Group 13

黃子源
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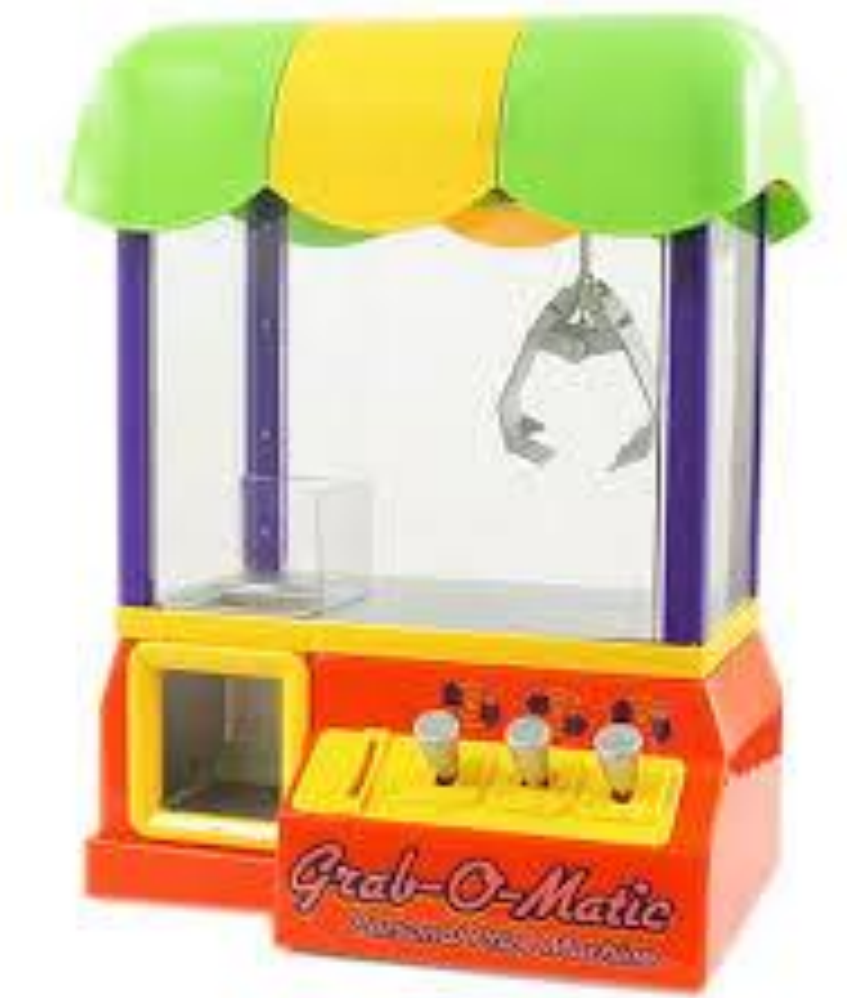
