

AI for STEM Competition

Asia Pacific STEAM\_AI Technology  
Innovation Challenge

# 05 Barrel Firing (Part I)

CocoRobo





### Chapter 1

Projection process  
analysis



### Chapter 2

Energy Ball  
Captured



### Chapter 3

Energy Ball  
Launches

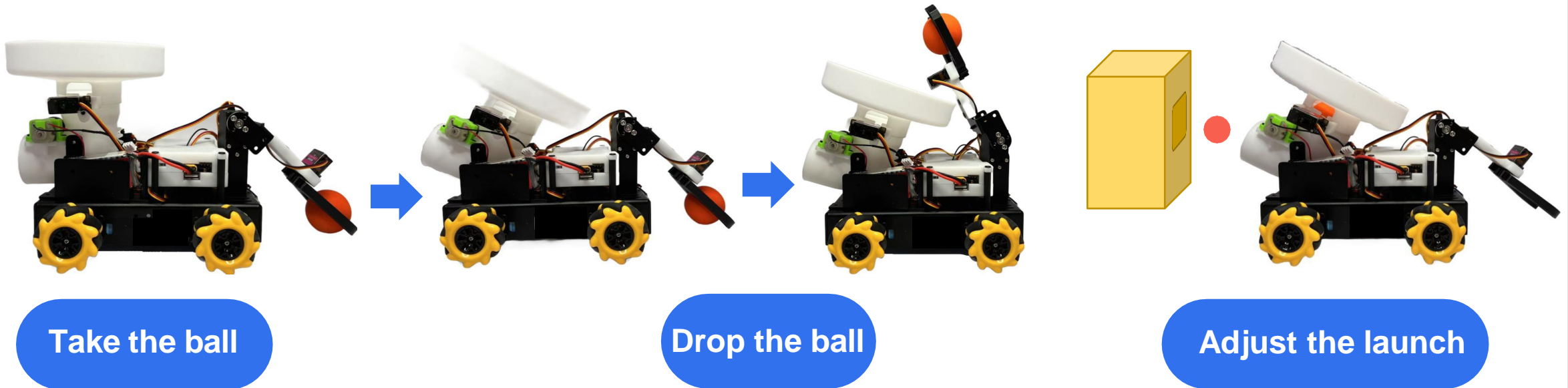
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# ONE.

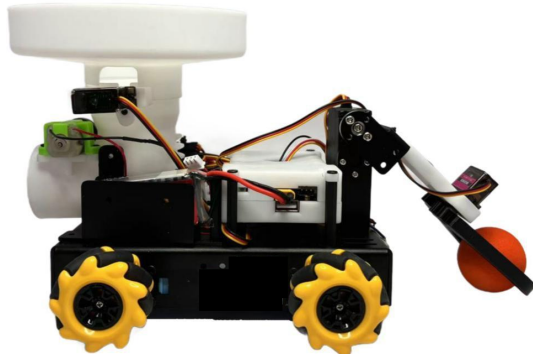
## Projection process analysis

## Projection process analysis

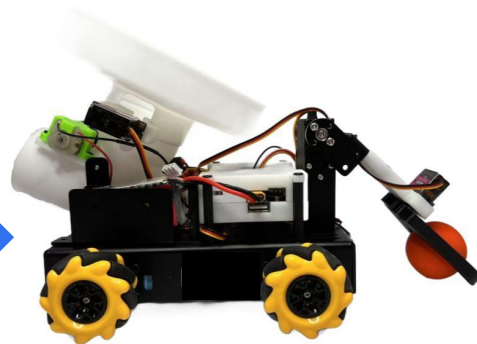


## Projection process analysis

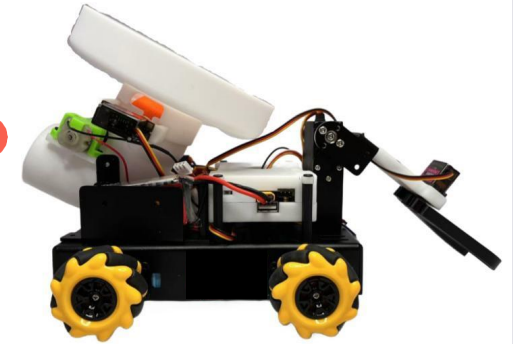
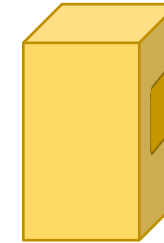
Observing the following steps, which actuators are required to complete the corresponding actions?



Take the ball

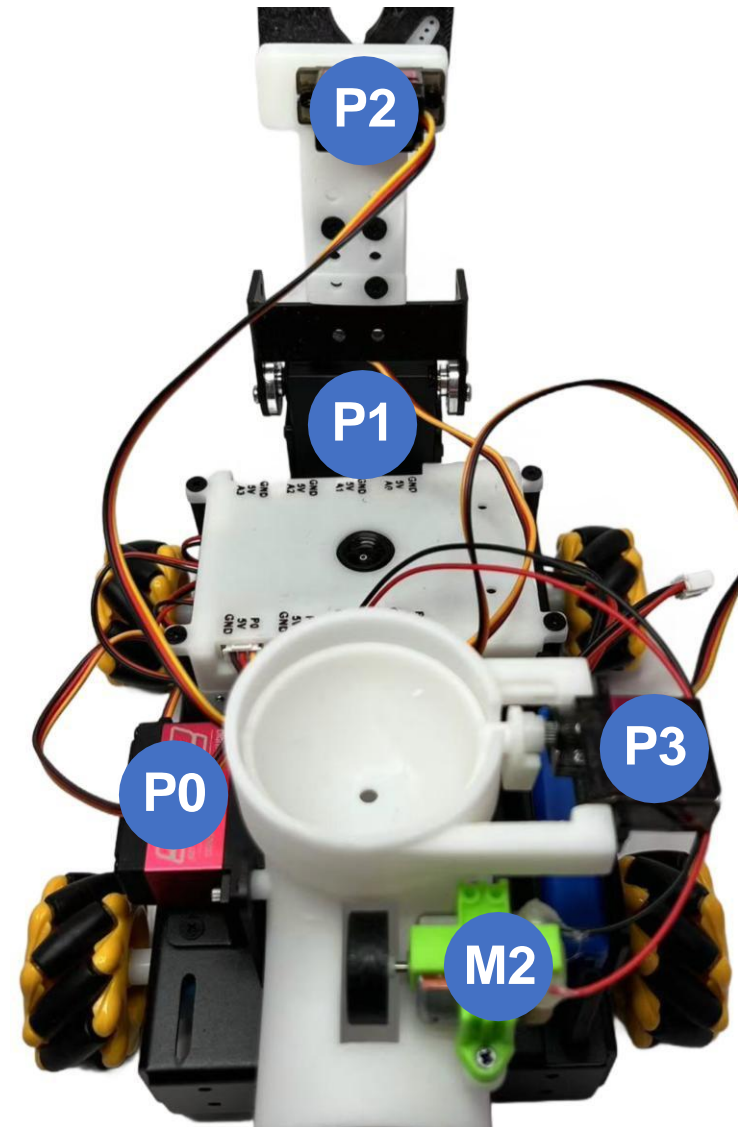
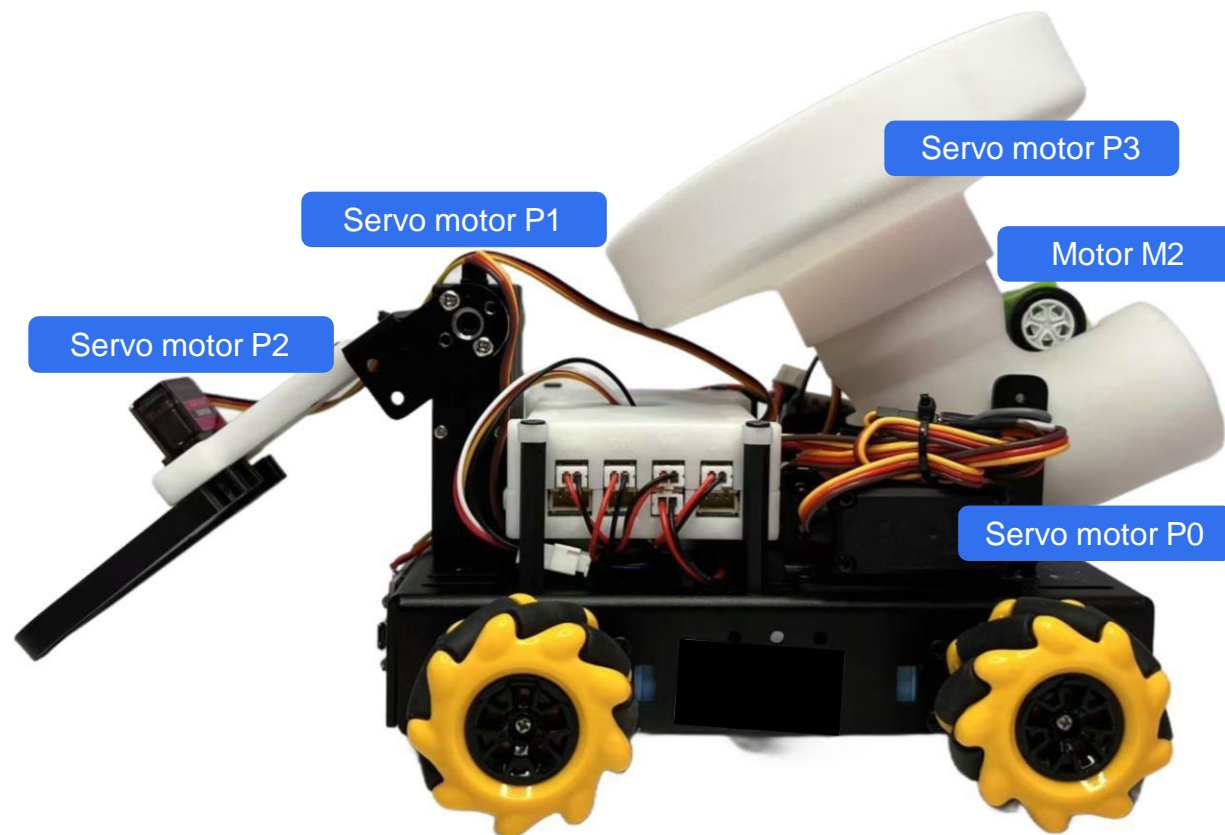


Drop the ball



Adjust the launch

## Projection process analysis



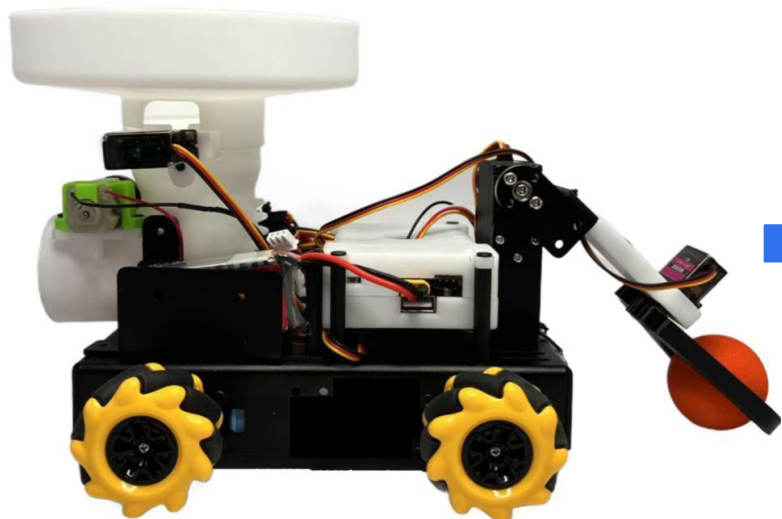
# TWO.

