Stochastic Signal Processing

Lesson 1 - Experiment

Weize Sun

Getting Start with a Game

- Installing Matlab
- Start to use it: https://blog.csdn.net/cnds123/article/details/99645919

matlab入门（适合初学者）

原创 软件开发技术爱好者 于 2019-08-15 17:29:56 发布 32477 收藏 385 版权

分类专栏： R & matlab 系列

R & matlab 系列 专栏收录该内容 4 订阅 2 篇文章 订阅专栏

matlab入门

MATLAB 是“matrix laboratory”的缩写形式。MATLAB® 主要用于处理整个的矩阵和数组，而其他编程语言大多逐个处理数值。矩阵是指通常用来进行线性代数运算的二维数组。

MATLAB 是美国MathWorks公司出品的商业数学软件，用于算法开发、数据可视化、数据分析以及数值计算的高级技术计算语言和交互式环境，主要包括MATLAB和Simulink两大部分。MATLAB拥有丰富的算法工具箱，因此在工程计算、控制设计、信号处理与通讯、图像处理、信号检测、金融建模设计与分析等领域都能看到它的身影，可谓是无处不在。功能强大，MATLAB 安装包比较大，R2018b版12G。

matlab安装包体积巨大，下载安装都是比较耗时的，正版软件太贵。你可以使用云超级应用，简单的来说就是软件搭载服务器上，你不用安装到本地电脑，只要有网络即可进行学习实验。可以用此了解学习。

在线版matlab（网页版，web版），不用安装了，可以用此了解学习，地址：

https://uzer.me/u/signin 【注、此网址目前已打不开，请改用官网在线体验 https://matlab.mathworks.com/】

没有注册账号，先注册，注册时需要使用手机接收验证消息。

Getting Start with a Game

- Now we use a Game as a starter
- Suppose you joint such a game:
  1. There are 40 persons in the game, 39 counterparties and you
  2. In each time, two person (20 pairs) will trade with each other
  3. You and your counterparties both have two options:
     - Trade, or says, trust.
     - Cheat, or says, betray.

     Once both persons choose his/her option, calculate the points he/she get as the table

		A	
		trust	betray
B	trust	A: +10; B: +10	A: +2X; B: -X
	betray	A: -X; B: +2X	A: -Y; B: -Y

Getting Start with a Game

- Encourage trust and trade: win-win
- The social reality is: if one get betrayed, he will loss something, i.e. money; the person who betray him will gain something. (-X, +2X)
- In some cases, if both person betray each other, they will loss something, i.e., time, reputation, … (both -Y)

		A	
		trust	betray
B	trust	A: +10; B: +10	A: +2X; B: -X
	betray	A: -X; B: +2X	A: -Y; B: -Y

```
if Strategy_this==0
    if Strategy_counterparty==0
        Return_one_trade(person_id) = 10;   % both trust, add 10 points
    else
        Return_one_trade(person_id) = -6;   % self trust, counterparty betray, -X = -6 points
    end
else
    if Strategy_counterparty==0
        Return_one_trade(person_id) = 12;   % self betray, counterparty trust, + 2 * X = 12 points
    else
        Return_one_trade(person_id) = 0;    % self betray, counterparty betray, -Y = -0 points
    end
end
```

Getting Start with a Game

		A	
		trust	betray
B	trust	A: +10; B: +10	A: +2X; B: -X
	betray	A: -X; B: +2X	A: -Y; B: -Y

- Now we use a Game as a starter
- Suppose you joint such a game:
  1. There are 40 persons in the game, 39 counterparties and you
  2. In each time, two person (20 pairs) will trade with each other
  3. You and your counterparties both have two options:
     - Trade, or says, trust.
     - Cheat, or says, betray.

     Once both persons choose his/her option, calculate the points he/she get as the table
  4. Repeat 2-3 N times, here we use N = 100 first. In each time, the pairs are randomly settled.

