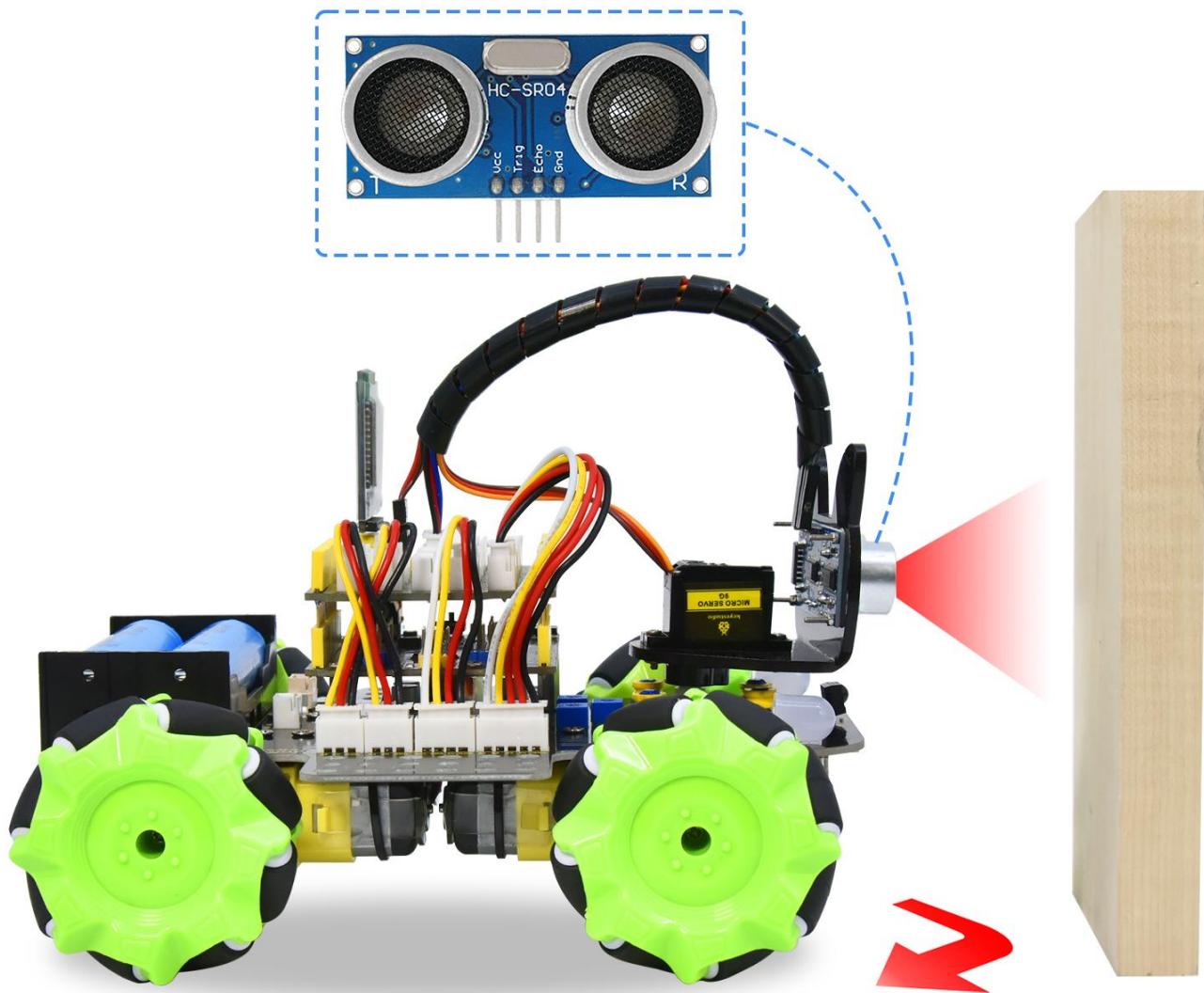


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## Project 9: Ultrasonic Obstacle Avoidance Smart Car