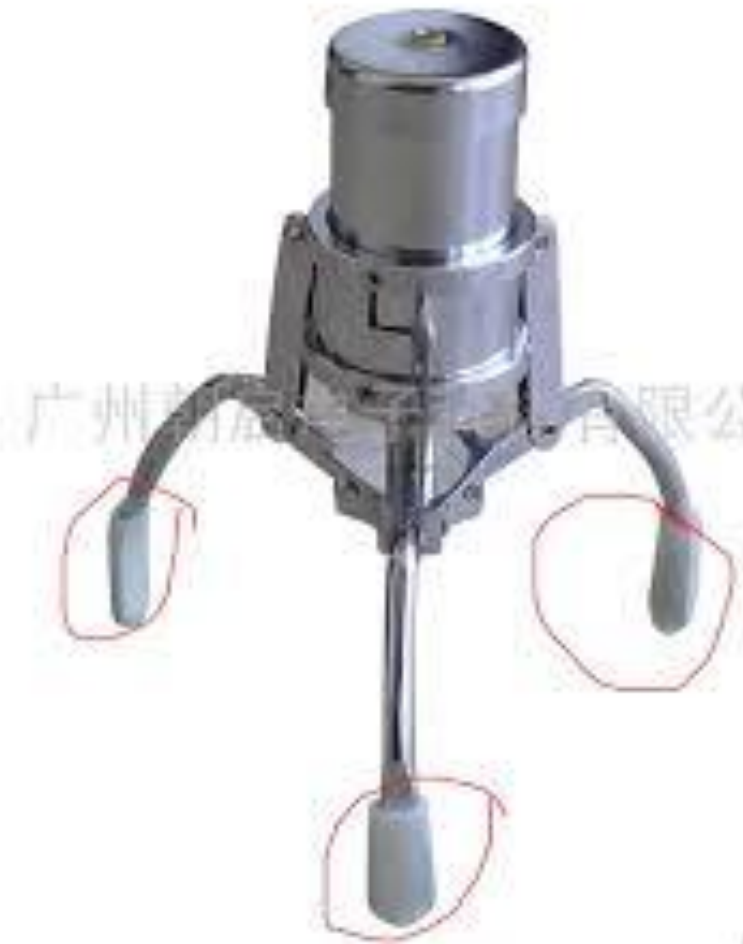
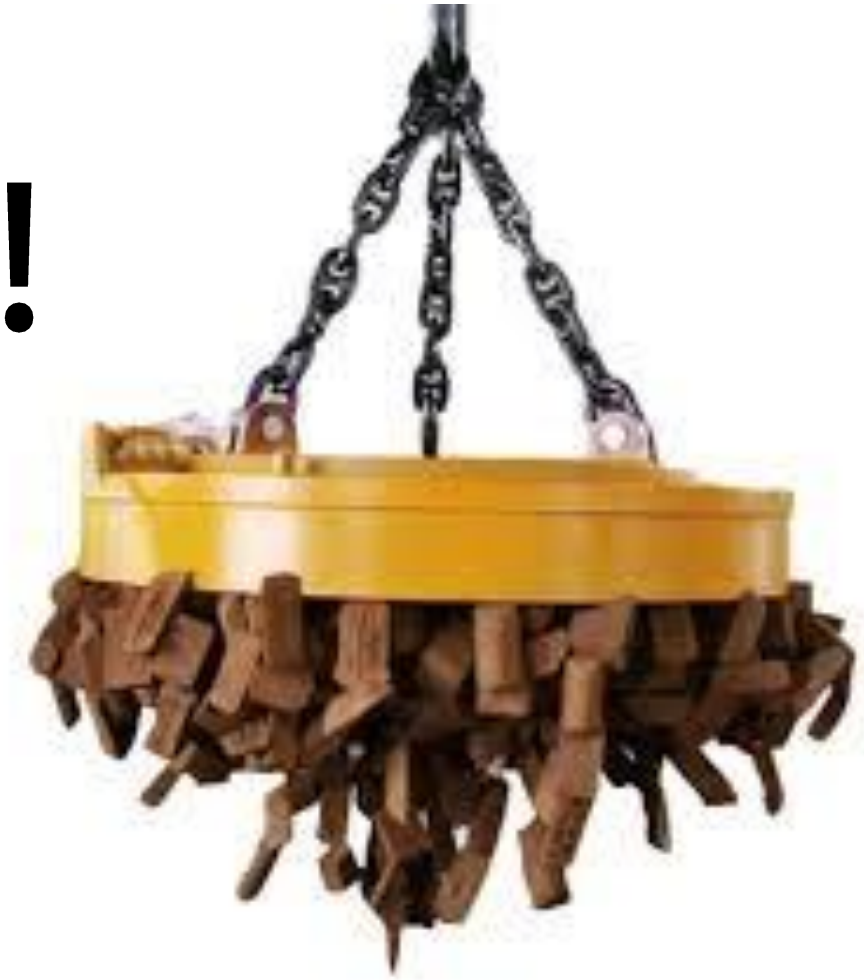
I have a 夾娃娃機