## Energy Ball Captured

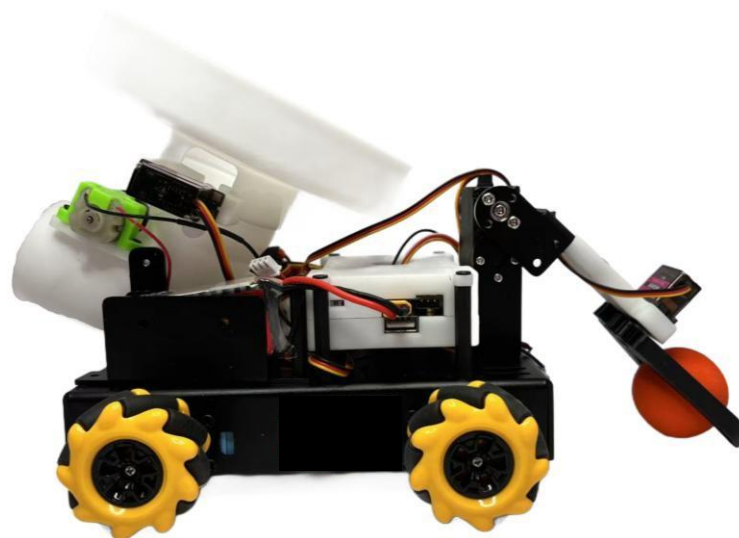


## Energy Ball Captured

Observing this step, which institutions are carrying out the movement?



Take the ball

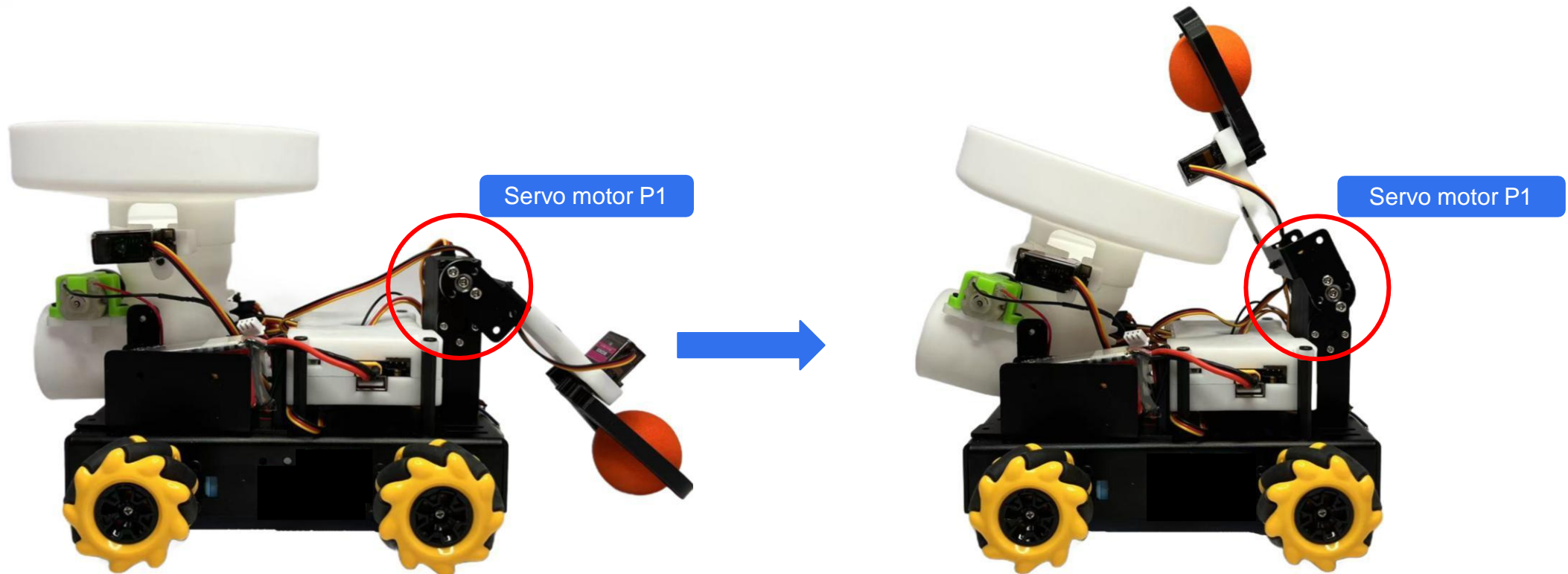


Drop the ball





## ● Energy Ball Captured



Servo motor **P1** The angle is 14 degree

Servo motor **P1** The angle is 160 degree

## ● 能量球獲取



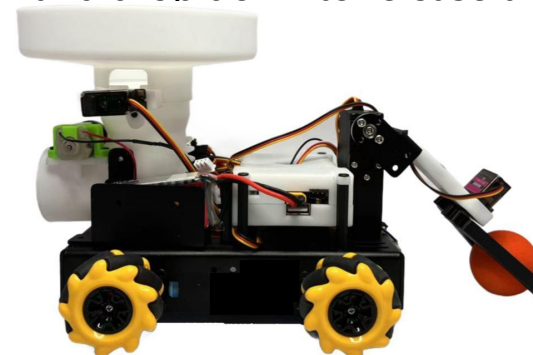
### Task 1:

On the basis of the previous lesson, press the UP button of the game hand button to rise up to fetch the ball;

Press the DOWN button on the game switch and drop down to release the ball.



Send a  
message  
"UP"



When receiving "UP", set the angle of the servo motor P1 to 160 degree



Send a  
message  
"DOWN"



When receiving "DOWN", set the angle of the servo motor P1 to 14 degree

There may be some errors in the actual working angle due to the influence of installation

# Energy Ball Captured



## Task 1:

On the basis of the previous lesson, press the UP button of the game hand button to rise up to fetch the ball;  
Press the DOWN button on the game switch and drop down to release the ball.

## Reference

```

Motor Driver Setup
Set Motor [M3] 's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor [M4] 's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor [M5] 's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor [M6] 's Speed to 0 (0~255) Rotating Clockwise turns

UART ↺
Obtain data through the serial port to initialize
Set Baud Rate: 115200 bps
Set Data = " "
Repeat forever
Do Clear serial port cache data
by Set Data = Get Serial (UART) Data at 0 as
except
Set control = Split string to a list [Data] by delimiter: Split and generate a list
If List [control] # 0 item = "U"
Do If int List [control] # 1 item > 100
Do right
Else if int List [control] # 1 item < -100
Do left
Else if int List [control] # 2 item > 100
Do back

```

```

Else if int List [control] # 2 item < -100
Do front
Else if List [control] # 0 item = "R"
Do turn_right
Else if int List [control] # 1 item < -100
Do turn_left
Else If [Data] = "NONE"
Do stop
Else if [Data] = "UP"
Do Set Servo on GPIO # P1 Rotate to 160 Degree (0°~180°)
Else if [Data] = "DOWN"
Do Set Servo on GPIO # P1 Rotate to 14 Degree (0°~180°)

```

```

Define stop
do
Set Motor [M3] 's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor [M4] 's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor [M5] 's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor [M6] 's Speed to 0 (0~255) Rotating Clockwise turns

```

```

Define turn_right
do
Set Motor [M3] 's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor [M4] 's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor [M5] 's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor [M6] 's Speed to 100 (0~255) Rotating Anti-Clockwise turns

```

```

Define turn_left
If [Data] = "NONE"
Do stop
Else if [Data] = "UP"
Do Set Servo on GPIO # P1 Rotate to 160 Degree (0°~180°)
Else if [Data] = "DOWN"
Do Set Servo on GPIO # P1 Rotate to 14 Degree (0°~180°)

```

```

Set Motor [M3] 's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor [M4] 's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor [M5] 's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor [M6] 's Speed to 100 (0~255) Rotating Clockwise turns

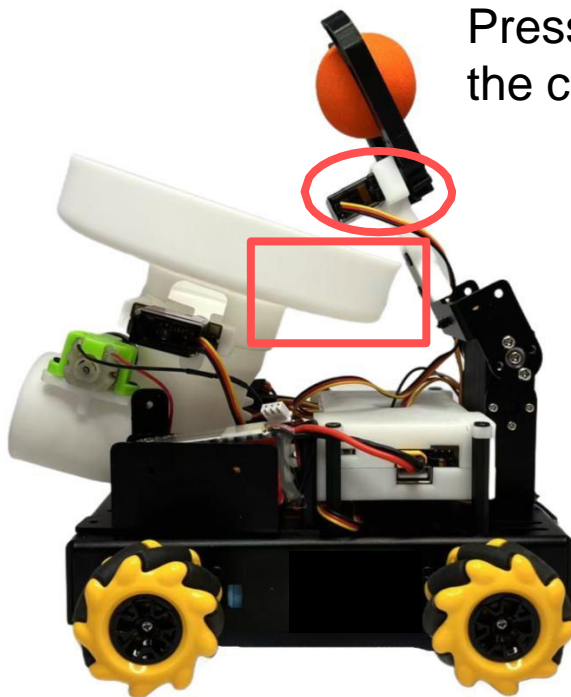
Set Motor [M3] 's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor [M4] 's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor [M5] 's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor [M6] 's Speed to 100 (0~255) Rotating Clockwise turns

```

## ● Energy Ball Captured



The servo motor of the mechanical claw will affect the angle adjustment of the barrel, so it needs to be reset, and the P1 servo motor needs to be increased by another angle: 90°



Press the LEFT button to reset to the center.



Servo motor **P1** The angle is **90** degree

## ● Energy Ball Captured

Press the game button **LEFT**  
The key is reset to the middle.



Send a  
message  
"LEFT"



Upon receiving "Left" ,  
Set the angle of the servo  
motor P1 to **90** degree.

