|  |  |  |  |
| --- | --- | --- | --- |
| code | paper height(mm) | width-height ratio | leg length(mm) |
| -1 | 148.5 | 0.4 | 8 |
| 1 | 210 | 0.5 | 10 |



Unwanted noises:

1. The material property of papers may vary in each frog.
2. The humidity in air will affect the elasticity of paper.
3. The angle between the finger and a frog will vary in each jumping test.
4. The friction coefficient between frog and finger may change because of sweat on hand.
5. The finger’s force and placement on a frog will vary in each jumping test.

factorial experiment:

|  |  |  |  |
| --- | --- | --- | --- |
| test | x1 | x2 | x3 |
| 1 | -1 | -1 | -1 |
| 2 | 1 | -1 | -1 |
| 3 | -1 | 1 | -1 |
| 4 | 1 | 1 | -1 |
| 5 | -1 | -1 | 1 |
| 6 | 1 | -1 | 1 |
| 7 | -1 | 1 | 1 |
| 8 | 1 | 1 | 1 |

In my experiment, I will create three identical frogs for each combination of factors. To ensure randomization, I will randomize the order of the jumping trials instead of following a fixed sequence for each run. Since there are three runs, each frog will perform three jumps.

Experiment table:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | |  |  | replication 1 | | | replication 2 | | | replication 3 | | |
| test | | paper height(mm) | width-height ratio | leg length(mm) | run1 | run2 | run3 | run1 | run2 | run3 | run1 | run2 | run3 |
| 1 | | 148.5 | 0.4 | 8 |  |  |  |  |  |  |  |  |  |
| 2 | | 210 | 0.4 | 8 |  |  |  |  |  |  |  |  |  |
| 3 | | 148.5 | 0.5 | 8 |  |  |  |  |  |  |  |  |  |
| 4 | | 210 | 0.5 | 8 |  |  |  |  |  |  |  |  |  |
| 5 | | 148.5 | 0.4 | 10 |  |  |  |  |  |  |  |  |  |
| 6 | | 210 | 0.4 | 10 |  |  |  |  |  |  |  |  |  |
| 7 | | 148.5 | 0.5 | 10 |  |  |  |  |  |  |  |  |  |
| 8 | | 210 | 0.5 | 10 |  |  |  |  |  |  |  |  |  |

How to handle the noises: do more replication and randomize the experimental trials to make noises more uniformly and more randomly distributed.



* Day: 6/4 Tuesday
* time: 8:30pm~9:30pm
* place: lab

experiment result:





Effect coefficient:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| E1 | E2 | E3 | E12 | E23 | E13 | E123 |
| -69.0278 | -51.25 | 27.36111 | 55.13889 | 10.97222 | -11.80555556 | -10.41666667 |



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| source of variation | SS | DOF | MS | F | F\_0.05 |
| E1 | 85767.01 | 1 | 85767.01 | 81.79793 | 3.984049 |
| E2 | 47278.13 | 1 | 47278.13 | 45.09021 | 3.984049 |
| E3 | 13475.35 | 1 | 13475.35 | 12.85174 | 3.984049 |
| E12 | 54725.35 | 1 | 54725.35 | 52.1928 | 3.984049 |
| error | 70251.04 | 67 | 1048.523 |  |  |
| total | 271496.9 | 71 |  |  |  |



SN ratio: Larger-the-best