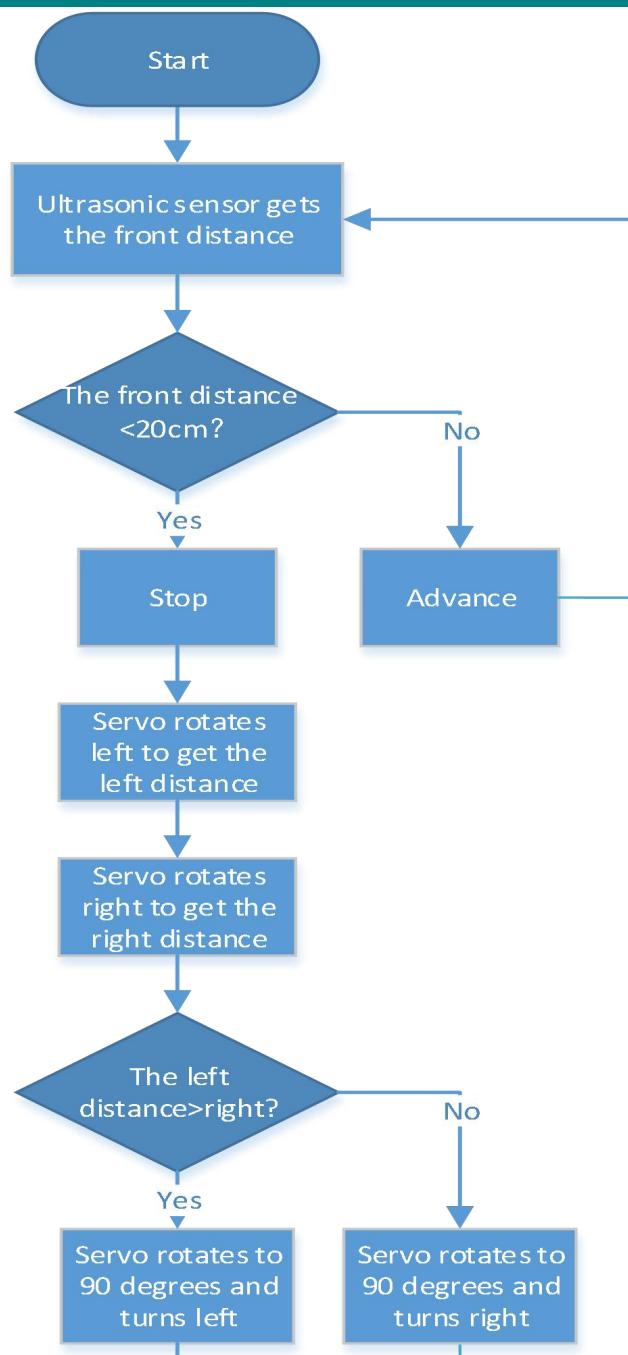


### 1. Description

Ultrasonic obstacle avoidance smart car is used to control the car motion state, so as to achieve obstacle avoidance by using the ultrasonic sensor detecting the obstacles distance.

