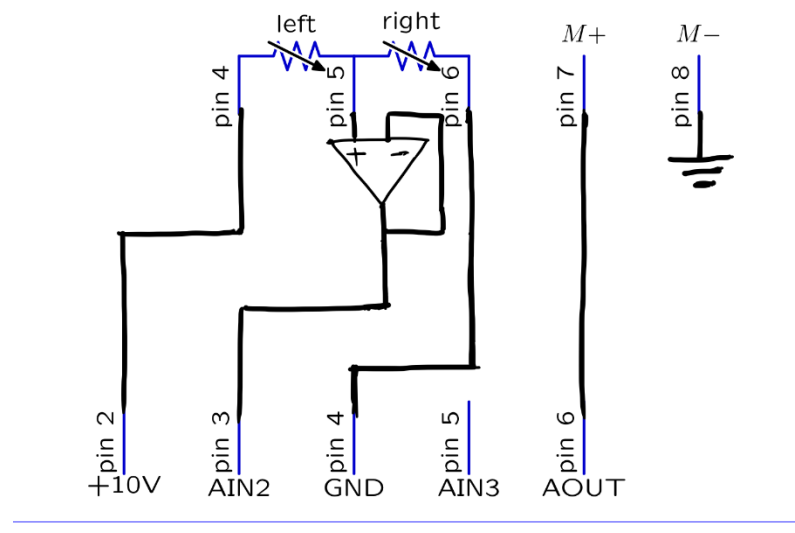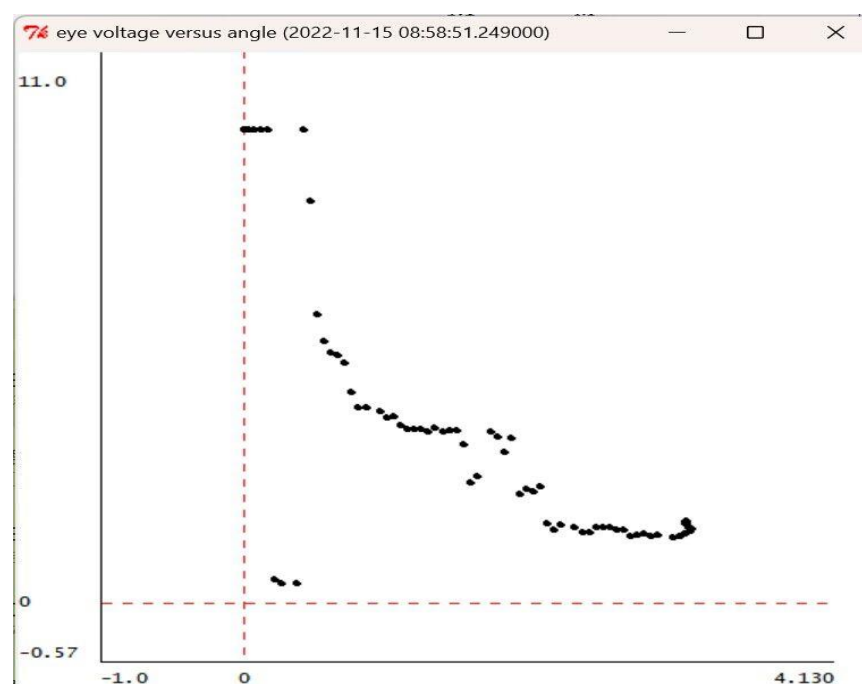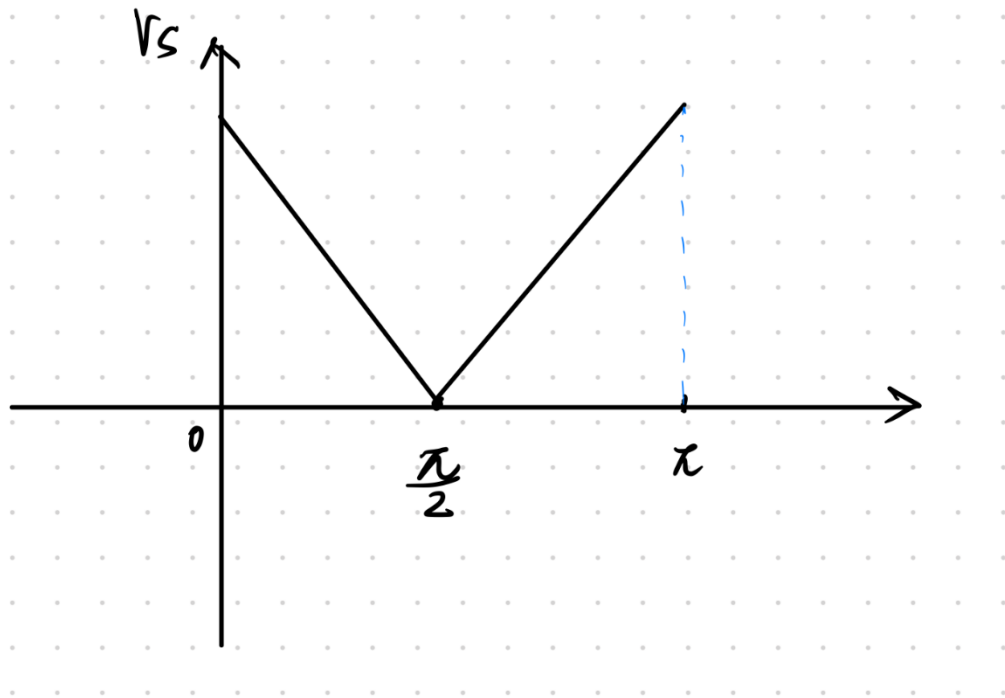Measuring k_s:

Connect the robot and head proto board through the circuit shown in the figure above.

Getting the plot of "vs signal as a function of rotation angle" through the analog input and AOUT interfaces of the robot:
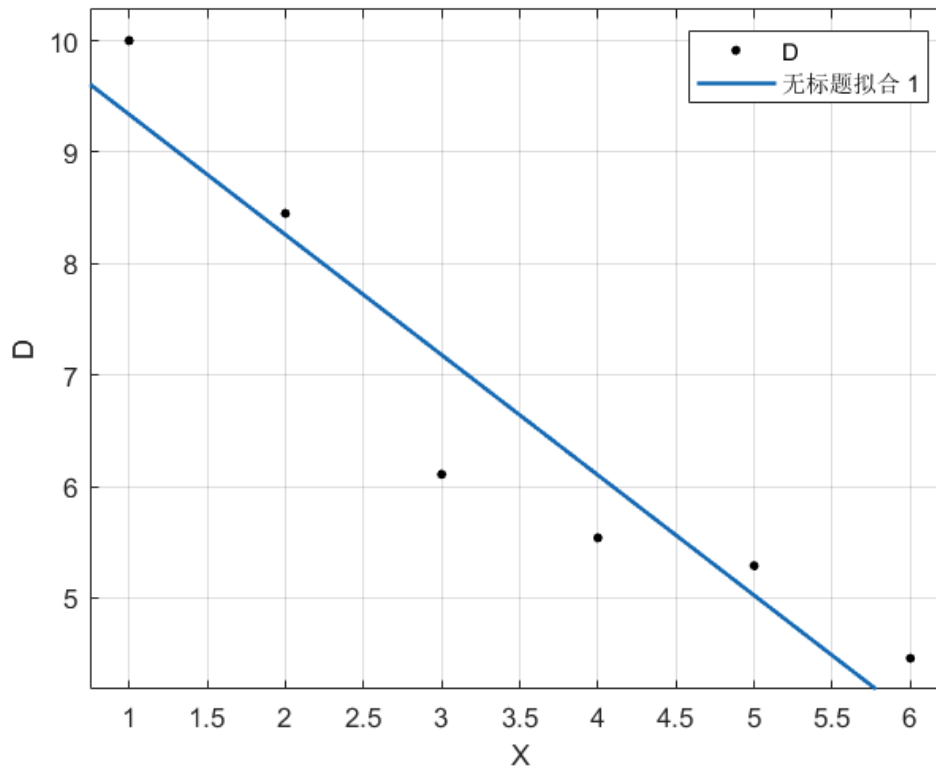
(The rotation angle changes from 0 to pi)。

However, the plot of "vs signal as a function of rotation angle" in theory is as followed:

We found that the scatter data obtained in the actual experiment had a certain linear relationship between the Angle of 0 and pi/2, which could be properly fitted. However, between pi/2 and pi, there was a big difference between the actual measured data and the theoretical value. We suspected that there were technical problems in the analog input and AOUT interface of the car. The error is very large. Therefore, we only used some scatter data in the first half of the scatter diagram for linear regression analysis and artificially removed some noise data. (Using
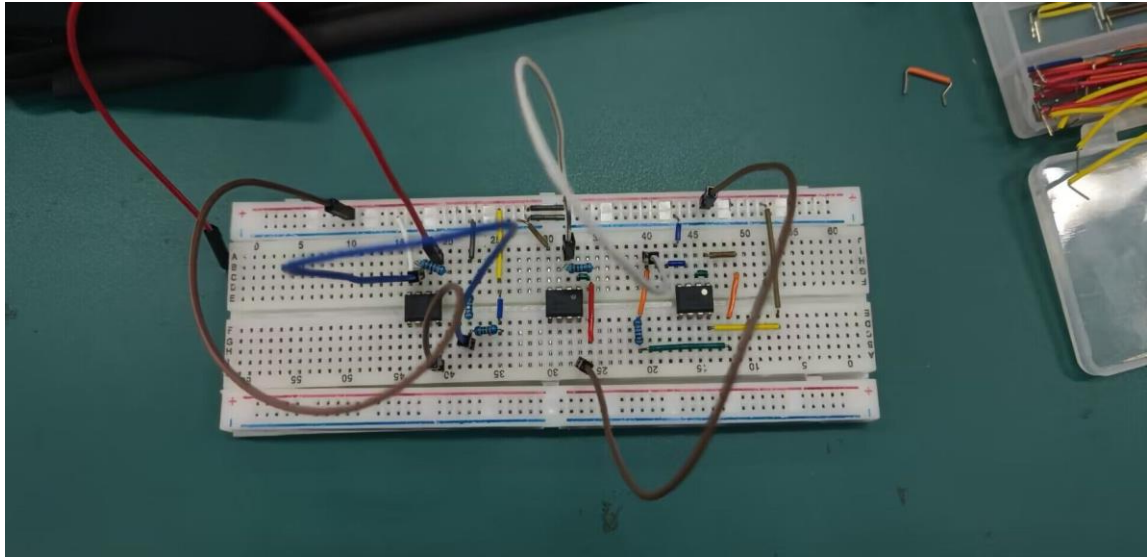
matlab's linear Fitting toolbox)

线性模型 Poly1:
    f(x) = p1*x + p2
系数(置信边界为 95%):
    p1 =   -1.079 (-1.579, -0.5782)
    p2 =   10.42 (8.468, 12.37)