Now, let’s go to the program

Getting Start with a Game

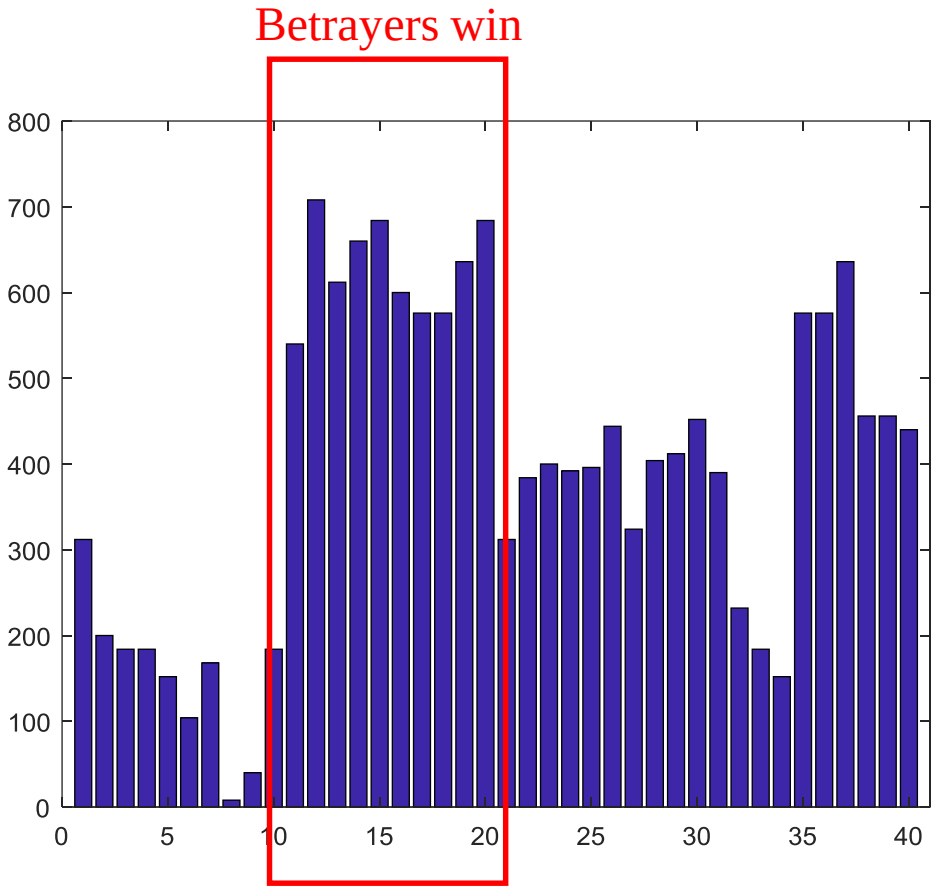
- Pre-set Strategies:
  - 13 always trust (ID1-ID10 & ID32-ID34)
  - 13 always betray (ID11-ID20 & ID35-ID37)
  - 13 trust one time and then betray one time and go on (ID21-ID30 & ID38-ID40)
    - Therefore, this Strategy should remember how many times he/she had already traded, or, what action he/she had used in the last time.
    - Here we use ‘remember how many times he/she had already traded’ as an example
  - 1 Society Revenger (ID31)
    - If he/she get trusted last time, trust the person this time
    - If he/she get betrayed last time, betray the person this time
    - Therefore, the information of what action one person faced in last time will be provided via an .mat file.

Getting Start with a Game: engineering basic

- Some parts of the program are very stupid, for example:
  - Every one has the right to storage and read files
  - …
- However, the basic prototype of this game can be said as ‘well developed’
- And also, this mini prototype shows the way to make lots of persons to cooperate with each other:
  - One write the whole framework, and design what and how others are written by who
  - Other persons finish his part following the specifications (规范)
- For a research person, ‘well developed’ prototype is very important: if it is valuable, you can improve it latter given time and money

Some interesting testing

- Pre-set Strategies:
  - 13 always trust (ID1)
  - 13 always betray (ID11)
  - 13 trust one time and then be
    - Therefore, this Strategy shoul
      what action he/she had used in
    - Here we use ‘remember how r
  - 1 Society Revenger (ID31)
    - If he/she get trusted last time,
    - If he/she get betrayed last time
    - Therefore, the information of
      via an .mat file.