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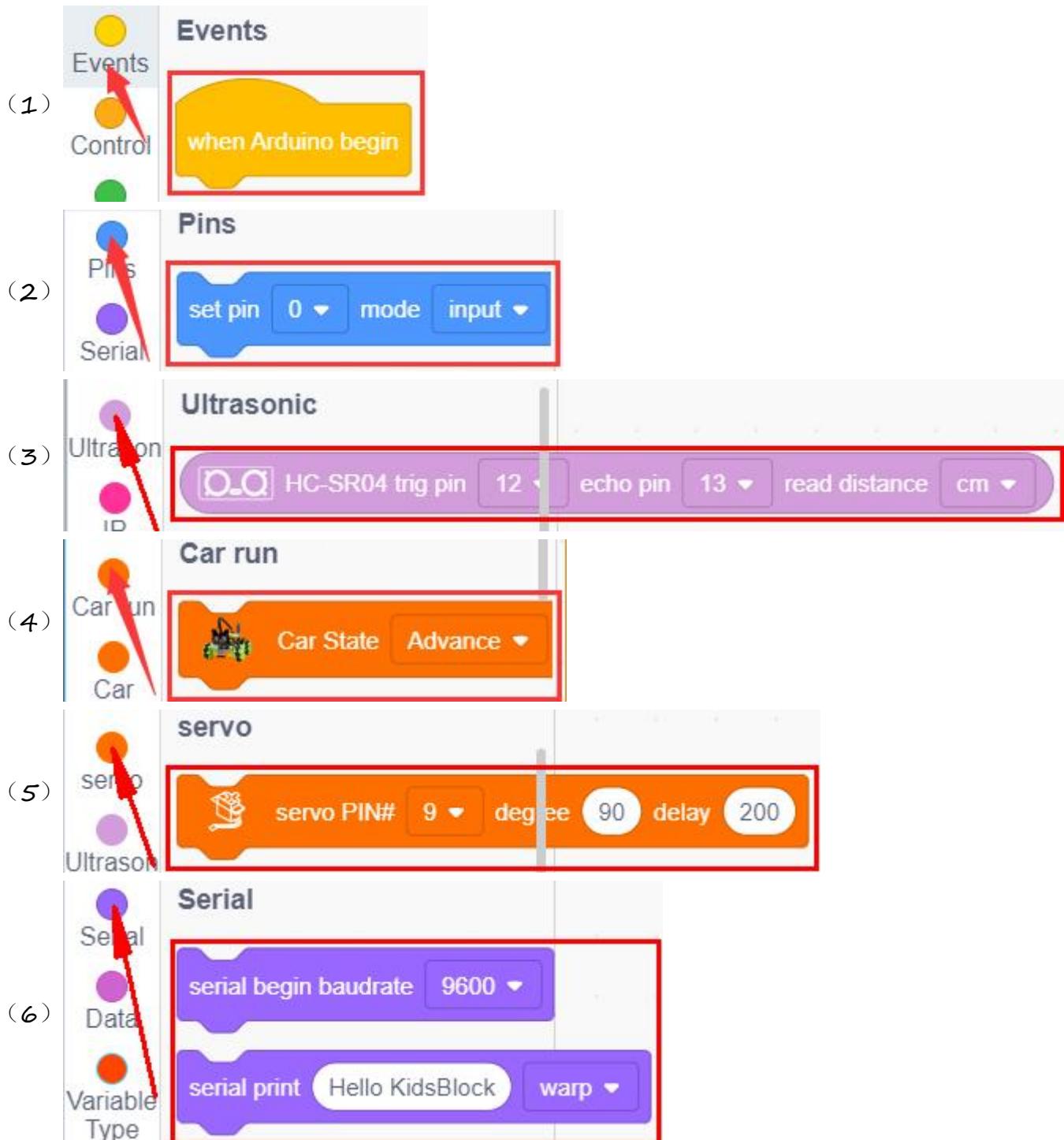
## 2. Flow Diagram



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## 3. Test Code

You can drag blocks to edit. Blocks listed below are for your reference



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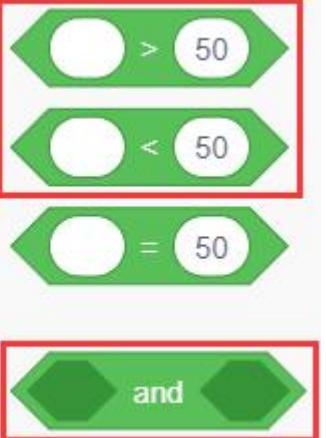
(7)



A Scratch script consisting of two blocks:

- A "Variable" block: "variable item" (Type int, Assigned to item).
- A "Set" block: "Set item to [0]".

