Project 13 Ultrasonic Obstacle Avoidance Smart Car



1.Description

In this project, we aim to make an ultrasonic obstacle avoidance smart car. We will use the ultrasonic to detect the distance from the obstacle, which can be used to control the servo to rotate so as to make the car move. Meanwhile, the 8X16 LED board will display the corresponding status pattern.

2.Flow Chart

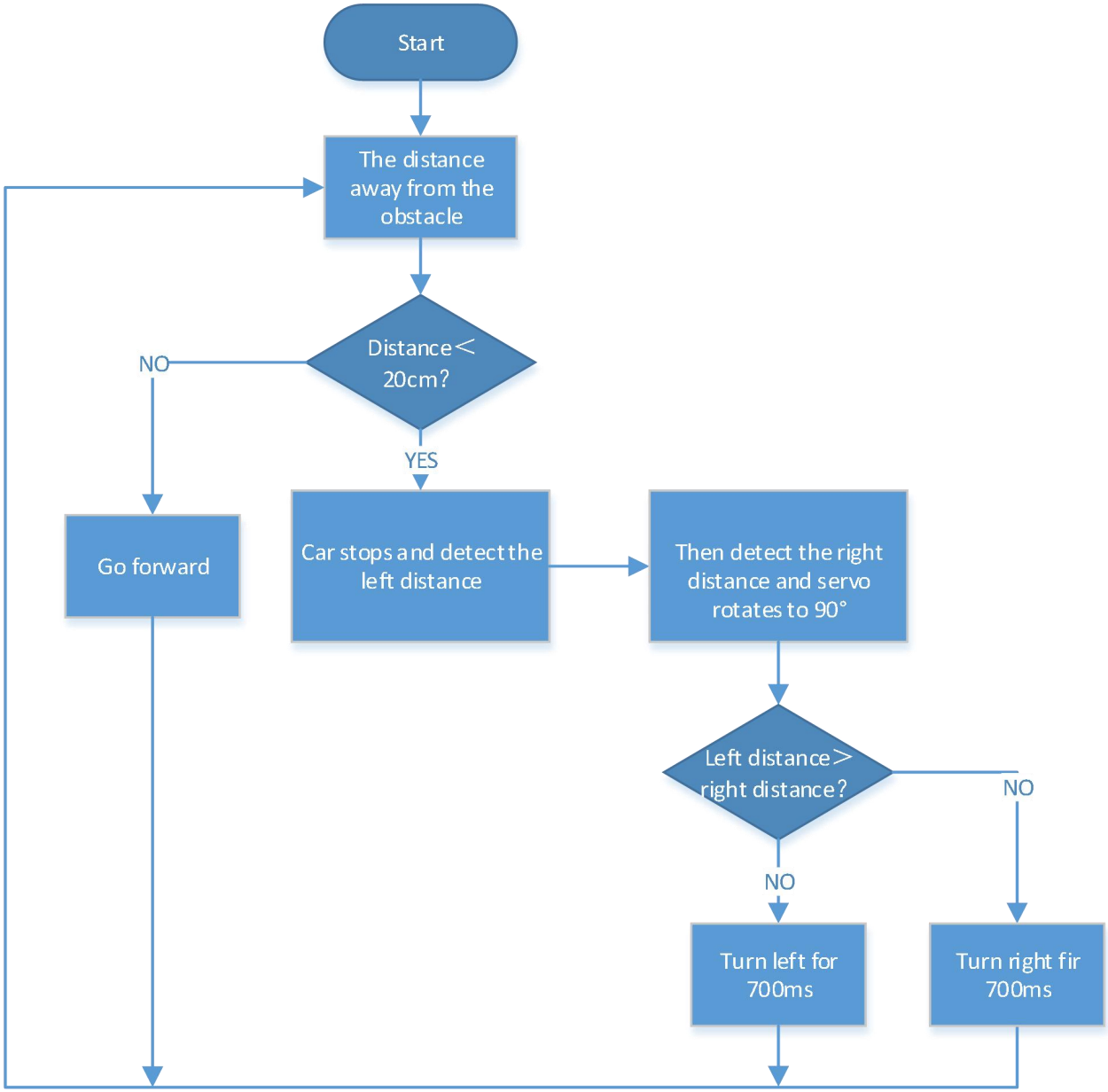
The specific logic of ultrasonic obstacle avoidance smart car is shown below:

Detection	measured distance of front obstacle set servo to 90°	distance (unit: cm)
	measured distance of left obstacle (set servo to 160°)	a1 (unit: cm)
	measured distance of right obstacle (set servo to 20°)	a2 (unit: cm)

<table>
<tr><td>Setting</td><td colspan="4">set the initial angle of servo to 90°</td></tr>
<tr><td>Condition 1</td><td colspan="4">Status</td></tr>
<tr><td rowspan="6">a < 20</td><td colspan="4">Stop for 1000ms; set the angle of servo to 160°, read a1, delay in 500ms; set the angle of servo to 20°, read a2, delay in 500ms</td></tr>
<tr><td colspan="2">Condition 2</td><td colspan="2">Status</td></tr>
<tr><td rowspan="3">a1 < 50
or
a2 < 50</td><td colspan="3">Compare a1and a2</td></tr>
<tr><td>Condition 3</td><td>Status</td></tr>
<tr><td>a1 > a2</td><td>Set the angle of servo to 90°, rotate to left for 700ms and go front</td></tr>
<tr><td></td><td>a1 < a2</td><td colspan="2">Set the angle of servo to 90°, rotate to right for 700ms, go front</td></tr>
<tr><td>Condition 2</td><td colspan="3">Status</td></tr>
<tr><td>a1 ≥</td><td>Random</td><td colspan="2">Set the angle of servo to 90°, rotate to left</td></tr>
</table>

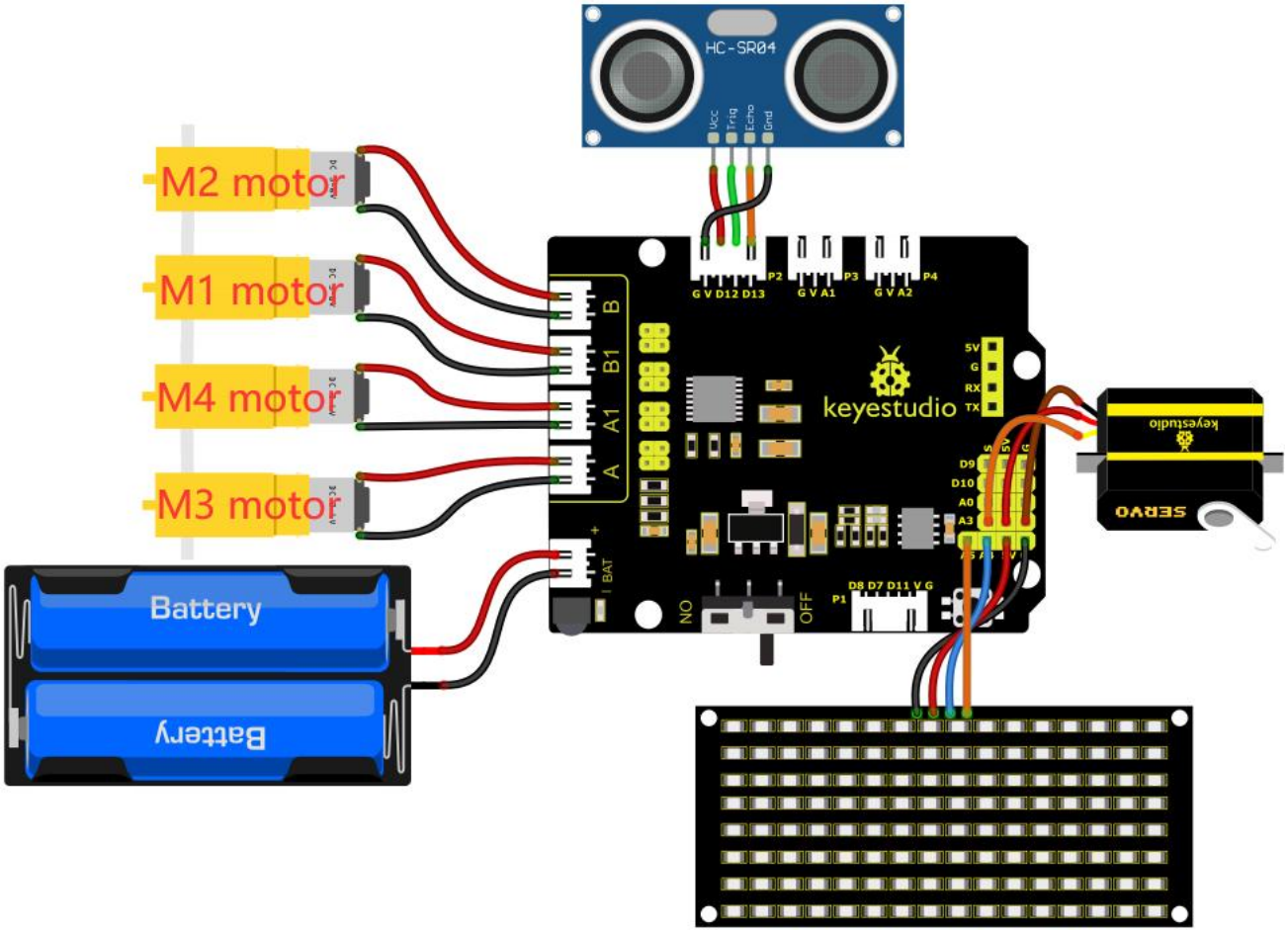
	50 and a2 ≥ 50		for 700ms and go front
			Set the angle of servo to 90°, rotate to right for 700ms, go front
Condition 1	Status		
a≥20	Go forward		