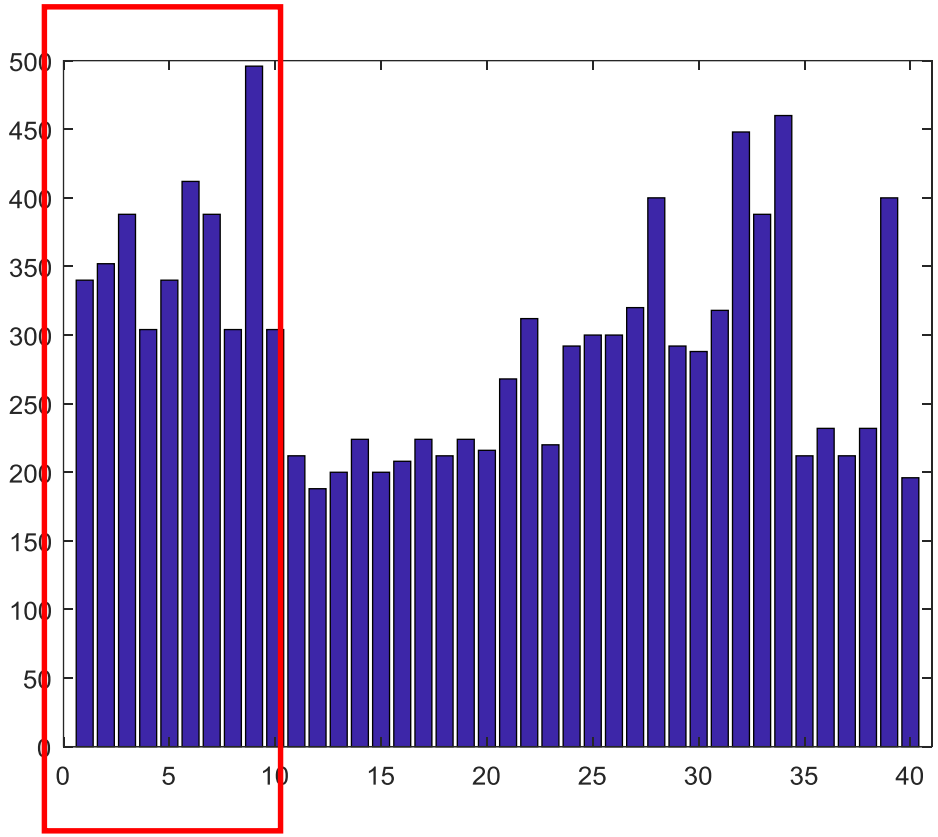
Under X=6, Y=0

		A	
		trust	betray
B	trust	A: +10; B: +10	A: +2X; B: -X
	betray	A: -X; B: +2X	A: -Y; B: -Y

Some interesting testing

- Pre-set Strategies:
  - 13 always trust (ID1)
  - 13 always betray (ID11)
  - 13 trust one time and then be
    - Therefore, this Strategy shoul
      what action he/she had used in
    - Here we use ‘remember how r
  - 1 Society Revenger (ID31)
    - If he/she get trusted last time,
    - If he/she get betrayed last time
    - Therefore, the information of
      via an .mat file.