(8)



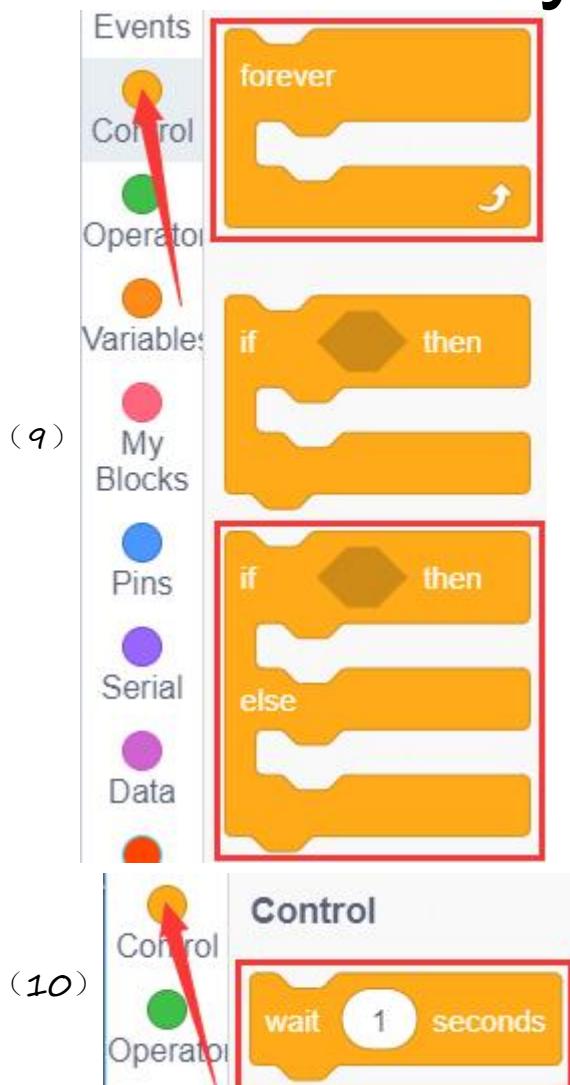
Three green control blocks are highlighted with a red box:

- "> [50]" (greater than 50)
- "< [50]" (less than 50)
- "[= 50]" (equal to 50)

One green control block is also highlighted with a red box:

- "and" (join two conditions)