拟合优度:
    SSE: 2.273
    R 方: 0.8995
    调整 R 方: 0.8744
    RMSE: 0.7539

The fit slope is -1.079, and the goodness of fit is 0.8995

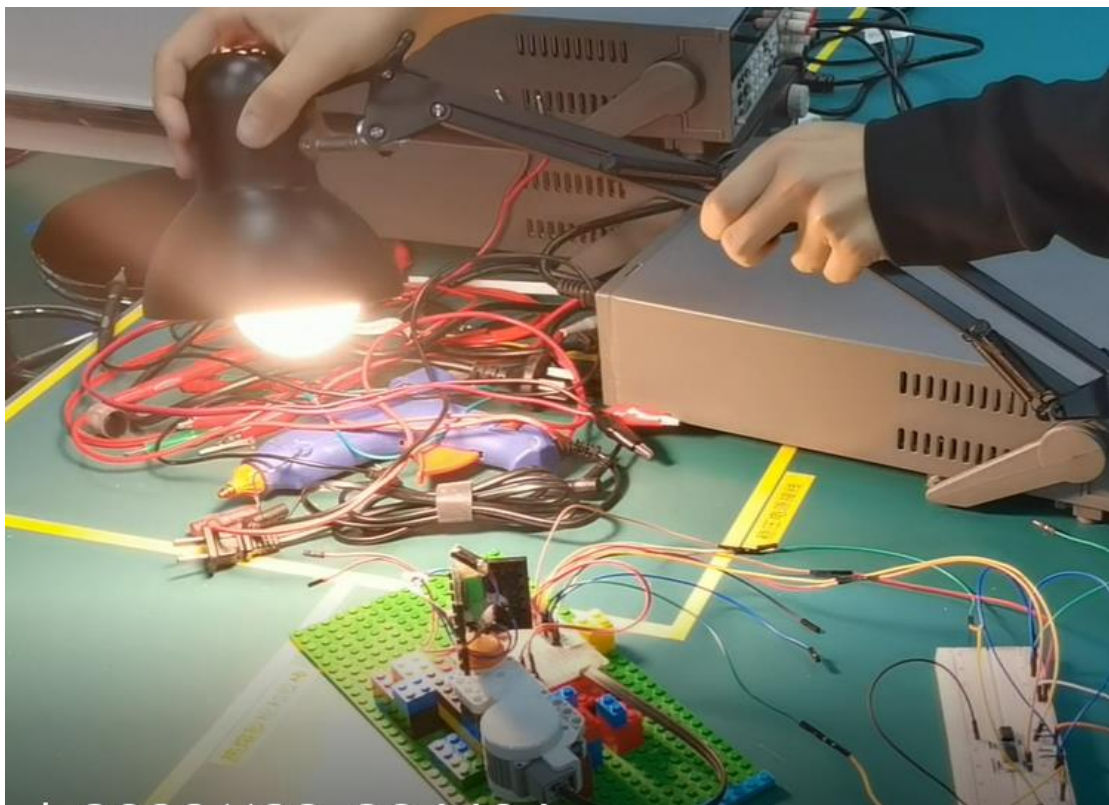Therefore, it