Sample 5-3

周波数解析

2 変量信号の周波数

画像処理特論

村松 正吾

動作確認: MATLAB R2020a

Fourier analysis

Frequency of bivariate signals

Advanced Topics in Image Processing

Shogo MURAMATSU

Verified: MATLAB R2020a

準備

(Preparation)

```
close all
```

二変量余弦波の定義

(Definition of bivariate cosine wave)

$$\cos(\mathbf{\Omega}^T\mathbf{p}) = \cos(\Omega_1 p_1 + \Omega_2 p_2)$$

ただし，(where)

$$\mathbf{\Omega} = \begin{pmatrix} \Omega_1 \\ \Omega_2 \end{pmatrix} \in \mathbb{R}^2$$

$$\mathbf{p} = \begin{pmatrix} p_1 \\ p_2 \end{pmatrix} \in \mathbb{R}^2$$

二変量角周波数の設定

(Bivariate angular frequency setting)

```
% Vertical angular frequency
f1 = 1;
Omega1 = 2*pi*f1;
% Horizontal angular frequnecy
f2 = 2;
Omega2 = 2*pi*f2;
```

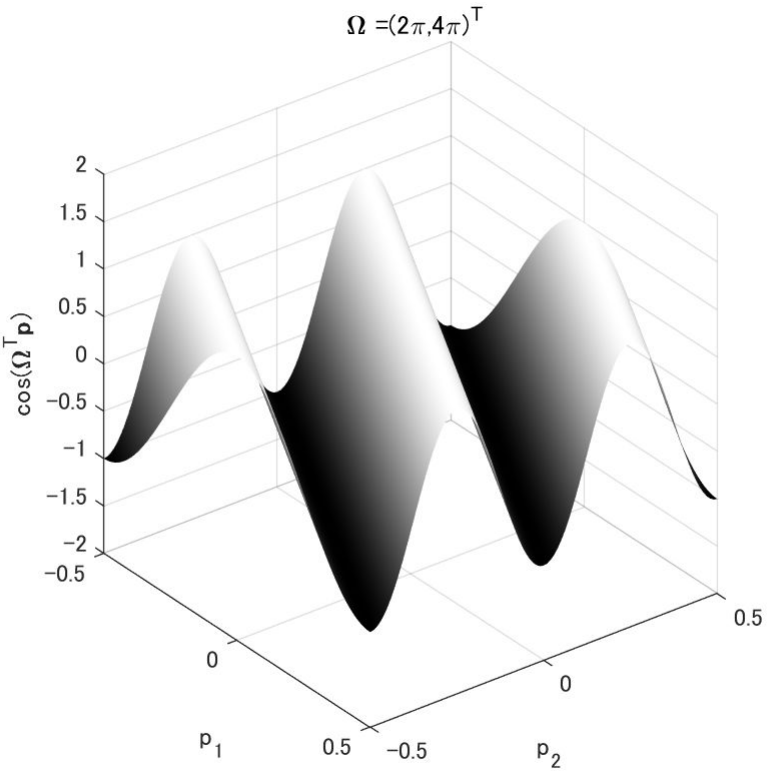
```
% Definition of sampling points
[p2,p1] = meshgrid(-0.5:0.01:0.5,-0.5:0.01:0.5);

% Definition of a bivariate cosine wave
x = cos(Omega1*p1 + Omega2*p2);
```

二変量余弦波の表示

(Bivariate cosine wave display)

```
% Display of a bivariate cosine wave
surf(p2,p1,x)
xlabel('p_2')
ylabel('p_1')
zlabel('cos({\bf\Omega}^T{\bfp})')
title(['{\bf \Omega} =(' num2str(Omega1/pi) '\pi,' num2str(Omega2/pi) '\pi)^T'])
colormap gray
shading interp
axis([-0.5 0.5 -0.5 0.5 -2 2])
axis ij
axis vis3d
```



表示を回転

(Rotate the display)

```
%{
```

```
stepAngle = 2;
for iAngle=1:stepAngle:360
    camorbit(0,stepAngle,'camera');
    drawnow
end
%}
```