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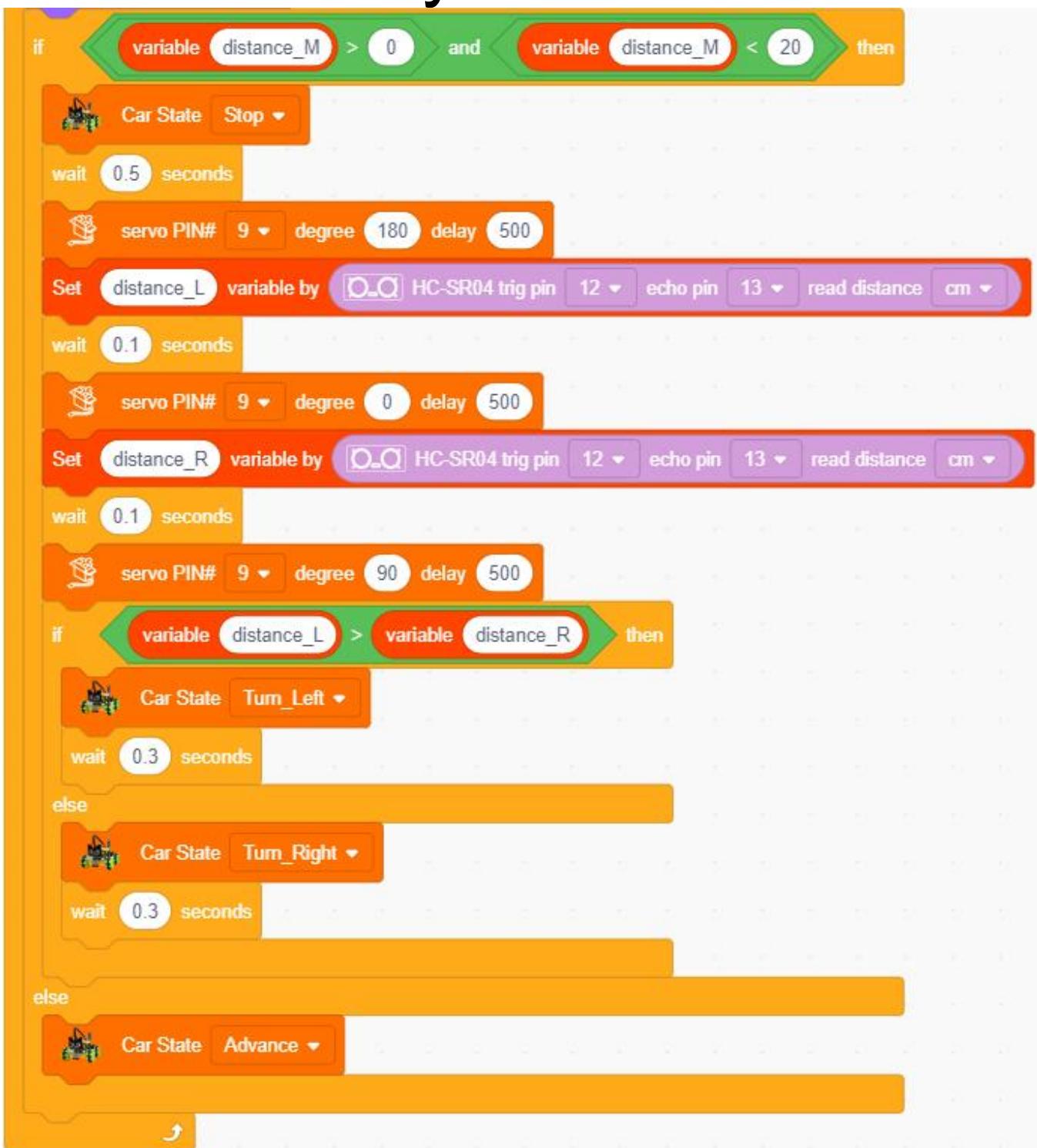


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Complete Test Code

```
when Arduino begin
    serial begin baudrate 9600
    set pin 12 mode output
    set pin 13 mode input
    set pin 2 mode output
    set pin 3 mode output
    servo PIN# 9 degree 90 delay 300
    Declare Global variable Type int Name distance_M Assigned to 0
    Declare Global variable Type int Name distance_L Assigned to 0
    Declare Global variable Type int Name distance_R Assigned to 0
forever
    Set distance_M variable by D-O HC-SR04 trig pin 12 echo pin 13 read distance cm
    serial print distance: no-warp
    serial print variable distance_M no-warp
    serial print cm warp
```

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This Scratch script controls a robot car's behavior based on distance sensors. It includes a main loop with an 'if' condition for proximity, servo calibration, distance reading, and state switching logic.

```
when green flag clicked
  if [distance_M > 0 and distance_M < 20] then
    set [Car State v] to [Stop]
    wait (0.5) seconds
    servo PIN# 9 degree 180 delay 500
    Set [distance_L] variable by (HC-SR04 trig pin 12 echo pin 13 read distance cm)
    wait (0.1) seconds
    servo PIN# 9 degree 0 delay 500
    Set [distance_R] variable by (HC-SR04 trig pin 12 echo pin 13 read distance cm)
    wait (0.1) seconds
    servo PIN# 9 degree 90 delay 500
    if [distance_L > distance_R] then
      set [Car State] to [Turn_Left]
      wait (0.3) seconds
    else
      set [Car State] to [Turn_Right]
      wait (0.3) seconds
    else
      set [Car State] to [Advance]
    end
  end
end
```

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## 4. Test Result

After uploading the code successfully, turn the DIP switch to the ON end and power up, then the car can automatically avoid obstacles. Note that the speed can't be too large.

The car will stop when encountering obstacles in front of it and the servo cradle head will rotate left to detect the left distance, then rotate right to detect the right distance. Then judge the distance between the obstacles on the left and the right, the car will turn along the farther side, and then continue to drive.