

# Sample 10-6

## 冗長変換

$\ell_1$  -ノルム最小化

画像処理特論

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動作確認: MATLAB R2020a

## Redundant transforms

$\ell_1$  -norm minimization

Advanced Topics in Image Processing

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Verified: MATLAB R2020a

## 準備

(Preparation)

```
close all
```

## 非線形近似の設定

(Settings of non-linear approximation)

```
% # of Coefs.  
K = 32;
```

## 入力信号の生成

(Generation of input sequence)

```
% # of input samples  
nSamples = 128;  
  
% Random process in AR(1) model  
rng('default');  
w = 0.1*randn(nSamples,1);  
w(floor(end/2)) = 1;  
u = filter(1,[1 -0.95],w);
```

## 合成辞書

(Synthesis dictionary)

```
% Synthesis filters
```



3

[illegible]

33 列から 64 列

[illegible]



最適解が見つかりました。

```
s = z(1:M) - z(M+1:end);
```

係数選択 (Coefficient selection)

```
s = s(:);  
[~,ix] = sort(abs(s), 'descend');  
s(ix(K+1:end)) = 0;
```

近似結果 (Approximation result)

```
v = D*s;
```

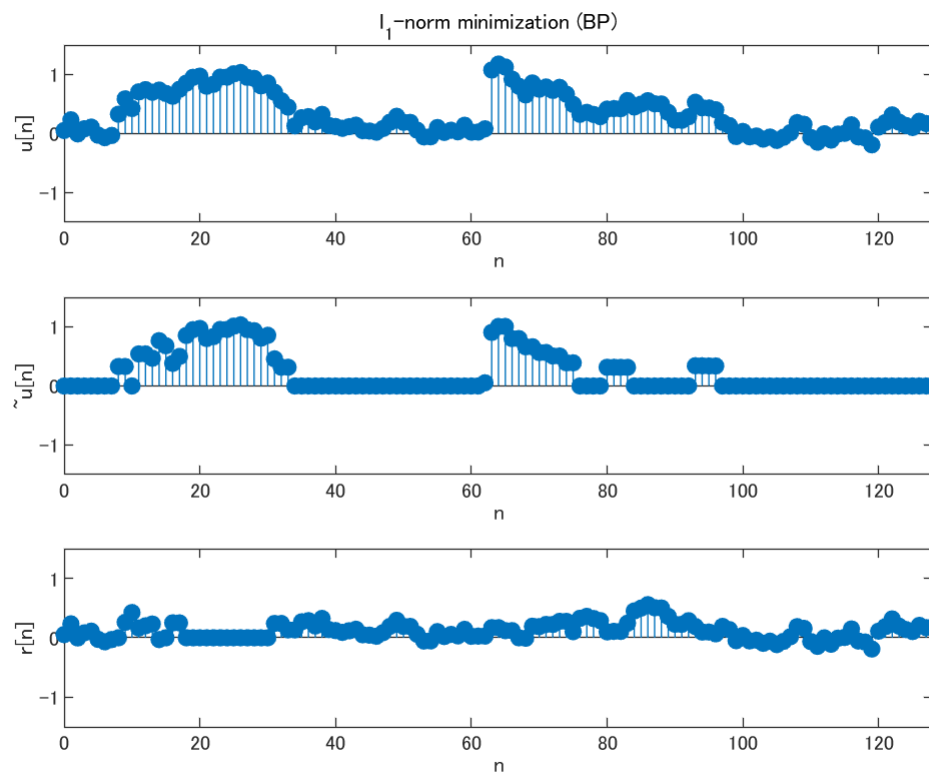
近似誤差 (Residual)

```
r = u - v;
```

## グラフ描画

(Graph plot)

```
figure(1)  
  
% Input  
subplot(3,1,1)  
stem(0:nSamples-1,u, 'filled')  
axis([0 nSamples -1.5 1.5])  
xlabel('n')  
ylabel('u[n]')  
title('l_1-norm minimization (BP)')  
  
% NLA  
subplot(3,1,2)  
stem(0:nSamples-1,v, 'filled')  
axis([0 nSamples -1.5 1.5])  
xlabel('n')  
ylabel('~u[n]')  
  
% Residual  
subplot(3,1,3)  
stem(0:nSamples-1,r, 'filled')  
axis([0 nSamples -1.5 1.5])  
xlabel('n')  
ylabel('r[n]')
```



MSE 評価 (MSE evaluation)

```
mymse = @(x,y) mean((x(:)-y(:)).^2);
fprintf('mse = %f\n',mymse(u,v));
```

```
mse = 0.035184
```

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