# 前文中的代码

syms d1 d2 tx0 tx1 tx2 ty0 ty1 ty2

X = [1,d1,d2,0,0;0,1,d1,d2,0;0,0,1,d1,d2]

Y = [d2,d1,1,0,0;0,d2,d1,1,0;0,0,d2,d1,1]

Tx = [tx0,tx1,tx2];

Ty = [1,ty1,ty2]; % ty0 set to 1

eq = Tx\*X == Ty\*Y;

vars = [tx0,tx1,tx2,ty1,ty2]

sol = solve(eq,vars)

# 封装一下

clear

syms d1 d2

x=[1,d1,d2];

y=[d2,d1,1];

[solX, solY] = relaSolve(x, y)

checkRela(solX, solY, x, y)

# 大一点的矩阵

clear

syms a0 a1 a2 a3 a4 a5 b0 b1 b2 b3

x=[a0,a1,a2,a3,a4,a5];

y=[b0,b1,b2,b3];

x\_start = 0;

y\_start = 1; % y[n]中h项从h[n-1]开始

[solX, solY]=relaSolve(x, y, x\_start, y\_start)

checkRela(solX, solY, x, y, x\_start, y\_start)

# 其他测试

clear

syms a0 a1 a2 a3 a4 a5 b0 b1 b2 b3

x=[a0,a1,0,a3,a4,a5];

y=[b0,114,b2,b3]; % 混杂一点其他数字

[solX, solY]=relaSolve(x, y)

checkRela(solX, solY, x, y)

function [solX, solY] = relaSolve(x, y, x\_start, y\_start)

if nargin == 2

x\_start = 0; y\_start = 0;

end

x0\_stored = x(1);

idx\_start = min(x\_start, y\_start);

x = [zeros(1, x\_start-idx\_start), x];

y = [zeros(1, y\_start-idx\_start), y];

padded\_len = length(x) + length(y) - 1;

x\_pad = padded\_len - length(x);

y\_pad = padded\_len - length(y);

x = [x, zeros(1, x\_pad)];

y = [y, zeros(1, y\_pad)];

X = sym(zeros(x\_pad+1, padded\_len));

Y = sym(zeros(y\_pad+1, padded\_len));

for k = 1:x\_pad+1

X(k, :) = circshift(x, k-1);

end

for k =1:y\_pad+1

Y(k, :) = circshift(y, k-1);

end

X

Y

Tx = arrayfun(@(i) sym(['tx', num2str(i)]), 0:x\_pad);

Ty = arrayfun(@(i) sym(['ty', num2str(i)]), 0:y\_pad);

% 生成sym

Ty(1)=1; % set to 1 as our wish

eq = Tx\*X == Ty\*Y;

vars = [Tx(:); Ty(:)];

vars = vars(vars ~= 1);

sol = solve(eq,vars);

sol.ty0 = 1;

fields = fieldnames(sol);

idx\_ty1 = find(strcmp(fields, 'ty1'));

new\_fields = [fields(1:idx\_ty1-1); {'ty0'}; fields(idx\_ty1:end-1)];

sol = orderfields(sol, new\_fields);

fields = fieldnames(sol);

% 遍历所有字段，并将每个字段的值乘以x0\_stored以归一化

for i = 1:numel(fields)

field = fields{i};

sol.(field) = sol.(field) \* x0\_stored;

end

idx\_split = find(strcmp(fieldnames(sol), 'ty0'));

fields1 = fields(1:idx\_split-1);

fields2 = fields(idx\_split:end);

solX = rmfield(sol, fields2);

solY = rmfield(sol, fields1);

end

function checkRela(solX, solY, x, y, x\_start, y\_start)

if nargin == 4

x\_start = 0; y\_start = 0;

end

Tx=struct2cell(solX);

Ty=struct2cell(solY);

LHS=Tx\*([zeros(1,x\_start),x])

RHS=(Ty\*([zeros(1,y\_start),y])).'

disp('Check that they are the same:')

disp('LHS-RHS=')

disp(LHS-RHS)

end