	
		Лістинг програми	9 с., ф. А4
		Результати	3 с., ф. А4
		апроксимації	
		Демонстраційний	у форматі
		матеріал	*.ppt

					ГЮИК. 757810.02 ВД		
Змін.	Арк.	№ документа	Підп.	Дата			
Розроб.		Бабічев О.О.				Літ.	Аркуш	Аркушів
Перевір.		Косенко В.В.						
Н. контр.						ХНУРЕ		
Затвер.		Невлюдов І.Ш				Кафедра КІТАМ		