Good persons win



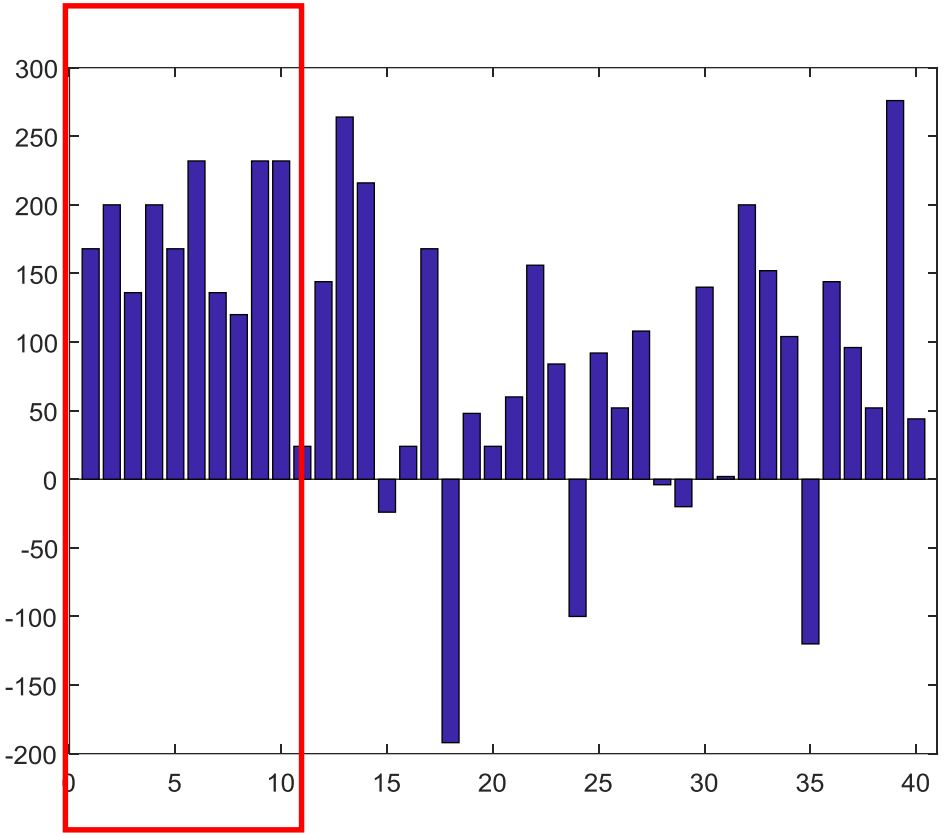
Under X=2, Y=0

		A	
		trust	betray
B	trust	A: +10; B: +10	A: +2X; B: -X
	betray	A: -X; B: +2X	A: -Y; B: -Y

Some interesting testing

- Pre-set Strategies:
  - 13 always trust (ID1)
  - 13 always betray (ID11)
  - 13 trust one time and then be
    - Therefore, this Strategy shoul
      what action he/she had used in
    - Here we use ‘remember how r
  - 1 Society Revenger (ID31)
    - If he/she get trusted last time,
    - If he/she get betrayed last time
    - Therefore, the information of
      via an .mat file.

Good persons win
in the sense of probability



Under X=6, Y=12

		A	
		trust	betray
B	trust	A: +10; B: +10	A: +2X; B: -X
	betray	A: -X; B: +2X	A: -Y; B: -Y

Mini Course/Experimental homework 1

- Hand in your program with your strategy before 23:59:59, 09/03
- Must write your `student ID and Name` in your submitted file
- Follow the ID list, for example, XXXX should name your submitted file as 'ID1.m', but not any other name!
- In your file, the only two .mat files you can operate are:
  - infor_idXX.mat (read only)
  - Storage_idXX.mat (read and write)

- 本作业考量的是大家遵循编程要求和编程规范的编程概念，所有交了程序的同学，只要符合上述规范，无论用了什么strategy，一律100分。
- 但是，大家可以思考怎么才能让自己在交易中获得最高分！（under X=4, Y=5）
- 本作业的最大意义在于让大家有兴趣地编程。附带熟悉这套逻辑，为experimental report 1打基础。

```
文件  导航  编辑  断点  运行
% Print your student ID and Name here, for example
% 000000    Weize Sun
%%
% your_strategy returns your strategy of the trade this time
% your_strategy = 0 means that you want to trust the counterparty this time
% your_strategy not equal to 0 means that you want to betray the
% counterparty this time
%%
% counterparty_id is the ID of the counterparty you are going to trade with
% this time
function [your_strategy] = id1(counterparty_id)
    your_strategy = 0;  % this strategy means that you will always trust anyone
end
```