# Energy Ball Captured

## Reference

**Motor Driver Setup**

Set Motor M3's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M4's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M5's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M6's Speed to 0 (0~255) Rotating Clockwise turns

**UART**

Obtain data through the serial port to initialize

Set Baud Rate: 115200 bps

Set Data = " "

Repeat forever

Do Clear serial port cache data

try

Set Data = Get Serial (UART) Data at 0 as

except

Set control = Split string to a list Data by delimiter: Split and generate a list

If

List control # 0 item = "L"

Do

If

int List control # 1 item > 100

Do right

Else if

int List control # 1 item < -100

Do left

Else if

int List control # 2 item > 100

Do back

Do left

Else if

int List control # 2 item > 100

Do back

Else if

int List control # 2 item < -100

Do front

Else if

List control # 0 item = "R"

Do

If

int List control # 1 item > 100

Do turn\_right

Else if

int List control # 1 item < -100

Do turn\_left

Else

If

Data = "NONE"

Do stop

Else if

Data = "UP"

Do Set Servo on GPIO # P1 Rotate to 160 Degree (0~180°)

Else if

Data = "DOWN"

Do Set Servo on GPIO # P1 Rotate to 14 Degree (0~180°)

Else if

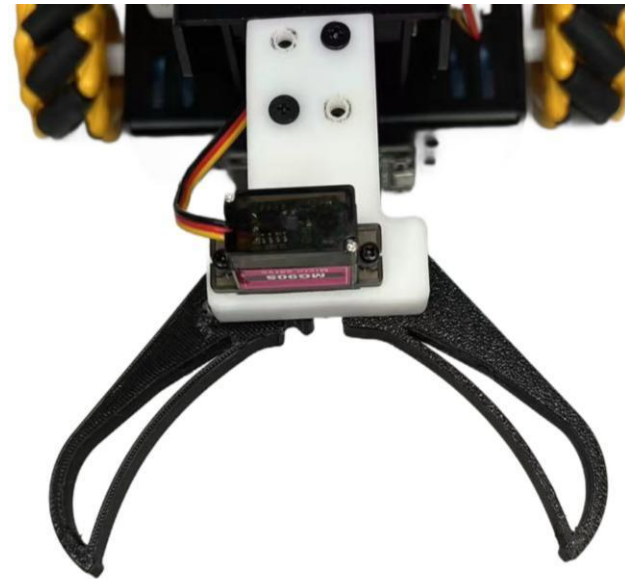
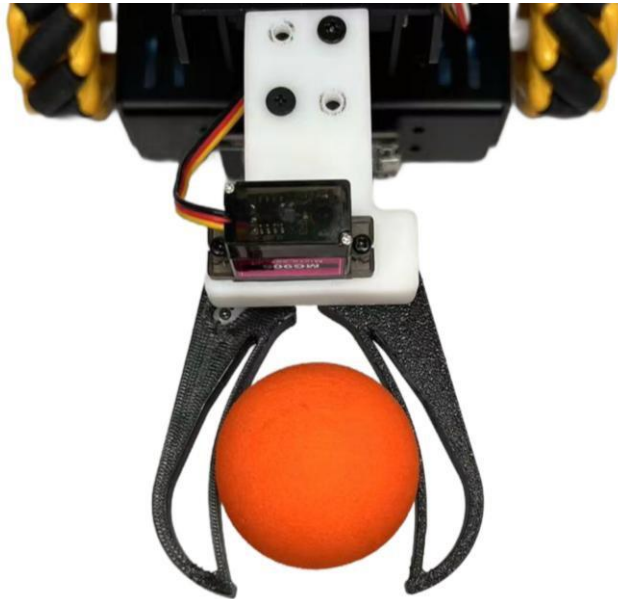
Data = "LEFT"

Do Set Servo on GPIO # P1 Rotate to 90 Degree (0~180°)

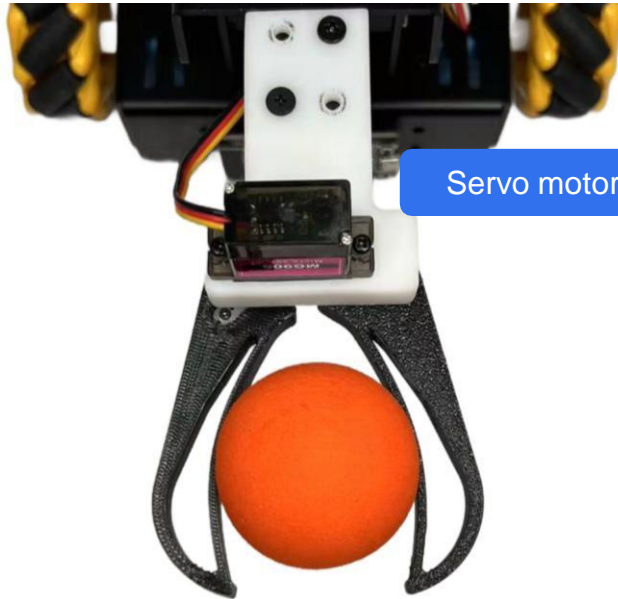


## ● Energy Ball Captured

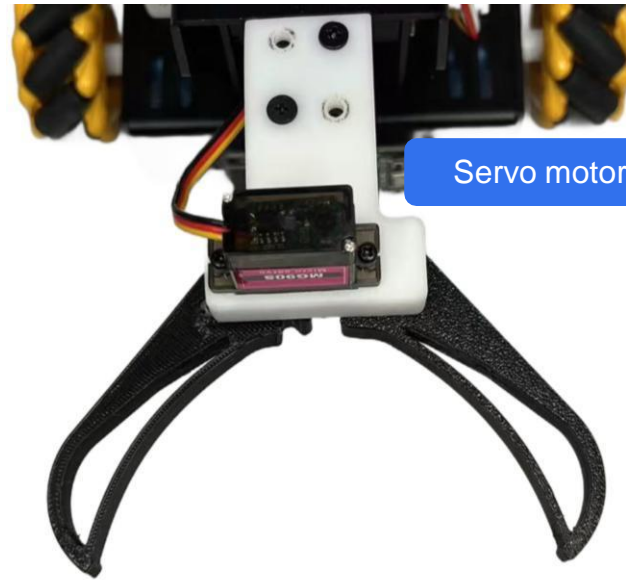
Observing this step, which institutions are carrying out the movement?



## ● Energy Ball Captured




Servo motor **P2** The angle is **96** degree



Servo motor **P2** The angle is **120** degree

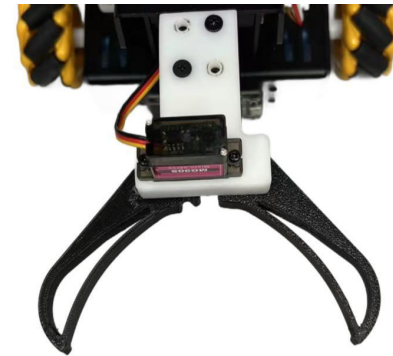
## ● Energy Ball Captured

-  **Task 2:** On the basis of the task 1 program, press the L1 button of the game hand to open the mechanical claw;  
Press the R1 button on the game switch to clamp the mechanical claw.



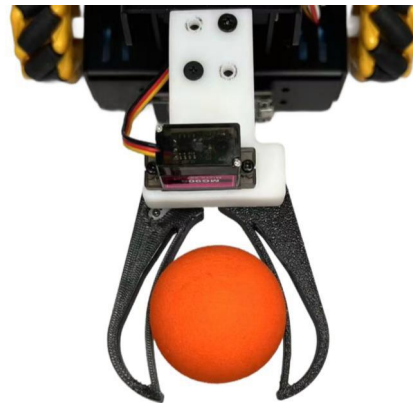
發送訊息

"L1"



發送訊息

"R1"



# Energy Ball Captured

## Task 2 :

```

Motor Driver Setup
Set Motor M3's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor M4's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor M5's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor M6's Speed to 0 (0~255) Rotating Clockwise turns

UART
Obtain data through the serial port to initialize
Set Baud Rate: 115200 bps
Set Data = ""
Repeat forever
Do Clear serial port cache data
try Set Data = Get Serial (UART) Data at 0 as
except
Set control = Split string to a list Data by delimiter: Split and generate a list
If List control == 0 item == " "
Do
If int List control # 1 item > 100
Do right
Else if int List control # 1 item < -100
Do left
Else if int List control # 2 item > 100
Do back

```

```

Else if List control # 0 item == "R"
Do
If int List control # 1 item > 100
Do turn_right
Else if int List control # 1 item < -100
Do turn_left
Else
If Data == "NONE"
Do stop
Else if Data == "UP"
Do Set Servo on GPIO # P1 Rotate to 180 Degree (0°~180°)
Else if Data == "DOWN"
Do Set Servo on GPIO # P1 Rotate to 14 Degree (0°~180°)
Else if Data == "LEFT"
Do Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)
Else if Data == "L1"
Do Set Servo on GPIO # P2 Rotate to 120 Degree (0°~180°)
Else if Data == "R1"
Do Set Servo on GPIO # P2 Rotate to 98 Degree (0°~180°)

```

```

Define stop
do
Set Motor M3's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor M4's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor M5's Speed to 0 (0~255) Rotating Clockwise turns
Set Motor M6's Speed to 0 (0~255) Rotating Clockwise turns

```

```

Define left
do
Set Motor M3's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M4's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M5's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M6's Speed to 100 (0~255) Rotating Clockwise turns

```

```

Define front
do
Set Motor M3's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M4's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M5's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M6's Speed to 100 (0~255) Rotating Anti-Clockwise turns

```

```

Define right
do
Set Motor M3's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M4's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M5's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M6's Speed to 100 (0~255) Rotating Anti-Clockwise turns

```

```

Define back
do
Set Motor M3's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M4's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M5's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M6's Speed to 100 (0~255) Rotating Clockwise turns

```

```

Define turn_right
do
Set Motor M3's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M4's Speed to 100 (0~255) Rotating Clockwise turns
Set Motor M5's Speed to 100 (0~255) Rotating Anti-Clockwise turns
Set Motor M6's Speed to 100 (0~255) Rotating Anti-Clockwise turns