is approximately believed that the k_s value
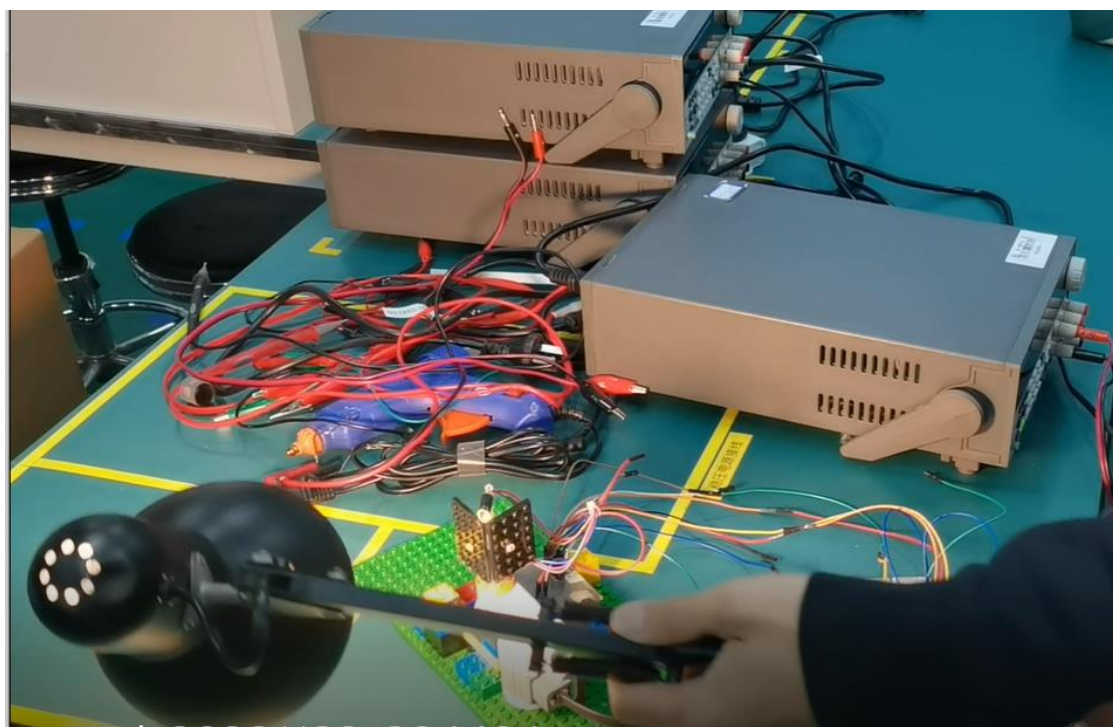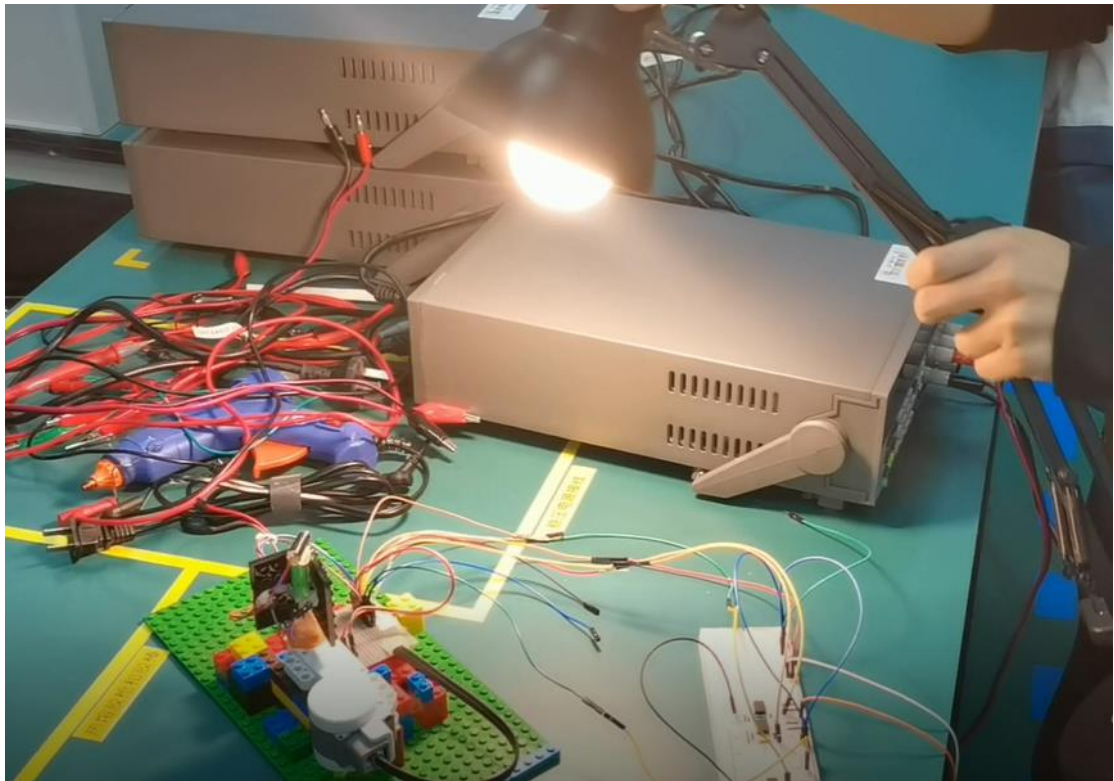
measured in the experiment is 1.1