ID list

- 请严格按照本列表，交自己ID号的程序；23:59:59, 09/03前直接email交给刘译哲
  - email交作业格式：
    - 所有文件均打包到一个rar文件
    - rar文件名，和email的标题，都命名为“学号+姓名+MiniProgramHomework1”

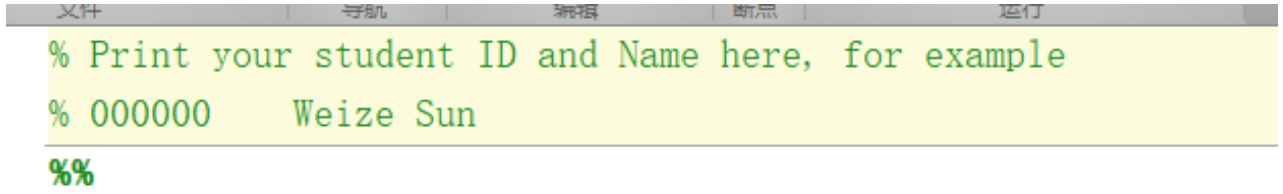
交程序的ID号	学号	姓名		交程序的ID号	学号	姓名		交程序的ID号	学号	姓名
1	2022040399	张桂嘉		11	2022280179	李梓琦		21	2022280450	孙浩然
2	2022090123	徐雷		12	2022280247	林茵茵		22	2022280453	陈奇峰
3	2022110131	廖祖颐		13	2022280297	陈应权		23	2022280485	贾苏健
4	2022270054	詹兴足		14	2022280307	叶朗钊		24	2022280546	张梓荣
5	2022280039	郭瑞煜		15	2022280327	古炜		25	2022280553	林凡超
6	2022280069	曾颖岚		16	2022280365	郭展鹏		26	2022280562	陈柯瑜
7	2022280105	郑志锰		17	2022280380	杨烨		27	2022280573	王梓为
8	2022280142	崔殷霖		18	2022280419	薛玉龙		28	2022280574	马海洲
9	2022280160	姚宇铭		19	2022280432	彭佳		29	2022300013	卫宏林
10	2022280162	曾源原		20	2022280445	何雨璇				

Problems – general problem

```
% Print your student ID and Name here, for example
% 没有写学号    没有写姓名
%%
% your_strategy returns your strategy of the trade this time
% your_strategy = 0 means that you want to trust the counterparty this time
% your_strategy not equal to 0 means that you want to betray the
% counterparty this time
%%
% counterparty_id is the ID of the counterparty you are going to trade with
% this time
function [your_strategy] = id40(counterparty_id)
    load infor_id40
    load storage_id40
    save('storage_id40', 'XXX', 'XXX')  % 无法运行
    your_strategy = round(rand(1),0);
    % this strategy means that you will always betray anyone
    % 不合理的注释
end
```

Problems– general problem

- There are some problems of the submitted program:
  - Fails to follow the rules



Problem of codes (previous years)

- There are some problems of the submitted program:
  - Use without loading the parameter from the .mat file