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3.Wiring Diagram

keyestudio



1. GND, VCC, SDA and SCL of the 8*8 LED board module are connected to G（GND), V（VCC), A4 and A5 of the expansion board.

2. VCC, Trig, Echo and Gnd of the ultrasonic sensor are connected to 5V(V), D12(S), D13(S) and Gnd(G)

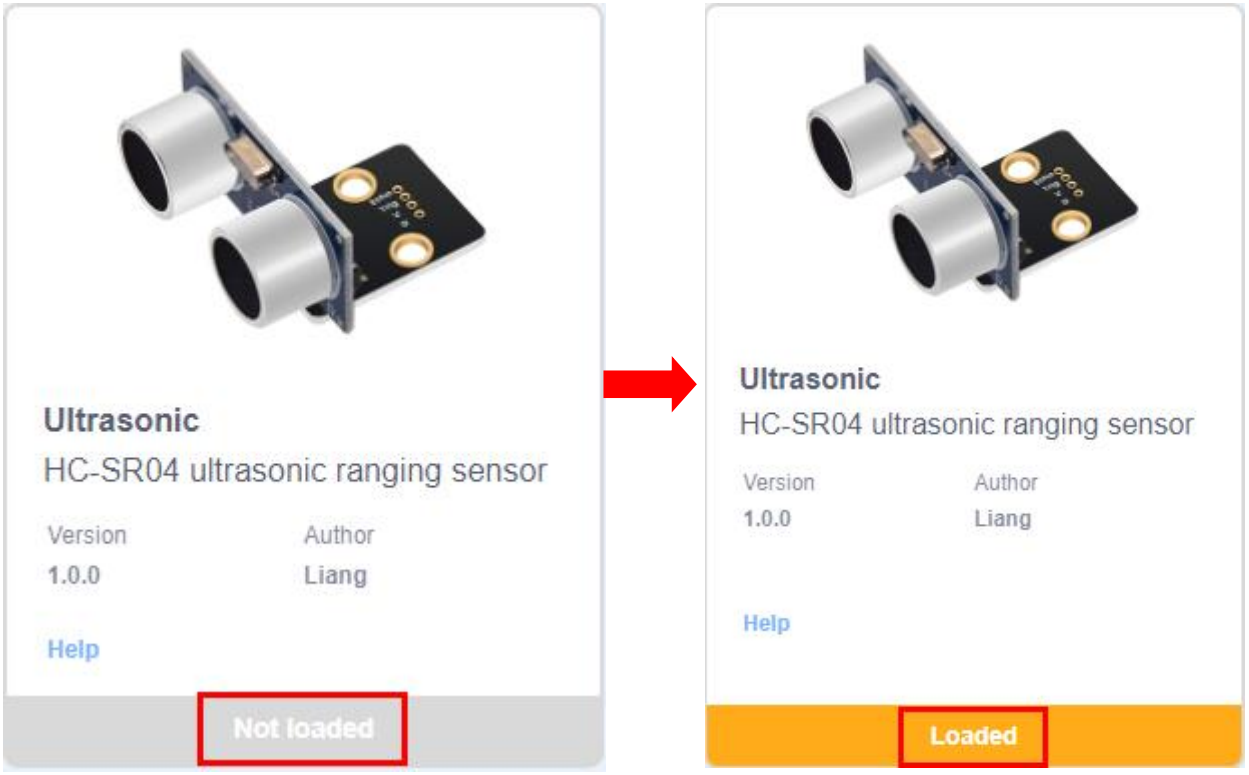
3. The servo is connected to G, V and A3. The brown wire is interfaced with Gnd(G), the red wire is interfaced with 5V(V) and the orange wire is interfaced with A3.