```

```

Define turn_left
do
Else if Data == "LEFT"
Do Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)
Else if Data == "L1"
Do Set Servo on GPIO # P2 Rotate to 120 Degree (0°~180°)
Else if Data == "R1"
Do Set Servo on GPIO # P2 Rotate to 98 Degree (0°~180°)

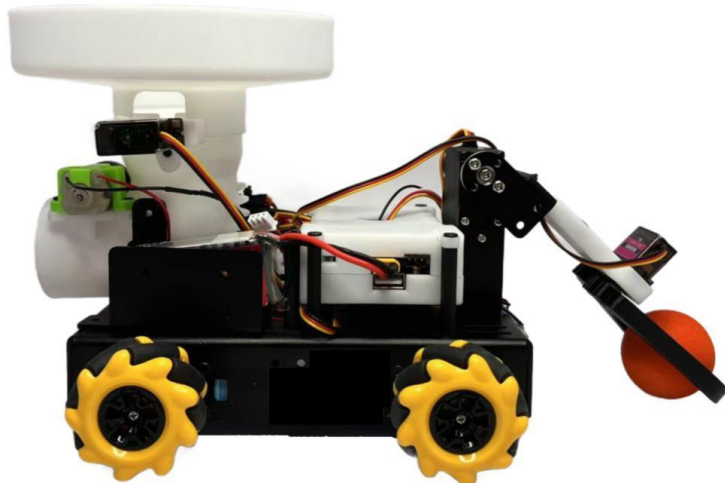
```

# THREE.

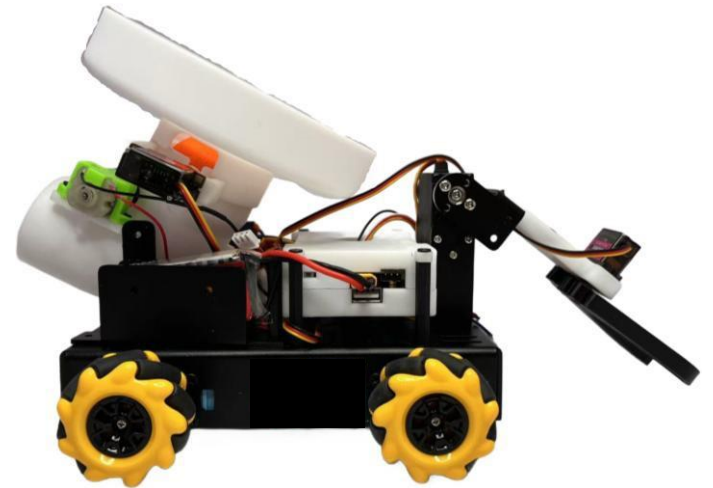
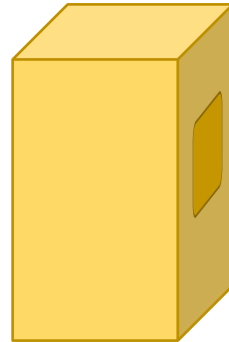
## Energy Ball Launches

## Energy Ball Launches

Observing this step, which agency is carrying out the movement?



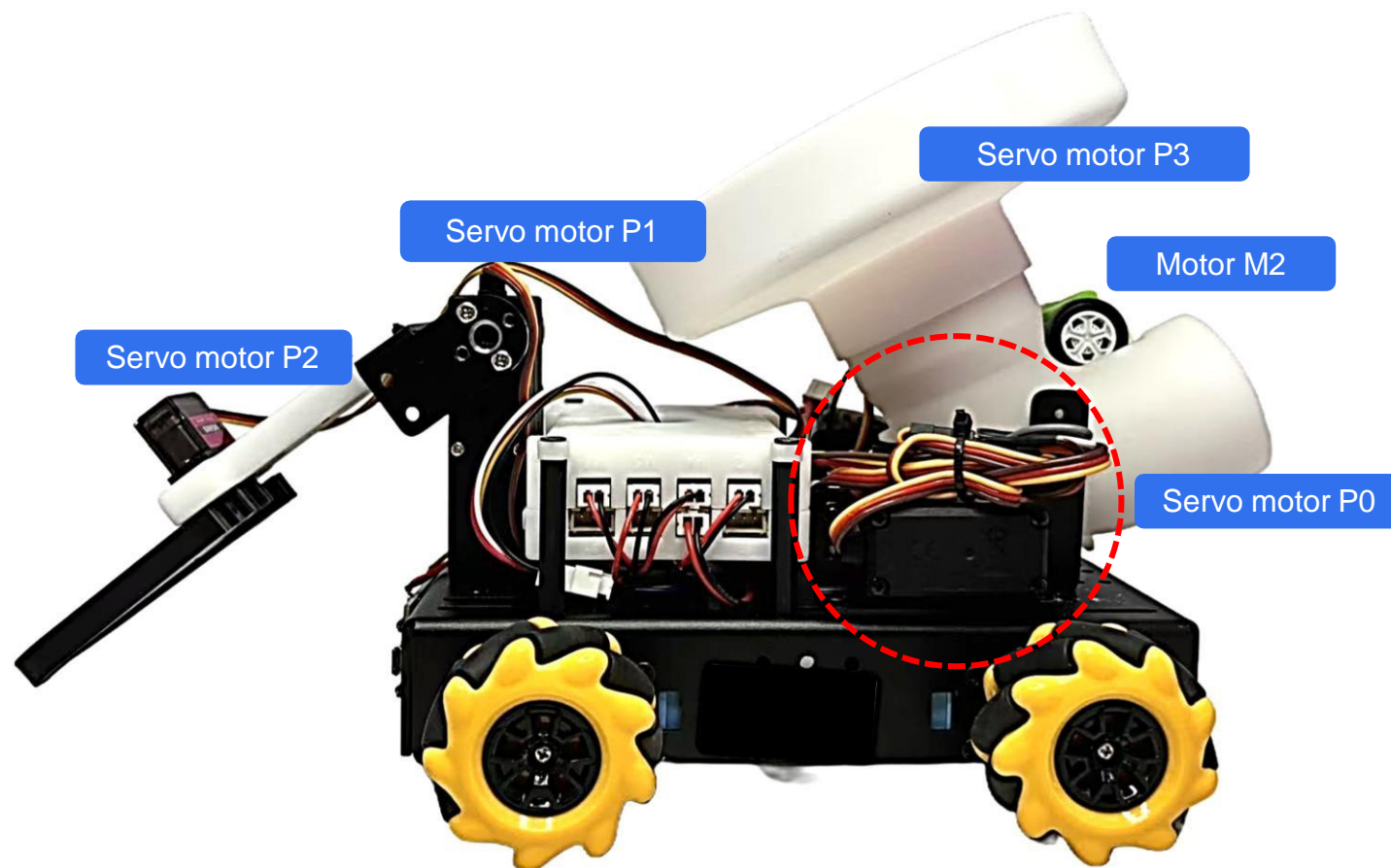
Wrap the ball



Barrel  
adjustment

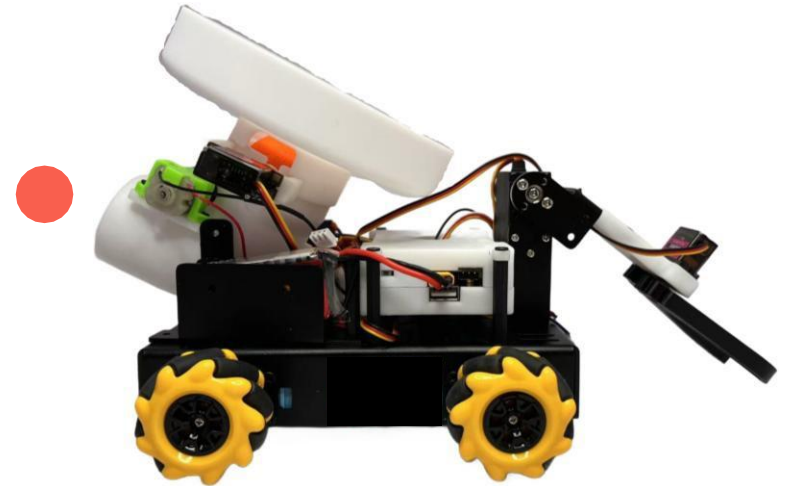
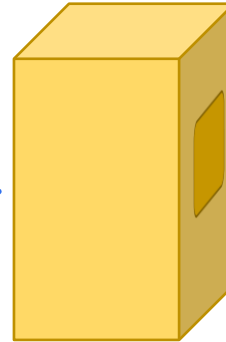


# Energy Ball Launches

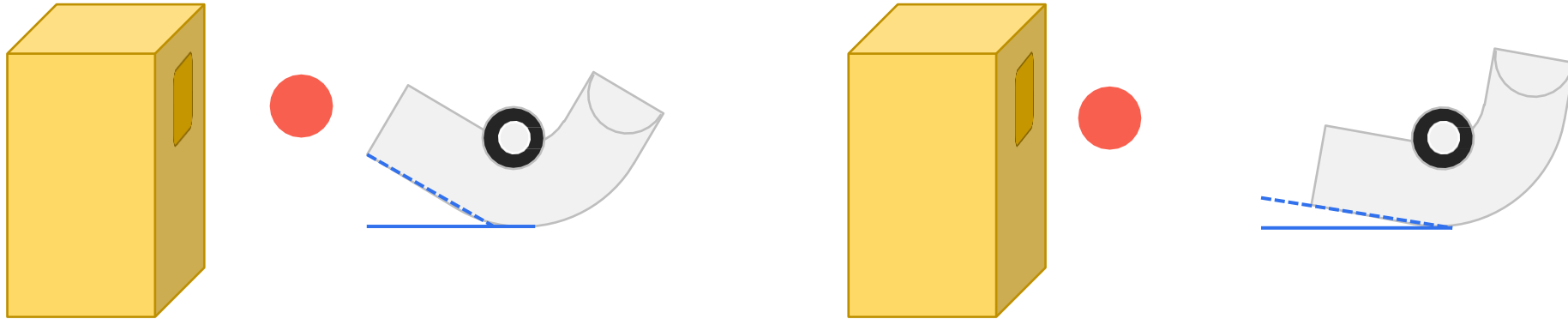


## Energy Ball Launches

Think about it, every time an energy ball is projected, does the barrel rise to the same height? What factors affect the elevation?