Above is the circuit connected according to the theoretical circuit diagram in homework3.

By connecting the circuit with the head, we have achieved a better light tracing effect.
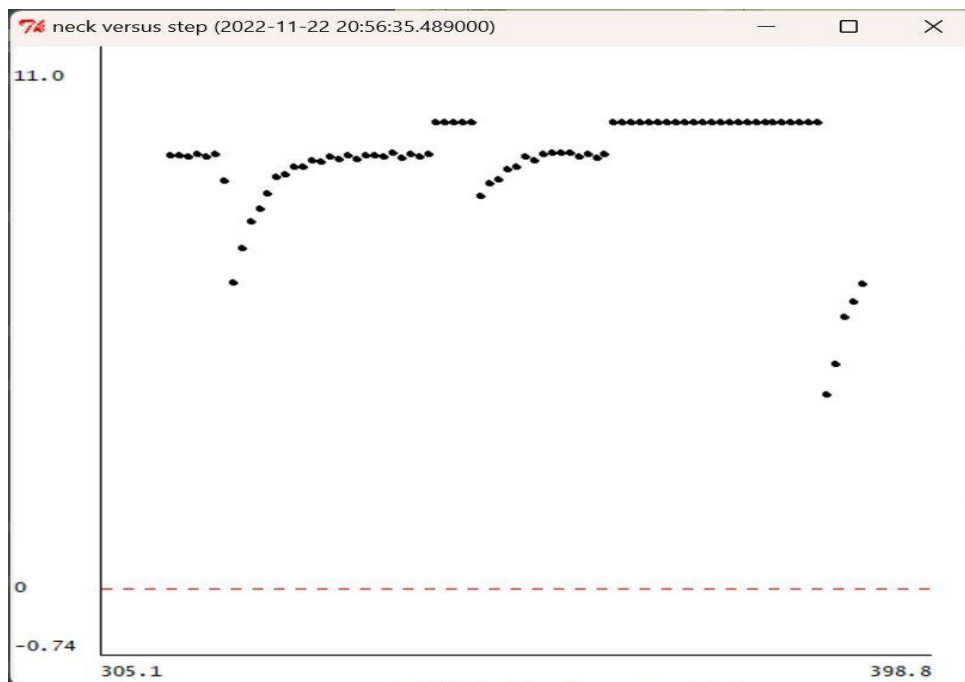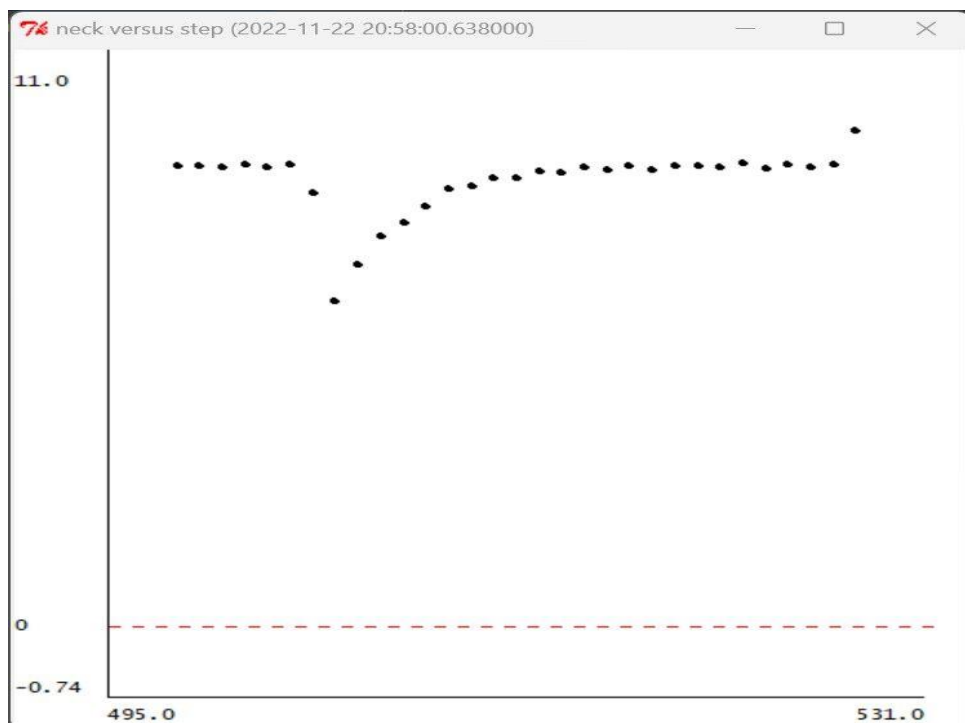
Test the head for light tracing (rotate the potentiometer