4. The power is connected to the BAT port

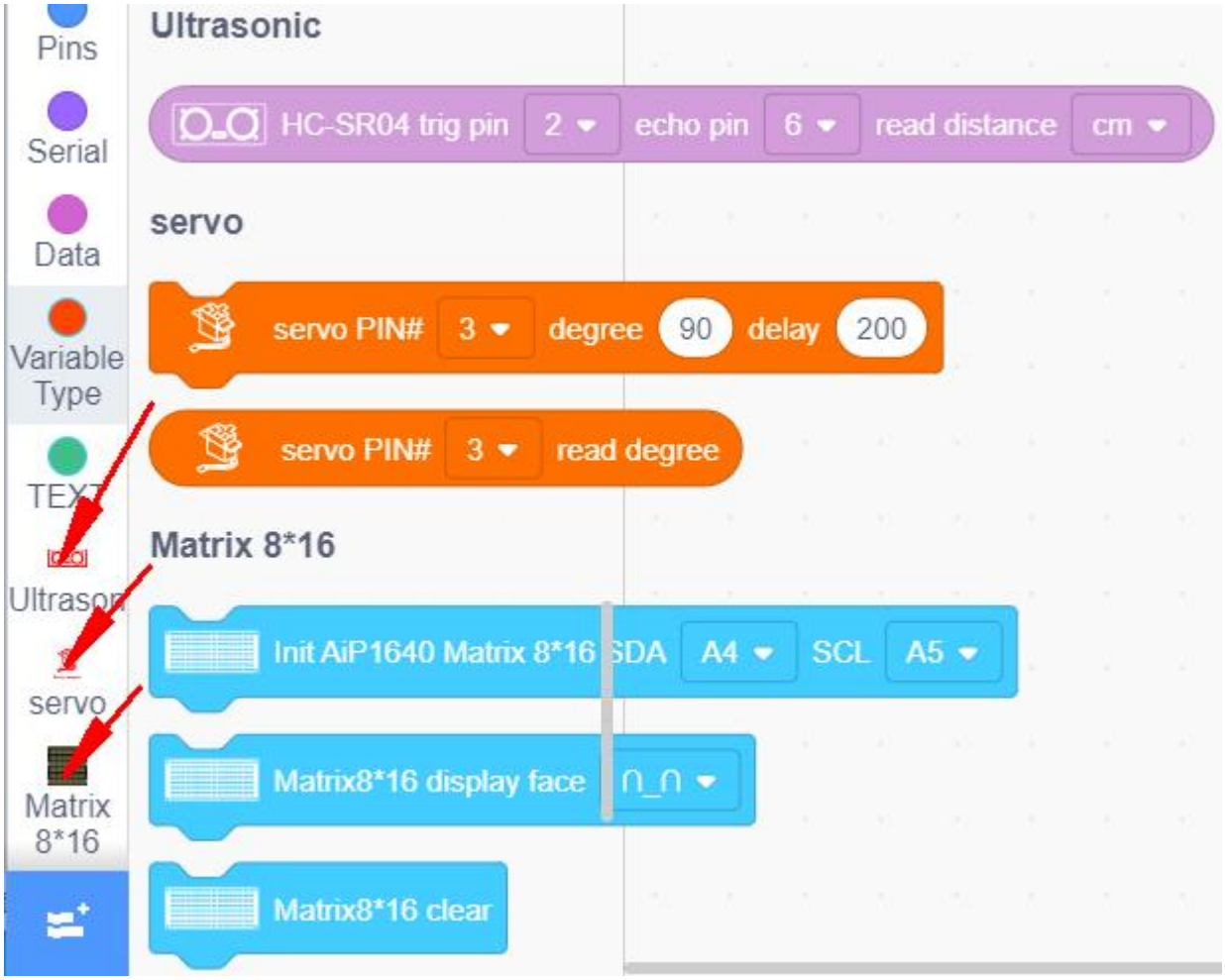
4.Test Code

Before writing the code, it is necessary to import the library files of the ultrasonic sensor , 8x16 LED board and the servo. The specific steps are as follows:

Click  to enter the extension library interface of sensors/modules/components, then search for " Ultrasonic " sensor  and click it. In this way, "Not loaded" changes to "loaded", indicating that the "Ultrasonic" sensor was added successfully.