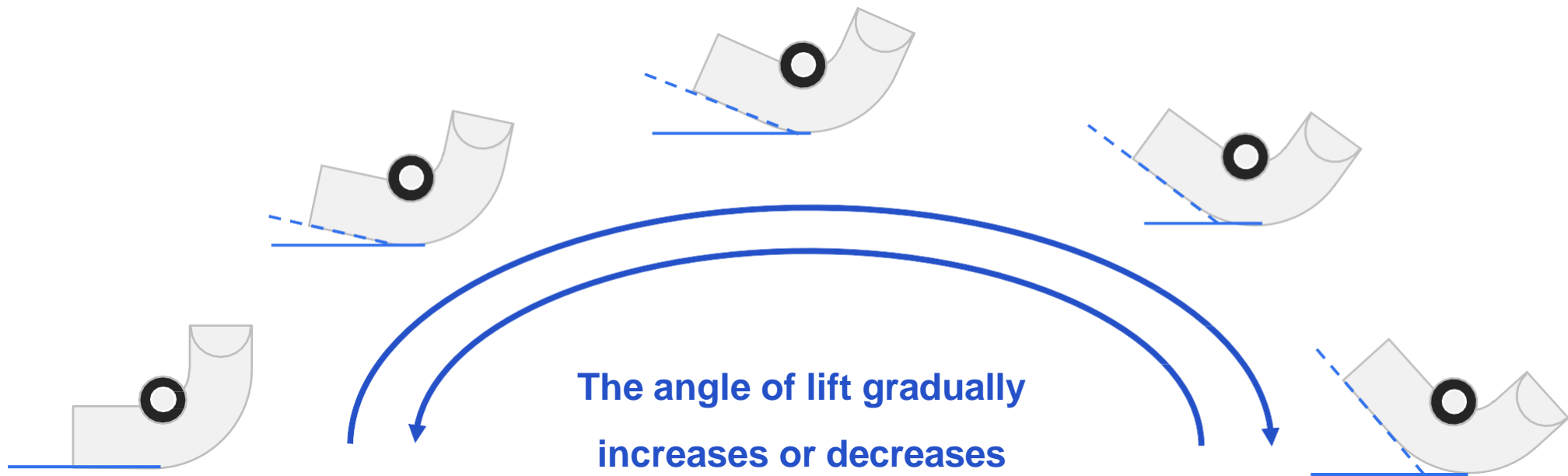


## Energy Ball Launches



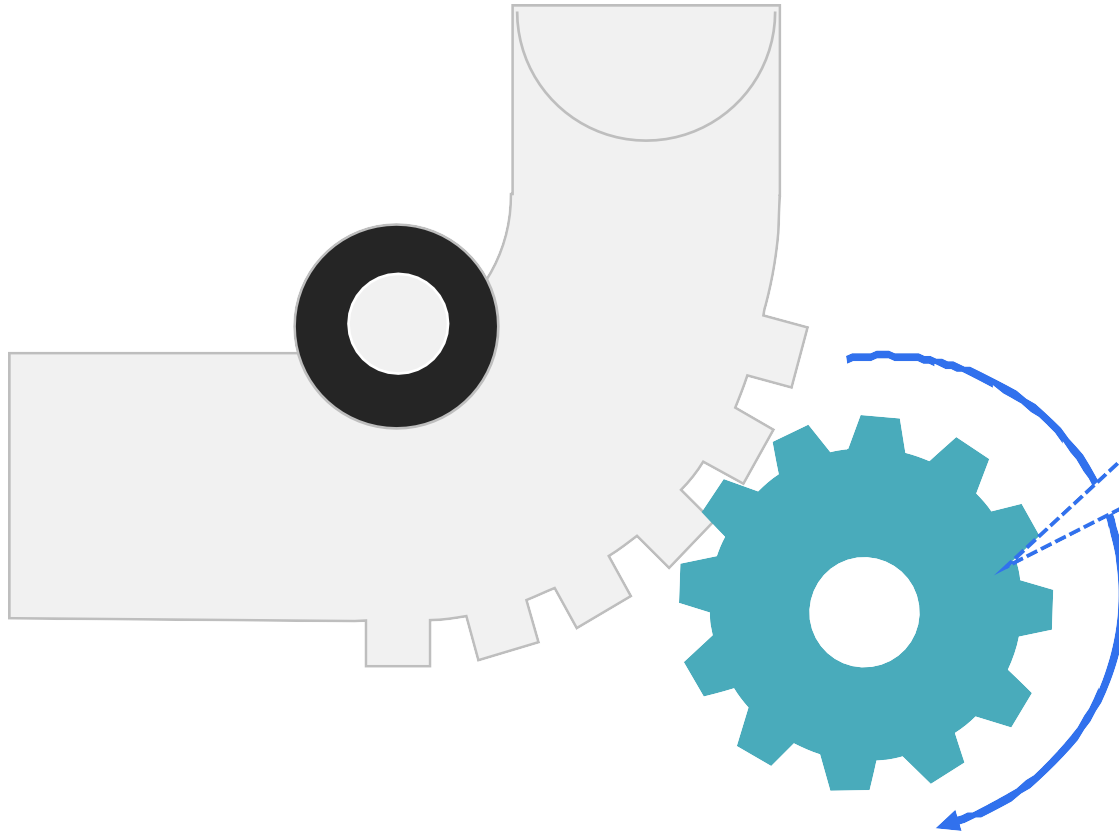
The closer you get to the tower, the higher the angle at which the barrel is raised; The farther it goes, the lower the angle at which the barrel is raised.

## Energy Ball Launches



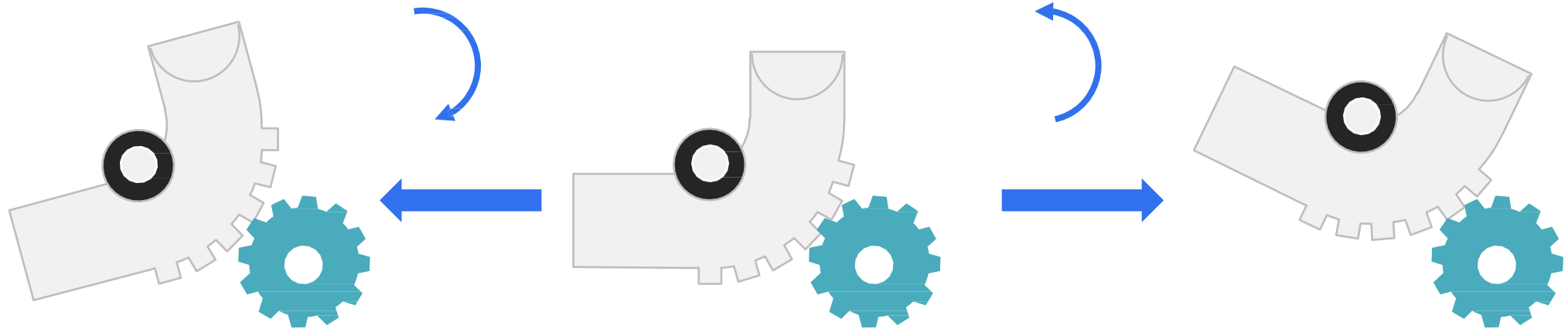
When controlling the barrel, it is necessary to make a subtle adjustment to the barrel angle every time.

## Energy Ball Launches



Think about it, how does the barrel move (lift/down) when the gears rotate clockwise?  
Does the angle of the servo motor increase or decrease at this point?

## Energy Ball Launches



When the gears rotate clockwise, the barrel of the gun **Move down**, Angle of the servo motor **decrease**.

When the gears rotate counterclockwise, the barrel **Uplift**, Angle of the servo motor **increase**.



# Energy Ball Launches

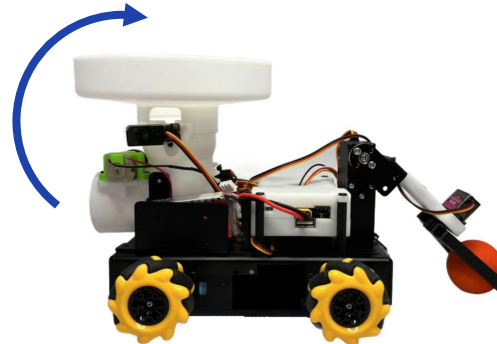


## Task 3:

On the basis of the procedure of task 2, the guerrillant is pushed to swing the right pole upwards and the barrel of the gun is raised;  
Push the player to swing the right lever downwards and move the barrel downward.



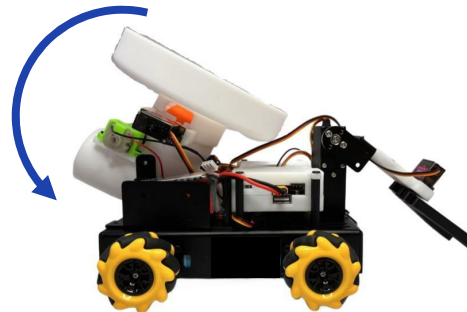
Send a  
message  
"R,0,-128"



The message received is: "R,0,-128" , set the servo motor P0 angle each time **increase** 5 degrees



Send a  
message  
"R,0,127"



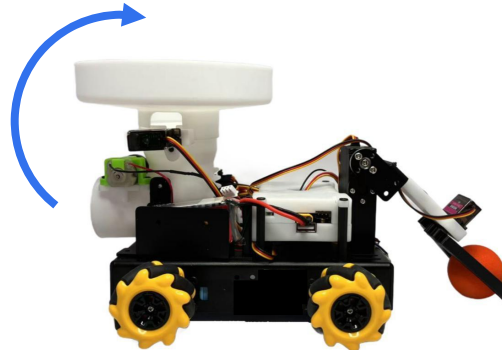
When receiving the message "R,0,127", set the angle of the servo motor P0 each time **decrease** 5 degrees

# Energy Ball Launches

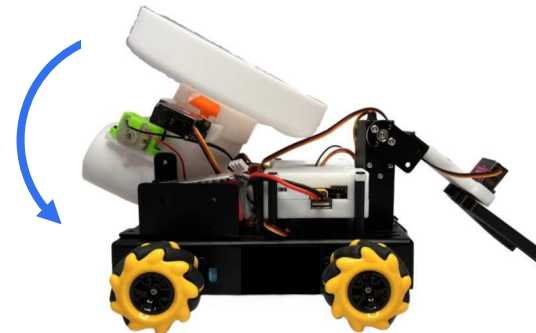


**Task 3:** On the basis of the procedure of task 2, the guerrillant is pushed to swing the right pole upwards and the barrel of the gun is raised;  
Push the player to swing the right lever downwards and move the barrel downward.

Think about it, how to achieve the increase and decrease of the servo motor angle each time?



When the received message is "R,0,-128", set the angle of the servo motor P0 each time **increase** 5 degrees



When receiving the message "R,0,127", set the angle of the servo motor P0 each time **decrease** 5 degrees

# Energy Ball Launches



## Task 3:

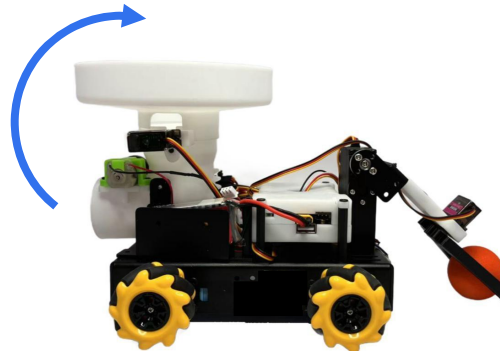
On the basis of the procedure of task 2, the guerrillant is pushed to swing the right pole upwards and the barrel of the gun is raised;  
Push the player to swing the right lever downwards and move the barrel downward.