counterclockwise to the end, then rotate the light source clockwise) and print the scatter plot in soar (the voltage of the neck read by robot) :
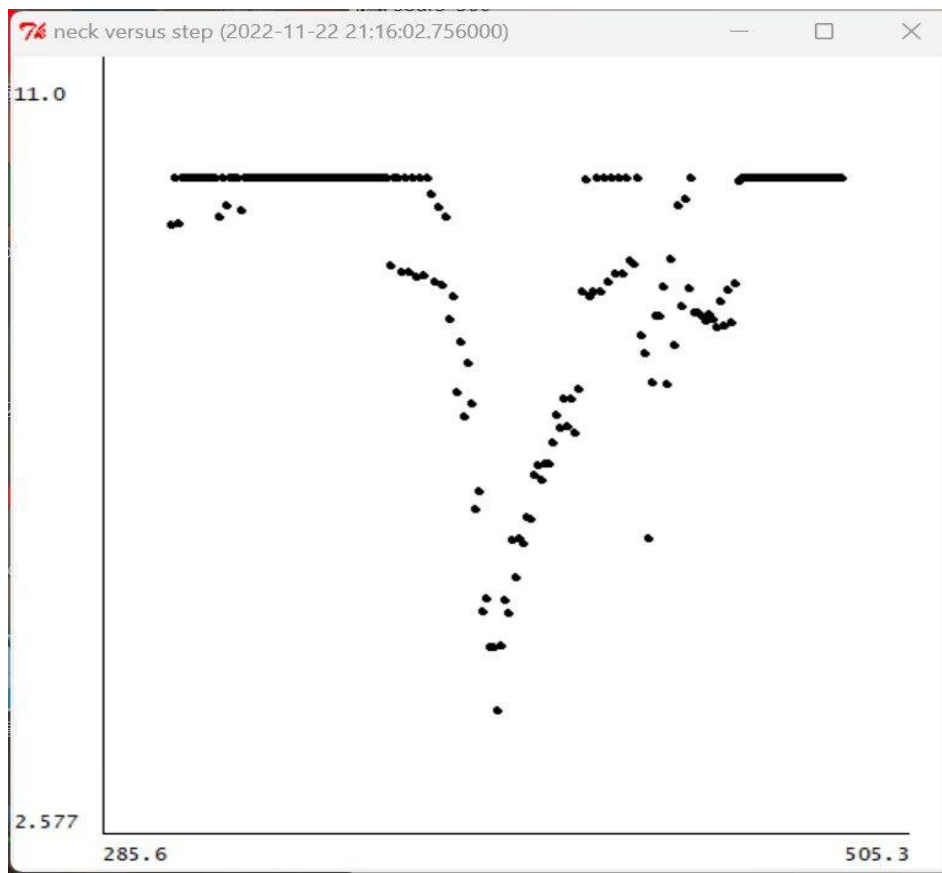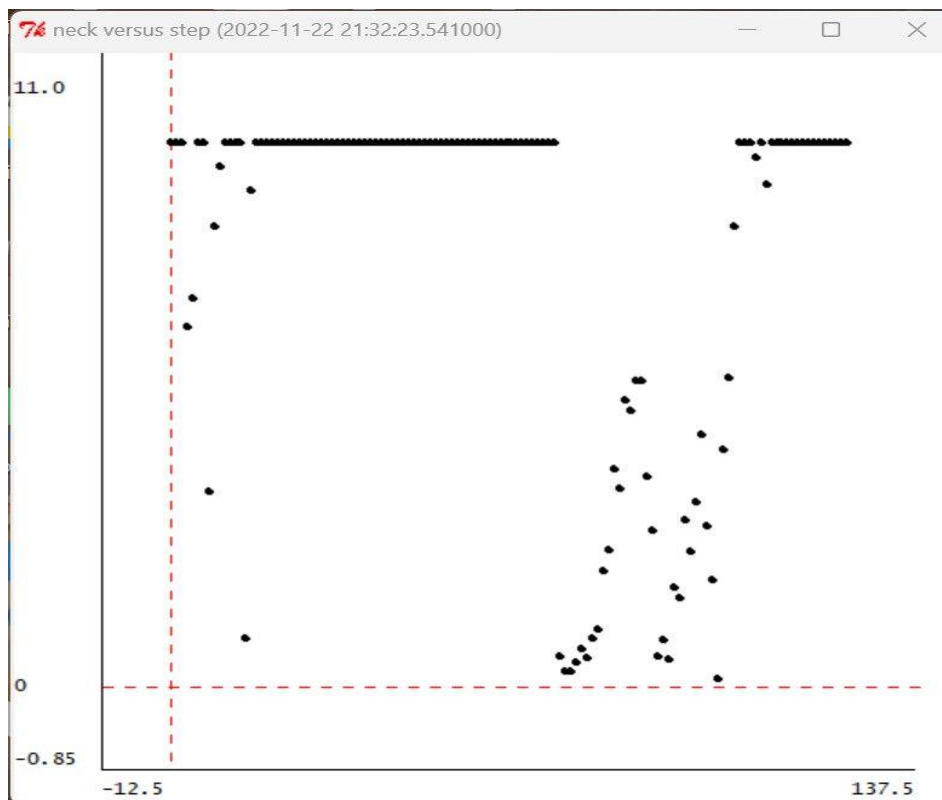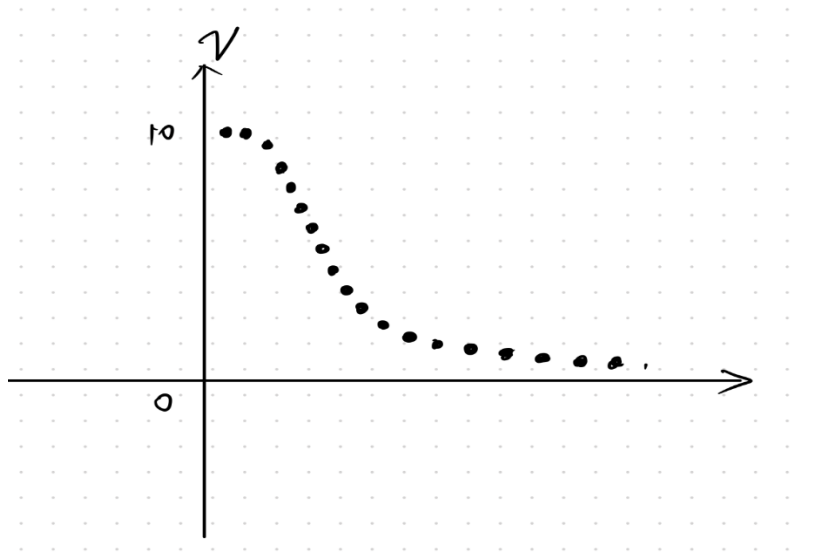
1. **Use analog input#1**