Click Back to return to the code editor interface, the instruction block of the added "Ultrasonic" sensor, "Matrix 8*16" module and "Servo" component can be seen in the module area.

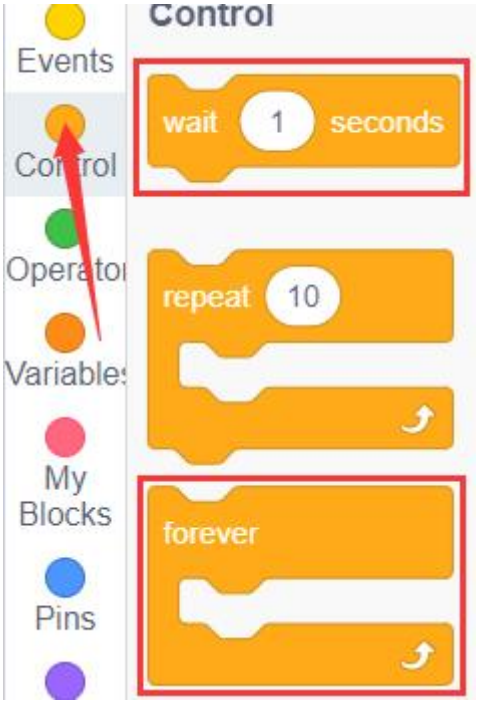


You can drag blocks to edit. Blocks listed below are for your reference

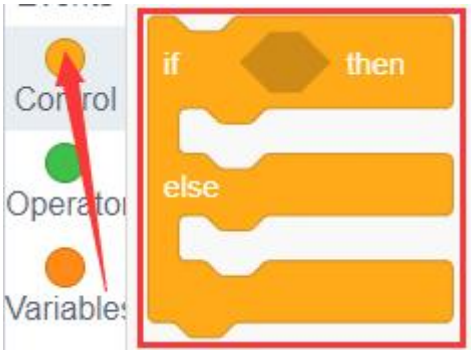
(1)



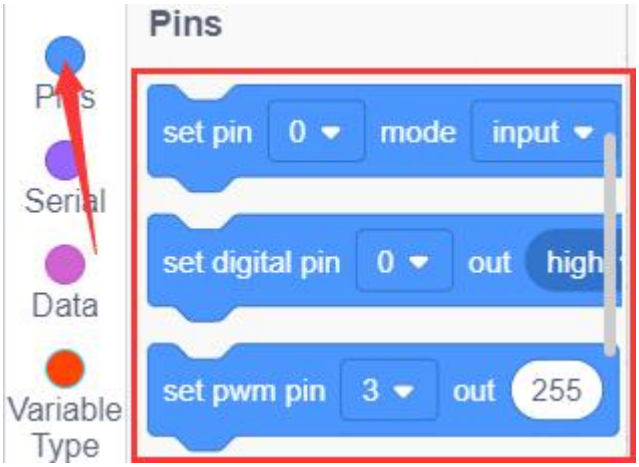
（2）


Control
Events
Control
Operators
Variables
My Blocks
Pins
wait 1 seconds
repeat 10
forever