Change shoot ▾ by -5

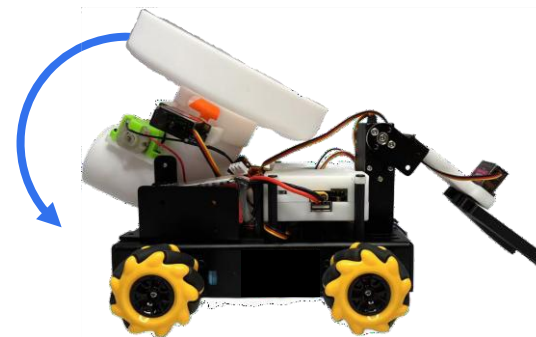
Change shoot ▾ by 5

Set Servo on GPIO # P0 ▾ Rotate to shoot ▾ Degree (0°~180°)

Create a new variable shoot and set it to the angle of the servo motor P0.



When the received message is "R,0,-128", set the angle of the servo motor P0 each time **increase** 5 degrees



When the received message is "R,0,-128", set the angle of the servo motor P0 each time **increase** 5 degrees

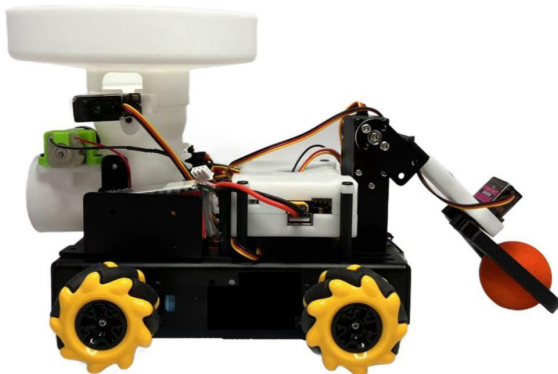
# Energy Ball Launches



## Task 3:

On the basis of the procedure of task 2, the guerrillant is pushed to swing the right pole upwards and the barrel of the gun is raised; Push the player to swing the right lever downwards and move the barrel downward.

Think about it, how do you change the angle of a servo motor from 0 to 70?



The servo motor P0 angle is 0 degrees



The servo motor P0 angle is 70 degrees

# Energy Ball Launches



## Task 3:

On the basis of the procedure of task 2, the guerrillant is pushed to swing the right pole upwards and the barrel of the gun is raised;  
Push the player to swing the right lever downwards and move the barrel downward.

```
Define shoot_up
do
  If shoot < 70
  Do Change shoot by 5
  Else Set shoot = 70
  Set Servo on GPIO # P0 Rotate to shoot Degree (0°~180°)
```

```
Define shoot_down
do
  If shoot > 0
  Do Change shoot by -5
  Else Set shoot = 0
  Set Servo on GPIO # P0 Rotate to shoot Degree (0°~180°)
```

# Energy Ball Launches

## Task 3:

**Motor Driver Setup**

- Set Motor M3's Speed to 0 (0~255) Rotating Clockwise turns
- Set Motor M4's Speed to 0 (0~255) Rotating Clockwise turns
- Set Motor M5's Speed to 0 (0~255) Rotating Clockwise turns
- Set Motor M6's Speed to 0 (0~255) Rotating Clockwise turns

**Servo Setup**

- Set Servo on GPIO # P0 Rotate to 0 Degree (0°~180°)
- Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)
- Set Servo on GPIO # P2 Rotate to 90 Degree (0°~180°)

**UART**

Obtain data through the serial port to initialize  
Set Baud Rate: 115200 bps

Set Data = " " " "

Set control = 100

Repeat forever

Do Clear serial port cache data

try Set Data = Get Serial (UART) Data at 0 as

except

Set control = Split string to a list Data by delimiter: Split and generate a list

If List control # 0 item = " L "

Do

If int List control # 1 item > 100

Do right

Else if int List control # 1 item < -100

Do left

Else if int List control # 2 item > 100

Do back

Else if int List control # 2 item < -100

Do front

Else if List control # 0 item = " R "

Do

If int List control # 1 item > 100

Do turn\_right

Else if int List control # 1 item < -100

Do turn\_left

Else if int List control # 2 item > 100

Do shoot\_down

Else if int List control # 2 item < -100

Do shoot\_up

Else

If Data = " NONE "

Do stop

Else if Data = " UP "

Do Set Servo on GPIO # P1 Rotate to 160 Degree (0°~180°)

Else if Data = " DOWN "

Do Set Servo on GPIO # P1 Rotate to 14 Degree (0°~180°)

Else if Data = " LEFT "

Do Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)

Else if Data = " L1 "

Do Set Servo on GPIO # P2 Rotate to 120 Degree (0°~180°)

Else if Data = " R1 "

Do Set Servo on GPIO # P2 Rotate to 96 Degree (0°~180°)

Define shoot\_up

do

If shoot < 70

Do Change shoot by 5

Else Set shoot = 70

Set Servo on GPIO # P0 Rotate to shoot Degree (0°~180°)

Define shoot\_down

do

If shoot > 0

Do Change shoot by -5

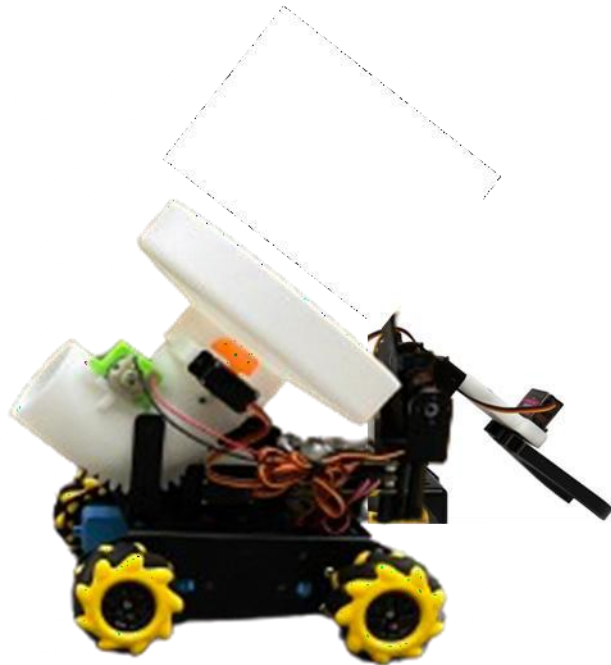
Else Set shoot = 0

Set Servo on GPIO # P0 Rotate to shoot Degree (0°~180°)

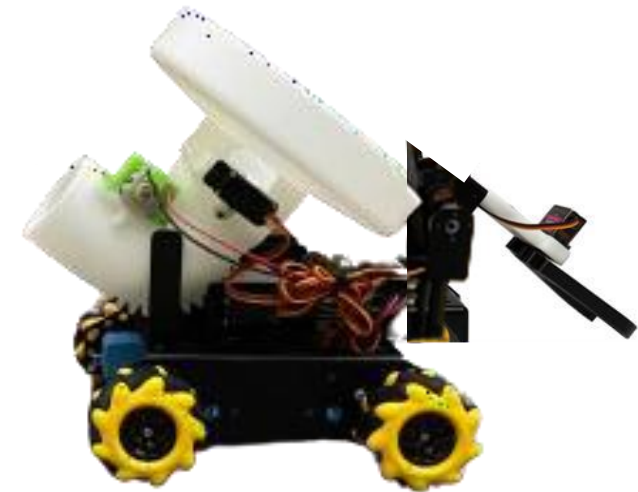


## Energy Ball Launches

Which agency do you think is carrying out this step?



Barrel  
adjustment

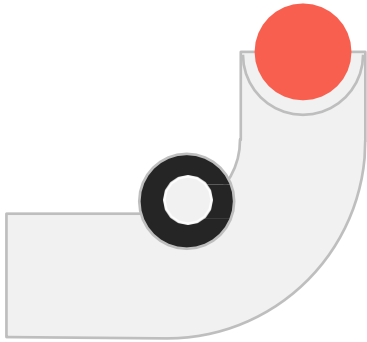


launch

# Energy Ball Launches

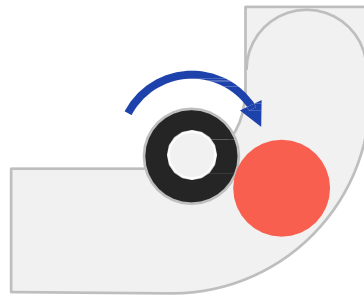
## Initial State

Servo motor P3  
Angle 0 Degrees



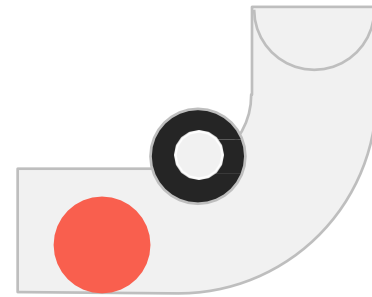
## launch

Servo motor P3  
Angle 180 Degrees



## The launch was successful

Servo motor P3  
Angle 0 Degrees

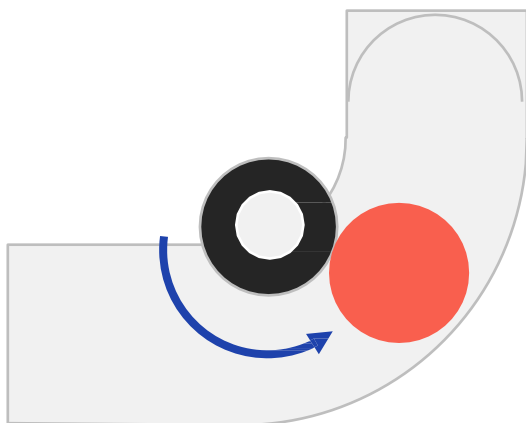


What happens if the friction wheel rotates counterclockwise at this point, and why?

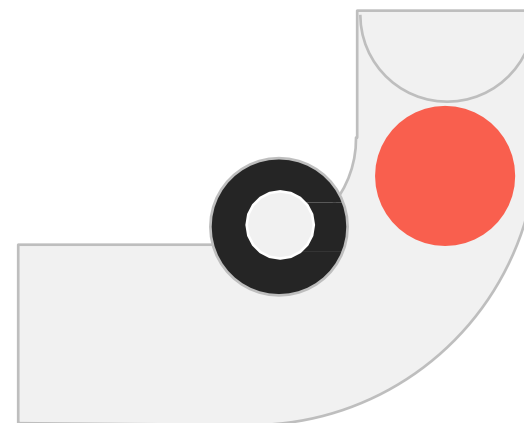
Motor M2 rotate 180  
degree clockwise

Motor M2 rotate 0  
degree clockwise

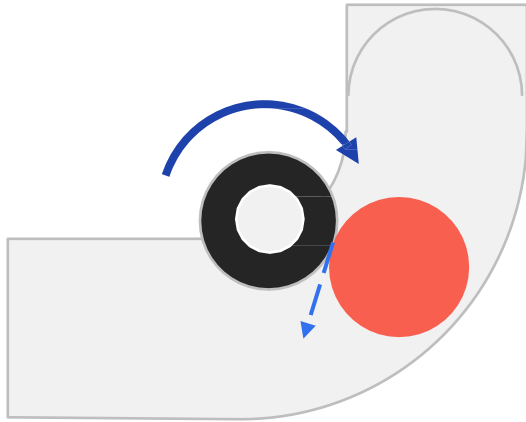
## Energy Ball Launches



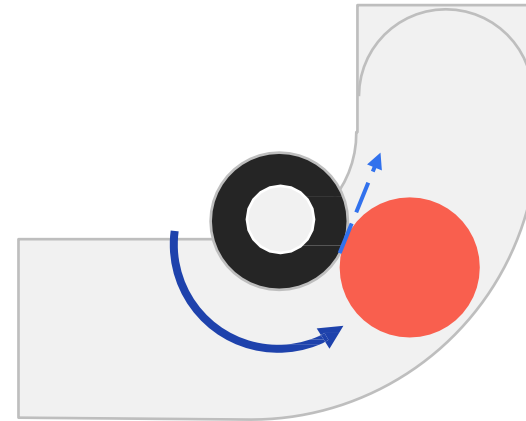
Why is that?



