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| **实验摘要：**  实验目的：   1. 熟悉使用matlab软件绘制信号图像的基本方法和步骤，掌握画图的基本函数 2. 熟悉信号的基础变换，并正确绘出变换后的信号图像   实验要求：  使用matlab正确绘制信号图像 |
| **实验题目** |

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| **实验内容**  **一、基本原理及步骤**   1. 根据题目要求，给出对应信号的方程计算公式 2. 若信号为连续性，使用函数画图；若为离散型，使用函数画图 3. 检测图像的正确性   **二、实验结果**  第一题图片结果如下图：        上述6个图分别对应题目1中的6个信号，将其函数画出即为上图 |
| 第二题图片结果如下图：      以上三个图分别对应信号的两次变换和求导  第九题图片结果如下图所示：    该图即第九题中的“Square Wave”方波 |
| **实验总结**   1. 以前并没有使用画过离散的信号图，因此对stem函数并不熟悉。在画图过程中使用函数画图时发现图连续且与x轴并没有连线，故查阅手册发现专门画离散信号的函数 2. 熟悉了阶跃函数、门函数在中的简便计算方法，取代了使用for循环挨个赋值的繁琐步骤 3. 再次练习了使用画图 |
| **参考文献**   1. 信号与线性系统分析第5版 2. Matlab Documentation |
| **源代码附件**  **问题一**  %% p1  figure(1);  t1 = -1:0.01:10;  f1 = zeros(size(t1));  f1(t1>=0) = 1;  plot(t1, f1);  xlabel('t');  ylabel('f1(t)');  title('f1(t) = ε(t)');  beauty\_plot;    %% p2  figure(2);  t2 = 0:0.01:10;  f2 = 4\*exp(-0.5\*t2).\*cos(pi\*t2);  plot(t2, f2);  xlabel('t');  ylabel('f2(t)');  title('f2(t) = 4e^{-0.5t}cos(\pit)');  beauty\_plot;    %% p3  figure(3);  t3 = -10:0.01:10;  tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1(t3 <= 1) = 1;  tmp2(t3 >= -1) = 1;  g2 = tmp1 - tmp2; |
| tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1(t3 <= 2) = 1;  tmp2(t3 >= -2) = 1;  g4 = tmp1 - tmp2;    f3 = g2 + g4;  plot(t3, f3);  xlabel('t');  ylabel('f3(t)');  title('f3(t) = g2(t) + g4(t)');  beauty\_plot;    %% p4  figure(4);  k4 = -10:1:20;  f4 = zeros(size(k4));  f4(k4>=-2) = 1;  f4(k4>=5) = f4(k4>=5) - 1;  stem(k4, f4);  xlabel('k');  ylabel('f4(k)');  title('f(k) = ε(k+2) - ε(k-5)');  beauty\_plot    %% p5  figure(5);  k5 = -5:1:20;  f5 = 7 \* (0.6).^k5 .\* cos(0.9\*pi\*k5);  stem(k5, f5);  xlabel('k');  ylabel('f5(k)');  title('f5(k) = 7\*(0.6)^k\*cos(0.9πk)');  beauty\_plot;    %% p6  figure(6);  t6 = -20:0.01:20;  f6 = sin(t6) ./ t6;  plot(t6, f6);  xlabel('t');  ylabel('f6(t)');  title('f6(t) = sin(t)/t');  beauty\_plot; |
| **问题二**  %% f3  t3 = -10:0.01:10;  tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1(t3 <= 1) = 1;  tmp2(t3 >= -1) = 1;  g2 = tmp1 - tmp2;  tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1(t3 <= 2) = 1;  tmp2(t3 >= -2) = 1;  g4 = tmp1 - tmp2;  f3 = g2 + g4;  %% (1)  figure(1);  tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1(2 \* t3 <= 1) = 1;  tmp2(2 \* t3 >= -1) = 1;  g21 = tmp1 - tmp2;    tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1(2 \* t3 <= 2) = 1;  tmp2(2 \* t3 >= -2) = 1;  g41 = tmp1 - tmp2;    f31 = g21 + g41;    plot(t3, f31);  xlabel('t3');  ylabel('f3(2t)');  title('f3(2t) = g2(2t) + g4(2t)');  beauty\_plot;  %% (2)  figure(2);  tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1((4 - 2 \* t3) <= 1) = 1;  tmp2((4 - 2 \* t3) >= -1) = 1;  g22 = tmp1 - tmp2;  tmp1 = zeros(size(t3));  tmp2 = zeros(size(t3));  tmp1((4 - 2 \* t3) <= 2) = 1;  tmp2((4 - 2 \* t3) >= -2) = 1;  g42 = tmp1 - tmp2;  f32 = g22 + g42;    plot(t3, f32);  xlabel('t3');  ylabel('f3(2t)');  title('f3(2t) = g2(2t) + g4(2t)');  beauty\_plot; |
