

拡大系状態空間表現

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \\ \dot{\hat{x}}_1(t) \\ \dot{\hat{x}}_2(t) \end{bmatrix} = \begin{bmatrix} -1 & -2 & 0 & 0 \\ -1 & -4 & 0 & 0 \\ 0 & -14 & -1 & 12 \\ 0 & 4 & -1 & -8 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ \hat{x}_1(t) \\ \hat{x}_2(t) \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} u(t)$$

$$\begin{bmatrix} y(t) \\ \hat{y}(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ \hat{x}_1(t) \\ \hat{x}_2(t) \end{bmatrix}$$

初期条件

$$x_1(0) = -1, x_2(0) = 1$$

$$\hat{x}_1(0) = 0, \hat{x}_2(0) = 0$$

MATLAB

拡大系状態空間表現

```
sys1=ss([-1 -2 0 0; -1 -4 0 0; 0 -14 -1 12; 0 4 -1 -8],[1; 1; 1; 1],[1 0 0 0],0)
```

```
a =    x1    x2    x3    x4
```

```
  x1   -1   -2    0    0
```

```
  x2   -1   -4    0    0
```

```
  x3    0  -14   -1   12
```

```
  x4    0    4   -1   -8
```

```
b =    u1
```

```
  x1    1
```

```
  x2    1
```

```
  x3    1
```

```
  x4    1
```

```
c =    x1    x2    x3    x4
```

```
  y1    1    0    0    0
```

```
sys2=ss([-1 -2 0 0; -1 -4 0 0; 0 -14 -1 12; 0 4 -1 -8],[1; 1; 1; 1],[0 1 0 0],0)
```

```
sys3=ss([-1 -2 0 0; -1 -4 0 0; 0 -14 -1 12; 0 4 -1 -8],[1; 1; 1; 1],[0 0 1 0],0)
```

```
sys4=ss([-1 -2 0 0; -1 -4 0 0; 0 -14 -1 12; 0 4 -1 -8],[1; 1; 1; 1],[0 0 0 1],0)
```

初期値応答

```
x0=[1; -1; 0; 0];
```

```
>> initial(sys1,sys2,sys3,sys4,x0)
```

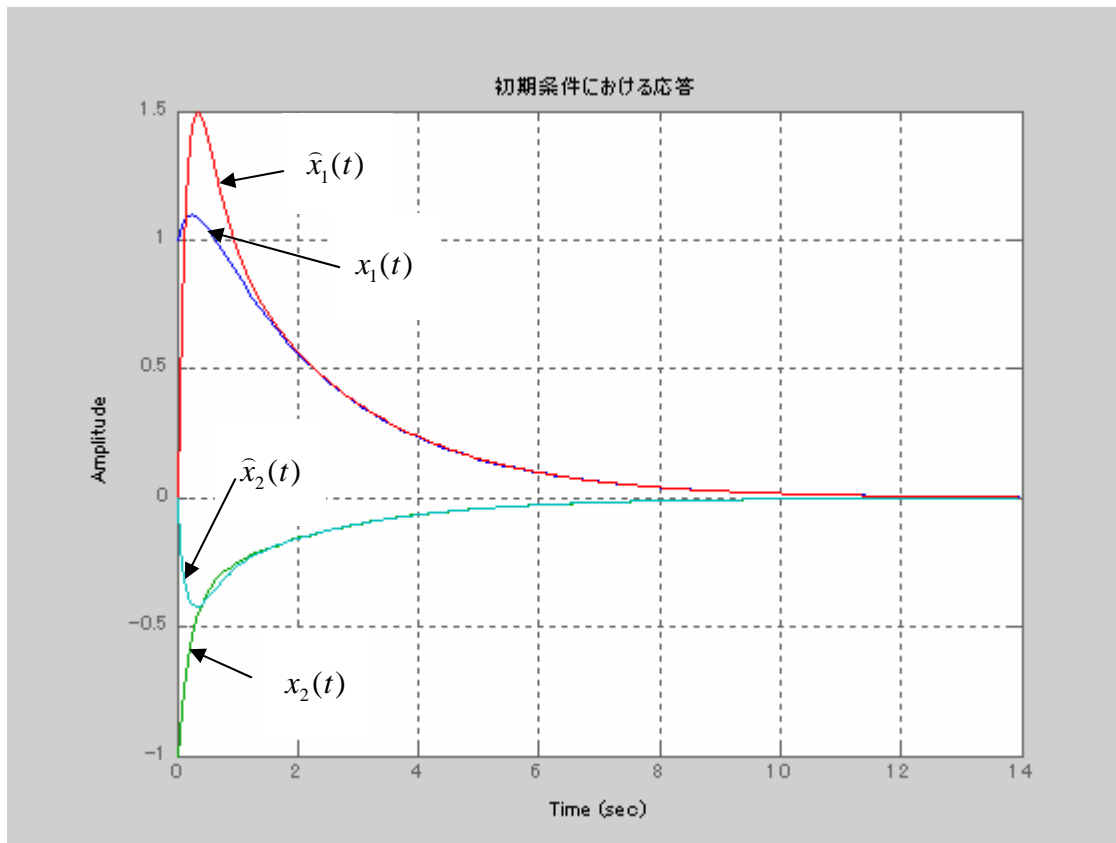
単位ステップ応答

```
t=0:0.05:2;
```

```
>> u=ones(1,41);
```

```
>> lsim(sys1,sys2,sys3,sys4,u,t,x0);
```

初期値応答



単位ステップ応答