## Energy Ball Launches



When the friction wheel rotates clockwise, the contact surface between the friction wheel and the ball will produce an outward force, and the ball will move downward and outward after being forced.



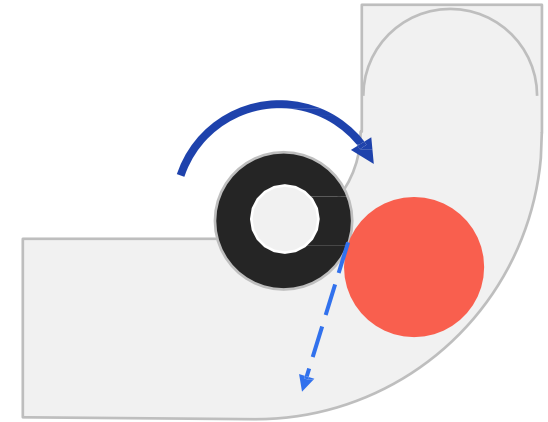
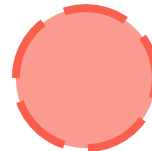
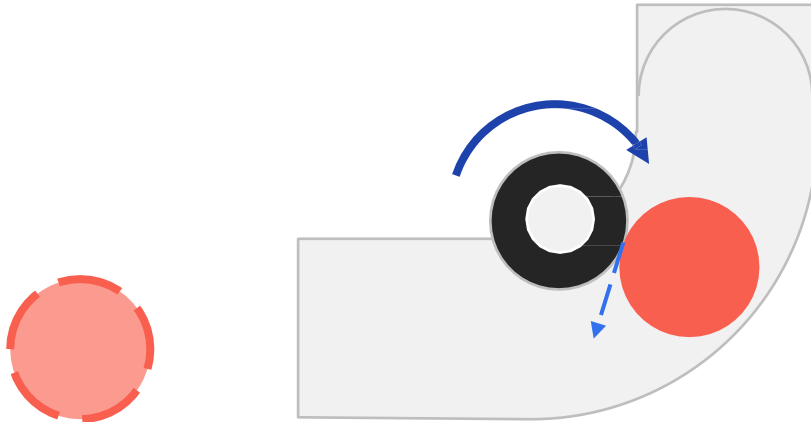
When the friction wheel rotates counterclockwise, the contact surface between the friction wheel and the ball will produce a backward force, and the ball will move upwards after being stressed.

## Energy Ball Launches

Think about it, what is the effect of the different rotational speeds of the friction wheel on the motion of the ball?



## Energy Ball Launches



The greater the velocity, the greater the force on the ball and  
the farther it will be projected;  
The lower the velocity, the less force the ball will experience and  
the closer it will be projected.

## Energy Ball Launches



Test the direction of movement of the minicar Motor M2



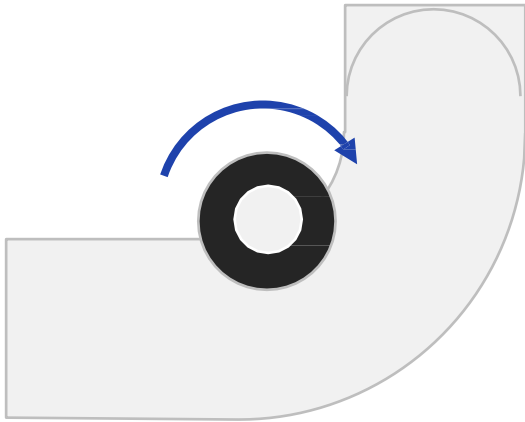
Repeat forever

Do

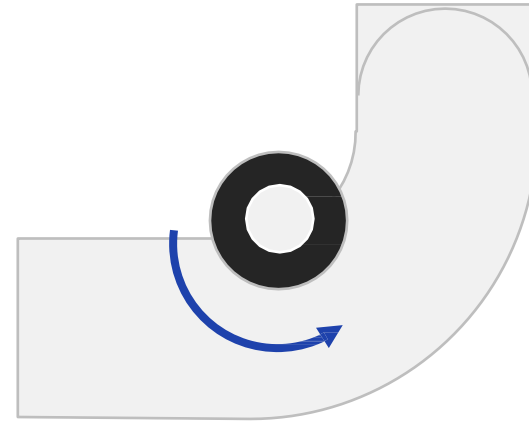
Set Motor M2's Speed to 150 (0~255) Rotating Clockwise turns

Observe how your trolley's friction wheels rotate at this point.

## Energy Ball Launches



If the friction wheel rotates clockwise, the rotation direction of the motor M2 should be set to clockwise



If the friction wheel rotates counterclockwise, the direction of rotation of motor M2 must be set to counterclockwise

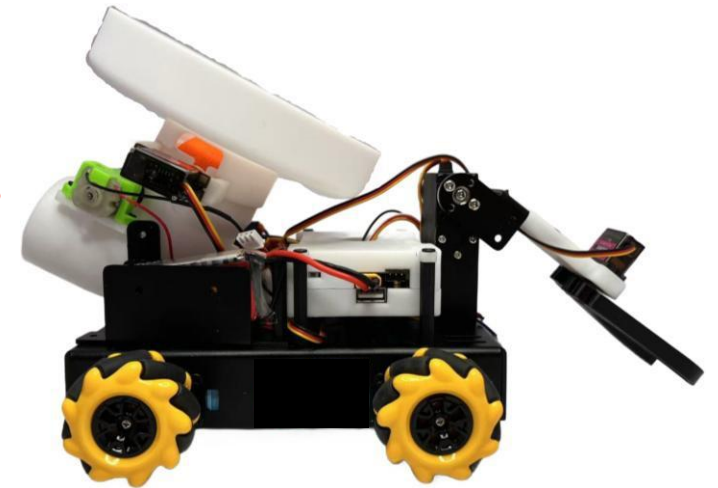
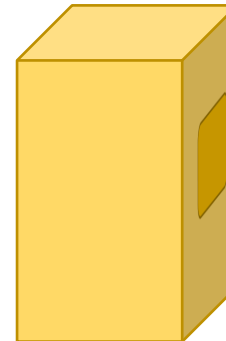


## Energy Ball Launches

 **Task 4:** Press the button **TRIANGLE** Button, energy balls are fired.



Send a  
message "TRIANGLE"

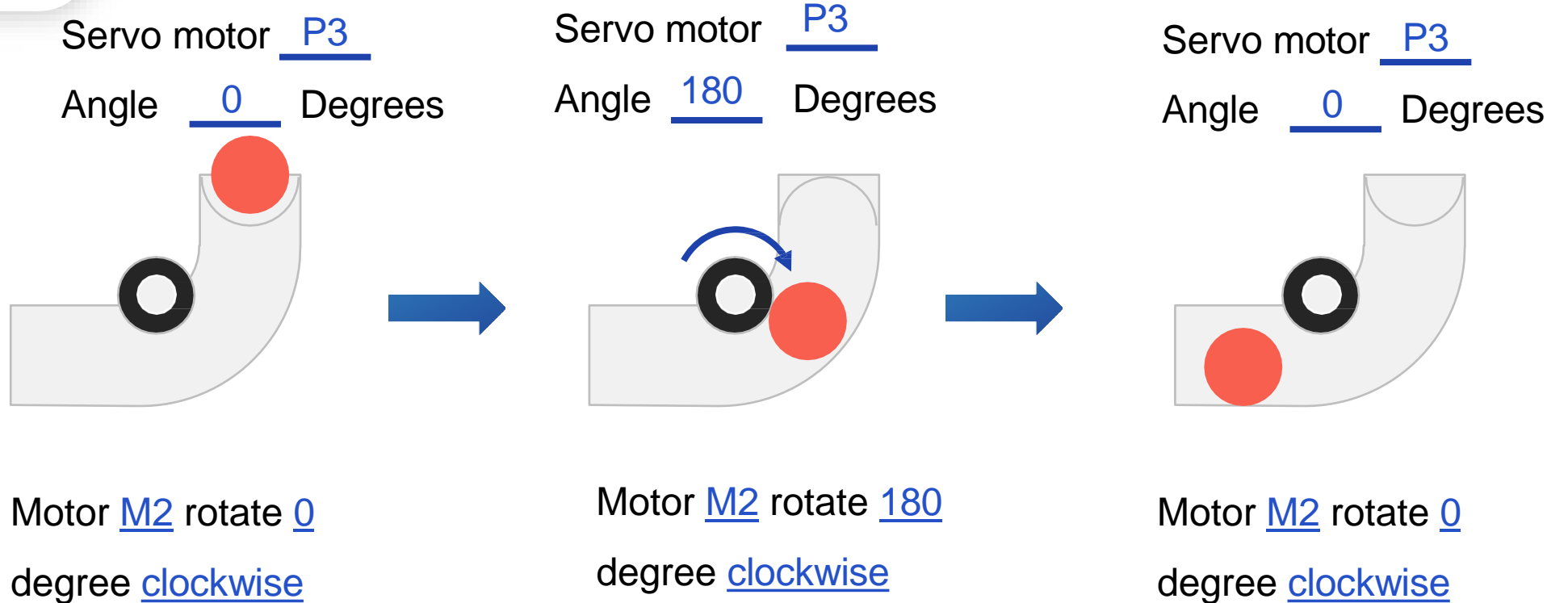


# Energy Ball Launches



**Task 4:** Press the button **TRIANGLE** Button, energy balls are fired.

## Process analysis



## Energy Ball Launches

 **Task 4:** Press the button **TRIANGLE** Button, energy balls are fired.

```
Define shoot_ball
do
  Set Motor M2's Speed to 200 (0~255) Rotating Clockwise turns
  Set Servo on GPIO # P3 Rotate to 180 Degree (0°~180°)
  Wait 1000 Milliseconds
  Set Servo on GPIO # P3 Rotate to 0 Degree (0°~180°)
  Wait 500 Milliseconds
  Set Motor M2's Speed to 0 (0~255) Rotating Clockwise turns
```