2. **Use analog input #2**

3. Use analog input #3

neck versus step (2022-11-22 21:16:02.756000)

4. Use analog input #4

neck versus step (2022-11-22 21:32:23.541000)

But in theory ,the scatter plot of 'the voltage of the 'neck' ' is as followed:

It can be seen that there are some problems with the four analog inputs of robot, which lead to very large measurement errors in the experiment, and theoretical results cannot be obtained.

And when we change the gain k_c in the circuit, the printed scatter plot hardly changes.Even when we do not connect the circuit, print the scatter plot directly, also get a bunch of noise data.
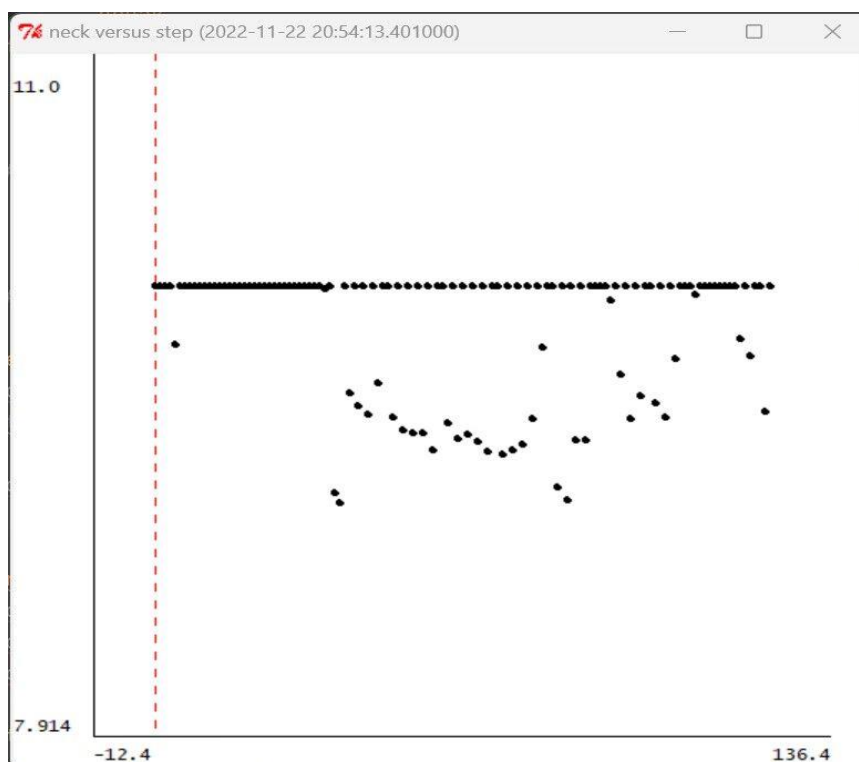
Therefore, the step of selecting the optimal gain k_c is difficult to complete.