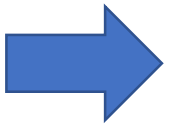
```
未定义函数或变量 'Trade_no'。

出错 id10 (line 18)
    Trade_no = Trade_no + 1;

出错 Run_Strategies (line 11)
    Strategies_one_trade(10) = id10(counterparty_list(10));

出错 main (line 36)
    Strategies_one_trade = Run_Strategies(counterparty_list);
```

```
function [your_strategy] = id10(counterparty_id)
    load infor_id10.mat
    if counterparty_action == 0
        your_strategy = 0;  % this means that you will tru
    else
        your_strategy = round(rand); % this means that you
    end
    Trade_no = Trade_no + 1;
    save('storage_id10', 'Trade_no', 'your_id')
    % your strategy will trush one person when last time
    % if last time you were betrayed, then you will have
```



```
function [your_strategy] = id10(counterparty_id)
    load infor_id10.mat
    load storage_id10.mat
    if counterparty_action == 0
        your_strategy = 0;  % this means that you will trust this person
    else
        your_strategy = round(rand); % this means that you will have a 50%
    end
    Trade_no = Trade_no + 1;
    save('storage_id10', 'Trade_no', 'your_id')
    % your strategy will trush one person when last time you were trusted,
    % if last time you were betrayed, then you will have a 50% chance of be
end
```

Problem of codes (previous years)

- There are some problems of the submitted program:
  - Wrong parameter name

```
未定义函数或变量 'Tarde_no'.

出错 id17 (line 27)
    if Tarde_no >= 3    % Be
```

```
load('storage_id17.mat', 'Trade_no',
your_strategy = 0;  % Firstly, trust
if counterparty_action == 1
    random_num = unifrnd(0, 1);
    if random_num > 0.5
        your_strategy = 1;
    else
        your_strategy = 0;
    end
    Trade_no = Trade_no + 1;
else
    your_strategy = 0;
end

if Tarde_no >= 3    % Being betrayed c
    your_strategy = 1;
end
```

```
if Trade_no >= 3    % Being
    your_strategy = 1;
end
```

Problem of codes (previous years)

- There are some problems of the submitted program:
  - Saving strange things

```
错误使用 save
'30' 不是有效的变量名称。

出错 id30 (line 20)
    save('storage_id30', 'Trade_no', '30')
```

```
function [your_strategy] = id30(counterparty_id)
    load storage_id30.mat
    if mod(Trade_no,3) == 0
        your_strategy = 1;  % To satisfy the earn
    else
        your_strategy = 0;  % this means that you
    end
    Trade_no = Trade_no + 1;
    save('storage_id30', 'Trade_no', '30')
```

```
function [your_strategy] = id30(counterparty_id)
    load storage_id30.mat
    if mod(Trade_no,3) == 0
        your_strategy = 1;  % To satisfy the earn
    else
        your_strategy = 0;  % this means that you
    end
    Trade_no = Trade_no + 1;
    save('storage_id30', 'Trade_no', 'your_id')
```

Problem of codes (previous years)

- There are some problems of the submitted program:
  - Display strange things
  - This problem will not lead to a bug, but will be very annoying when you are cooperating with others!
  - The rule of cooperation:

DO NOT DISPLAY ANYTHING UNLESS TOLD TO

```
%% Now we begins
function [your_strategy] = id29(counterparty_id)
    load storage_id29.mat
    load infor_id29.mat
    if counterparty_action == 0
        random = round(10*rand(1))
        if random <= 8
```

```
%% Now we begins
function [your_strategy] = id29(counterparty_id)
    load storage_id29.mat
    load infor_id29.mat
    if counterparty_action == 0
        random = round(10*rand(1));
```

Problem of codes (previous years)

- There are some problems of the submitted program:
  - for problems this year, I changed your Id to ‘idX’ as here the main purpose here is to show you the most common problems in programming

```
Trade_no = Trade_no + 1;
Betray_no = Betray_no + counterparty_action;
save('storage_idX', 'Trade_no', 'your_id',"Betray_no")
```

“ ” is not valid in Matlab

```
% this time
function [your_strategy] = id13(counterparty_id)
    load infor_id2021123456
    load storage_id2021123456.mat
```

fails to follow the Programming specification

```
end
persistent x % Number of recorded transactions
if isempty(x)
    x = 0
end
x = x + 1
```

```
x = randi(10)
if x <= 7
    your_strategy = 0;  % this m
else
    your_strategy = 1;  % this m
end
```

Do not output any non-neccessary things

```
n_trade =

    97


p =

    0.3700


n_trade =

    98


p =

    0.3663
```