| %% (3)  figure(3);    f33 = diff(f32);    plot([-10:0.01:9.99] ,f33);  xlabel('t3');  ylabel('f3(4-2t)');  title('f3(4-2t)');  beauty\_plot; |
| **问题九**  Square Wave函数部分  function y = square\_wave(n)    t = linspace(0, 4\*pi, 1001);  y = zeros(size(t));    for k = 1:n  y = y + sin((2\*k-1)\*t) ./ (2\*k-1);  end    end  调用运行部分  y = square\_wave(200);  plot(linspace(0, 4\*pi, 1001), y);  xlabel('t');  ylabel('y');  title('Square Wave');  beauty\_plot; |
| **beauty\_plot函数部分**  function beautiplot(model)  % --input : model  % --model : 'default'  % : 'small'  % --usage :  % beautiplot  % beautiplot('small')  %%  if nargin<1  model = 'default';  end  fig=gcf;  % fontname = 'Times New Roman';  fontname = 'STFangSong';  %% set Figure  set(fig,'Units','pixels');  %%  figchildren = fig.Children;  for ax\_i = 1 : length(figchildren)  figChildren = figchildren(ax\_i);  if strcmp(figChildren.Type,'axes') == 1  ax = figChildren;  class1=ax.Children; |
| %% set Axes  % 字体  set(ax,'FontName',fontname,'FontSize',10,'FontWeight','bold');  % 网格  set(ax,'XGrid','on','YGrid','on','GridLineStyle','--','GridAlpha',0.15);  % 边框  set(ax,'Box','off','LineWidth',1.5);  % 刻度  set(ax,'XMinorTick','on','YMinorTick','on');  % 标题    switch model  case 'default'  set(ax.XLabel,'FontSize',12,'FontWeight', 'bold');%normal  set(ax.YLabel,'FontSize',12,'FontWeight', 'bold');  set(ax.ZLabel,'FontSize',12,'FontWeight', 'bold');  set(ax.Title,'FontSize',13,'FontWeight', 'bold');  case 'small'  set(ax.XLabel,'FontSize',10,'FontWeight', 'bold');%normal  set(ax.YLabel,'FontSize',10,'FontWeight', 'bold');  set(ax.ZLabel,'FontSize',10,'FontWeight', 'bold');  set(ax.Title,'FontSize',11,'FontWeight', 'bold');  end  %% set Legend  % try  % set(ax.Legend,'Location','best','FontName',fontname,...%'Orientation','horizontal'  % 'FontWeight', 'bold');  % catch  try  set(ax.Legend,'FontName',fontname,...%'Orientation','horizontal'  'FontWeight', 'bold');  catch    end  %% set class  for i=1:length(class1)  % line(线图)  if strcmp(class1(i).Type,'line')==1  set(class1(i),'LineWidth',2,'MarkerSize',6);  % scatter(散点图)  elseif strcmp(class1(i).Type,'scatter')==1  set(class1(i),'MarkerFaceColor',[0.15,0.15,0.15],...  'LineWidth',2,...  'MarkerFaceAlpha',0.8);  % bar(柱状图)  % elseif strcmp(class1(i).Type,'bar')==1  % set(class1(i),'FaceColor',[0.47,0.67,0.19],'EdgeColor',[0 0 0],...  % 'LineWidth',1.5);  elseif strcmp(class1(i).Type,'bar')==1  set(class1(i),...  'LineWidth',1.5); |
| % text(文字)  elseif strcmp(class1(i).Type,'text')==1  set(class1(i),'FontSize',12,'FontName',fontname,'FontWeight', 'bold');  end  end  end  end    end |