# Energy Ball Launches



## Task 4:

### Motor Driver Setup

Set Motor (M2) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M3) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M4) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M5) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M6) 's Speed to 0 (0~255) Rotating Clockwise turns



### Servo Setup

Set Servo on GPIO # P0 Rotate to 0 Degree (0°~180°)  
 Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)  
 Set Servo on GPIO # P2 Rotate to 90 Degree (0°~180°)  
 Set Servo on GPIO # P3 Rotate to 0 Degree (0°~180°)

### UART

Obtain data through the serial port to initialize  
 Set Baud Rate: 115200 bps  
 Set Data = " " " "  
 Set control = 100  
 Repeat forever  
 Do Clear serial port cache data  
 try Set Data = Get Serial (UART) Data at 0 as  
 except  
 Set control = Split string to a list Data by delimiter: Split and generate a list  
 If List control = 0 item = "R"  
 Do If int List control = 1 item > 100  
 Do right  
 Else if int List control = 1 item < -100  
 Do left  
 Else if int List control = 2 item > 100  
 Do back  
 Else if int List control = 2 item < -100  
 Do front

Else if List control = 0 item = "R"  
 Do If int List control = 1 item > 100  
 Do turn\_right  
 Else if int List control = 1 item < -100  
 Do turn\_left  
 Else if int List control = 2 item > 100  
 Do shoot\_down  
 Else if int List control = 2 item < -100  
 Do shoot\_up  
 Else If Data = "NONE"  
 Do stop  
 Else if Data = "UP"  
 Do Set Servo on GPIO # P1 Rotate to 180 Degree (0°~180°)  
 Else if Data = "DOWN"  
 Do Set Servo on GPIO # P1 Rotate to 14 Degree (0°~180°)  
 Else if Data = "LEFT"  
 Do Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)  
 Else if Data = "L1"  
 Do Set Servo on GPIO # P2 Rotate to 120 Degree (0°~180°)  
 Else if Data = "R1"  
 Do Set Servo on GPIO # P2 Rotate to 96 Degree (0°~180°)  
 Else if Data = "TRIANGLE"  
 Do shoot\_ball

Define right  
 do Set Motor (M3) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M4) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M5) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M6) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns

Define left  
 do Set Motor (M3) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M3) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M3) 's Speed to 100 (0~255) Rotating Clockwise turns

Define back  
 do Set Motor (M3) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M4) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M5) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M6) 's Speed to 100 (0~255) Rotating Clockwise turns

Define front  
 do Set Motor (M3) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M4) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M5) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M6) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns

Define shoot\_up  
 do If shoot < 70  
 Do Change shoot by 5  
 Else Set shoot = 70  
 Set Servo on GPIO # P0 Rotate to shoot Degree (0°~180°)

Define turn\_right  
 do Set Motor (M3) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M4) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M5) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M6) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns

Define turn\_left  
 do Set Motor (M3) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M4) 's Speed to 100 (0~255) Rotating Anti-Clockwise turns  
 Set Motor (M5) 's Speed to 100 (0~255) Rotating Clockwise turns  
 Set Motor (M6) 's Speed to 100 (0~255) Rotating Clockwise turns

Define shoot\_ball  
 do Set Motor (M2) 's Speed to 200 (0~255) Rotating Clockwise turns  
 Set Servo on GPIO # P3 Rotate to 180 Degree (0°~180°)  
 Wait 1000 Milliseconds  
 Set Servo on GPIO # P3 Rotate to 0 Degree (0°~180°)  
 Wait 500 Milliseconds  
 Set Motor (M2) 's Speed to 0 (0~255) Rotating Clockwise turns

Define stop  
 do Set Motor (M3) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M4) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M5) 's Speed to 0 (0~255) Rotating Clockwise turns  
 Set Motor (M6) 's Speed to 0 (0~255) Rotating Clockwise turns

Define shoot\_down  
 do If shoot > 0  
 Do Change shoot by -5  
 Else Set shoot = 0  
 Set Servo on GPIO # P0 Rotate to shoot Degree (0°~180°)

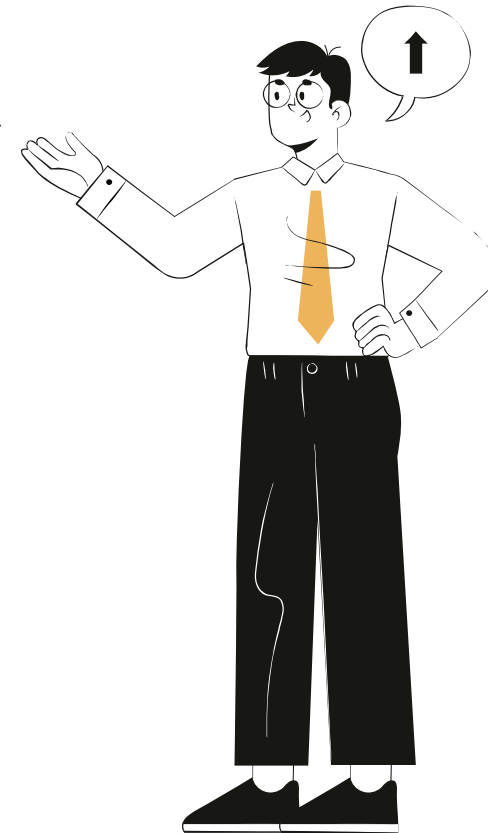
## Energy Ball Launches

Tests have found that sometimes pressing **TRIANGLE** button one time, the trolley will continue to fire several times in a row. How to solve this situation?



## Energy Ball Launches

Although, the button was pressed for a short instant, the same input will be continuously read. As the shooter requires time to fire, it stops receiving new data during the fire sequence. After the action is complete, it reads the data stored in the cache during that time, which causes it to continue firing.



# Energy Ball Launches



**Task 4:** Press the button **TRIANGLE** Button, energy balls are fired.

- Create a variable state, which starts at 0.
- When you press the TRIANGLE button to fire, you will determine the state at this time, and if the state=0 will be fired.
- Switch the state to 1 at the same time when launching
- When the key is not pressed (send NONE), the state is changed to 0.

設定 state 為 0

如果 Data = "NONE"  
執行 stop  
設定 state 為 0

否則如果 Data = "TRIANGLE"  
執行 如果 state = 0  
執行 設定 state 為 1  
shoot\_ball



# Energy Ball Launches

**Motor Driver Setup**

Set Motor M2's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M3's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M4's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M5's Speed to 0 (0~255) Rotating Clockwise turns

Set Motor M6's Speed to 0 (0~255) Rotating Clockwise turns

**Servo Setup**

Set Servo on GPIO # P0 Rotate to 0 Degree (0°~180°)

Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)

Set Servo on GPIO # P2 Rotate to 90 Degree (0°~180°)

Set Servo on GPIO # P3 Rotate to 0 Degree (0°~180°)

**UART**

Obtain data through the serial port to initialize

Set Baud Rate: 115200 bps

Set Data = 0

Set control = 100

Set state = 0

Repeat forever

Do Clear serial port cache data

try Set Data = Get Serial (UART) Data at 0 as

except

Set control = Split string to a list Data by delimiter: Split and generate a list

If List control # 0 item = "L"

Do right

Else if List control # 1 item < -100

Do left

Else if List control # 2 item > 100

Do back

Else if List control # 2 item < -100

Do front

Else if List control # 0 item = "R"

Do turn\_right

Else if List control # 1 item < -100

Do turn\_left

Else if List control # 2 item > 100

Do shoot\_down

Else if List control # 2 item < -100

Do shoot\_up

Else If Data = "NONE"

Do stop

Set state = 0

Else if Data = "UP"

Do Set Servo on GPIO # P1 Rotate to 180 Degree (0°~180°)

Else if Data = "DOWN"

Do Set Servo on GPIO # P1 Rotate to 14 Degree (0°~180°)

Else if Data = "LEFT"

Do Set Servo on GPIO # P1 Rotate to 90 Degree (0°~180°)

Else if Data = "L1"

Do Set Servo on GPIO # P2 Rotate to 120 Degree (0°~180°)

Else if Data = "R1"

Do Set Servo on GPIO # P2 Rotate to 96 Degree (0°~180°)

Else if Data = "TRIANGLE"

Do If state = 0

Do Set state = 1

shoot\_ball

**定義 front**

執行 設定馬達 M3 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M4 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M5 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M6 以速度 100 (0~255)進行 逆時針 轉動

**定義 shoot\_down**

執行 如果 shoot > 0

執行 將 shoot 增加 -5

否則 設定 shoot 為 0

設定位於引腳 # P0 的伺服馬達轉動至 shoot 度 (0°~180°)

**定義 shoot\_up**

執行 如果 shoot < 70

執行 將 shoot 增加 5

否則 設定 shoot 為 70

設定位於引腳 # P0 的伺服馬達轉動至 shoot 度 (0°~180°)

**定義 left**

執行 設定馬達 M3 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M4 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M5 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M6 以速度 100 (0~255)進行 順時針 轉動

**定義 right**

執行 設定馬達 M3 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M4 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M5 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M6 以速度 100 (0~255)進行 逆時針 轉動

**定義 back**

執行 設定馬達 M3 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M4 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M5 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M6 以速度 100 (0~255)進行 順時針 轉動

**定義 stop**

執行 設定馬達 M3 以速度 0 (0~255)進行 順時針 轉動

設定馬達 M4 以速度 0 (0~255)進行 順時針 轉動

設定馬達 M5 以速度 0 (0~255)進行 順時針 轉動

設定馬達 M6 以速度 0 (0~255)進行 順時針 轉動

**定義 turnright**

執行 設定馬達 M3 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M4 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M5 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M6 以速度 100 (0~255)進行 逆時針 轉動

**定義 turnleft**

執行 設定馬達 M3 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M4 以速度 100 (0~255)進行 逆時針 轉動

設定馬達 M5 以速度 100 (0~255)進行 順時針 轉動

設定馬達 M6 以速度 100 (0~255)進行 順時針 轉動

**定義 shoot\_ball**

執行 設定馬達 M2 以速度 200 (0~255)進行 順時針 轉動

設定位於引腳 # P3 的伺服馬達轉動至 180 度 (0°~180°)

等待 1000 毫秒

設定位於引腳 # P3 的伺服馬達轉動至 0 度 (0°~180°)

等待 500 毫秒

設定馬達 M2 以速度 0 (0~255)進行 順時針 轉動

See you in  
The Next Session!

T H A N K S

J U S T L E A V E P R E S E N T A T I O N T O O R I

