

**Design4Practice (D4P) Program****To:** Dr. Trevas**From:** Yanchu Du**Due:** 7/5/2020**Re:** Individual Memo - Self Learning Report

This memorandum summarizes the process, achievements and application of the self-learning. I believe that the results of my self-learning will play a role in the design of vertical agriculture in the future.

My self-learning is about how to use matlab to program. I learned cs122 about matlab foundation in NAU, but it was a year and a half ago, so this self-study not only further studies Matlab's advanced skills, but also has the purpose of review. And with the improvement of my programming ability, I believe that I can solve some complex calculations and program some devices in the future. I think it's important.

First of all, I want to find out if there is a matlab tutorial in LinkedIn, but unfortunately LinkedIn doesn't. I then searched for matlab advanced programming tutorial on Google, and I was lucky to find a website with detailed information about Matlab's foundation and advanced use. I learned how to use matlab for differentiation, integration, polynomials, transforms and so on. I then watched YouTube videos on some of the points I was interested in to learn more.

Because my personal analysis is about the nutrition system of aquaponics, I made a simple code about nutrition system. Unfortunately, I haven't found some formulas about the nutrition system of aquaponics, so I wrote the code of hydroponics formula this time. This code is about electrical conductivity, We can measure the electrical conductivity to know the current status of nutrient solution and know what we are going to do next. Here are my early practice code:

```

%Yanchu Du
format long
fVstk=@(Vc,ECc) (Vt*ECt-Vc*ECc-ECw(Vt-Vc))/(ECstk-ECw);
ECw=400;
Vt=30;
ECt=1.5;
ECstk=1000;
for Vc=1:30
    for ECc=100:900
        Vstk=fVstk(Vc,ECc);
        Vw=Vt-Vstk-Vc;
    end
end
plot(Vc,Vstk),xlabel('Vc'),ylabel('Vstk');
plot(ECc,Vstk),xlabel('ECc'),ylabel('Vstk');
plot(Vc,Vw),xlabel('Vc'),ylabel('Vw');
plot(ECc,Vw),xlabel('ECc'),ylabel('Vw');|

```

where  $V_t$  is the target volume of the nutrient solution stored in the drainage tank;  $EC_t$  is the target EC value;  $V_c$  and  $EC_c$  represent the current volume of nutrient solution and EC in the drainage tank, respectively.  $V_w$  is the required injection amount of tap water;  $EC_w$  is EC of tap water;  $V_{stk}$  is the required injection amount of stock solution; and  $EC_{stk}$  is the conversion of the milli-equivalent concentration of stock solution to EC.

Of course, the code I'm doing is very simple, because the formula itself is not complicated, in fact, there are not too many advanced techniques. As a matter of fact, I still have some questions about octave of MATLAB at present, which has not been fully understood. And I think matlab Simulink is a very useful tool. I will spend more time in the future to study Simulink and use Simulink to improve my code.

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