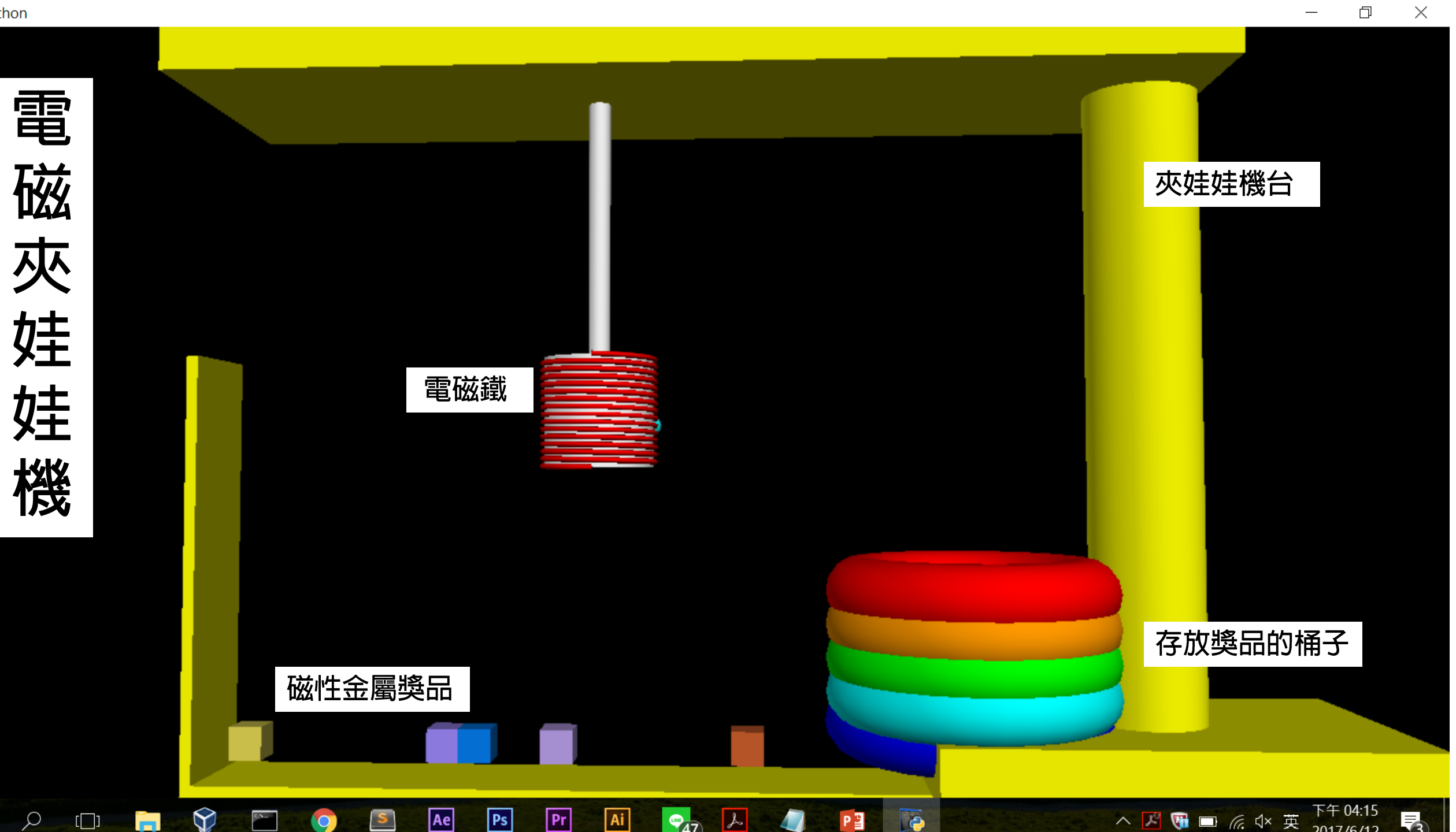


I have a 電磁鐵起重機



Uh!




電磁夾娃娃機
電磁鐵
夾娃娃機台
磁性金屬獎品
存放獎品的桶子

功能

Button “↓”:

make the electromagnetic crane go down and back once

Button “↑”:

cut off the circuit and stop the device

twice to recover the state

“Click”:

generate metal blocks

DEMO TIME

原理

- 電磁鐵磁化金屬塊成為磁偶極子(magnetic dipole)
- 視為兩個磁鐵相吸
- 使用鐵和鎳的合金，金屬塊的磁化率(magnetic susceptibility)

磁化

```
for metal in metals:
        Fb = norm(magnet.pos-(0,1,0)-metal.pos)*6e-7*metal.Xm*I*cycle*pi*5.2*5.2/(mag2(magnet.pos-(0,1,0)-metal.pos)*mag2(magnet.pos-(0,1,0)-metal.pos))*metal.flag
        while Fb.y-9.8*metal.mass < 0 and metal.pos.y <= -30:
            Fb.y = 9.8*metal.mass
        if mag(metal.pos - (magnet.pos-(0,1,0))) >= 3:
            metal.f = Fb+vector(0,-9.8*metal.mass,0)
            metal.p = metal.p + metal.f*dt
            metal.pos = metal.pos+(metal.p)*dt/metal.mass
        if mag(metal.pos - (magnet.pos-(0,1,0))) < 3:
            metal.f = (0,0,0)
            metal.pos += dt*vgoingdown
        if (metal.pos.x) > 11.5 and metal.pos.y <= -30 and metal.flag != 0:
            metal.p.x = -1*metal.p.x
            metal.pos.x = 11.5
        elif (metal.pos.x) < -43 and metal.pos.y <= -30:
            metal.p.x = -1*metal.p.x
            metal.pos.x = -43
        if metal.pos.y <= -30:
            metal.pos.y = -30
            metal.p.y = 0
```

$$F \approx 3\mu_2 \left(\frac{\mu_0}{4\pi} \frac{2\mu_1}{x^4} \right)$$

Fb = norm(magnet.pos-(0,1,0)-metal.pos)*6e-7*metal.Xm*I*cycle*pi*5.2*5.2/(mag2(magnet.pos-(0,1,0)-metal.pos)*mag2(magnet.pos-(0,1,0)-metal.pos))*metal.flag

Group 13 電磁夾娃娃機

- 成員：張中漢、黃子源、王普禾
- 工作分配：
  1. Structure and motion of the machine. (普禾)
  2. Function to generate metal blocks. (中漢)
  3. Function of magnetic force and gravity force. (子源)
  4. Main program. (中漢)
  5. Presentation Slides (中漢)
  6. Electricity current(普禾)
  7. Debug(子源)
  8. Click and keyboard function(普禾)