（3）


Control
Operators
Variables
if then
else

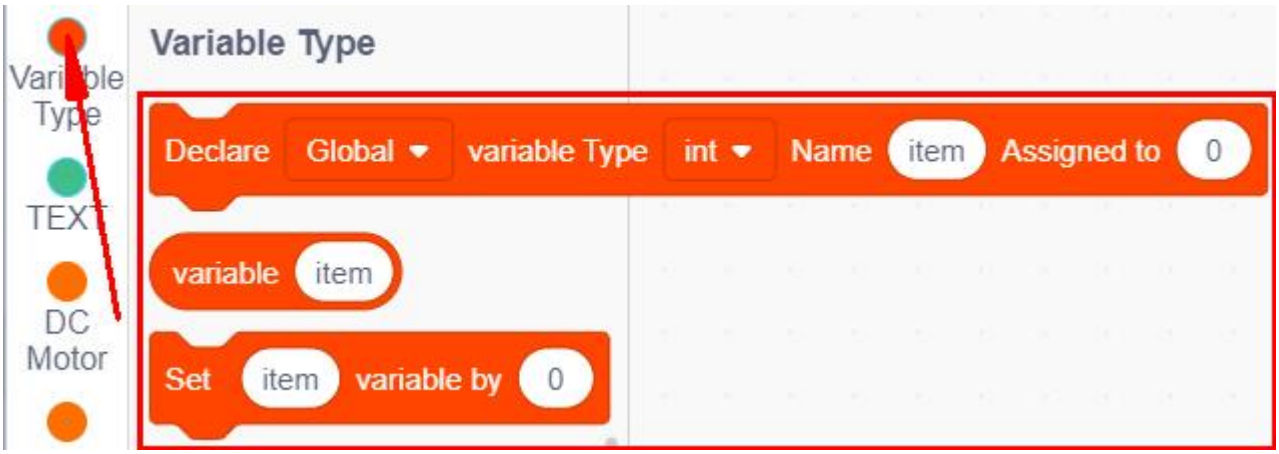
（4）


Pins
Pins
Serial
Data
Variable Type
set pin 0 mode input
set digital pin 0 out high
set pwm pin 3 out 255

（5）


Serial
Data
Variable Type
Serial
serial begin baudrate 9600
serial print Hello KidsBlock

（6）


TEXT
DC Motor
Variable Type
Declare Global variable Type int Name item Assigned to 0
variable item
Set item variable by 0

（7）


Matrix
servo
servo PIN# 3 degree 90 delay 200

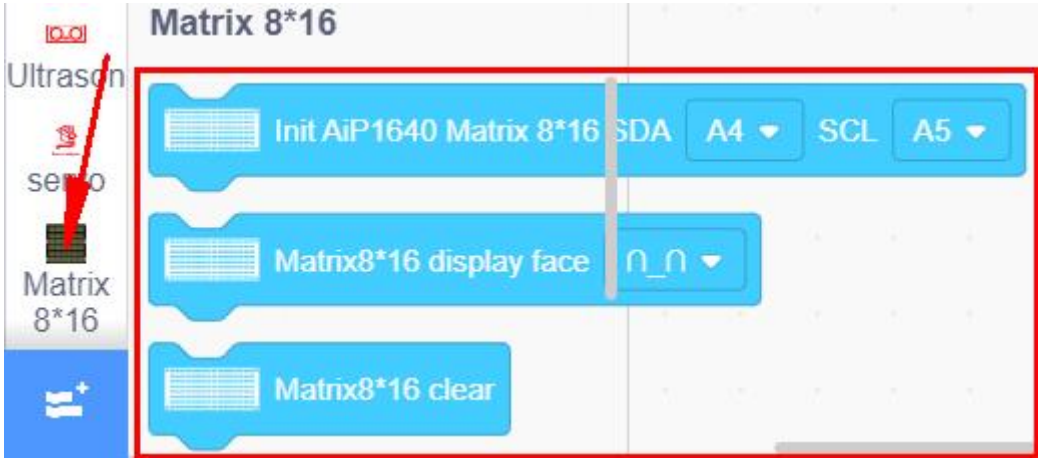
（8）


Ultrasonic
HC-SR04 trig pin 2 echo pin 6 read distance cm

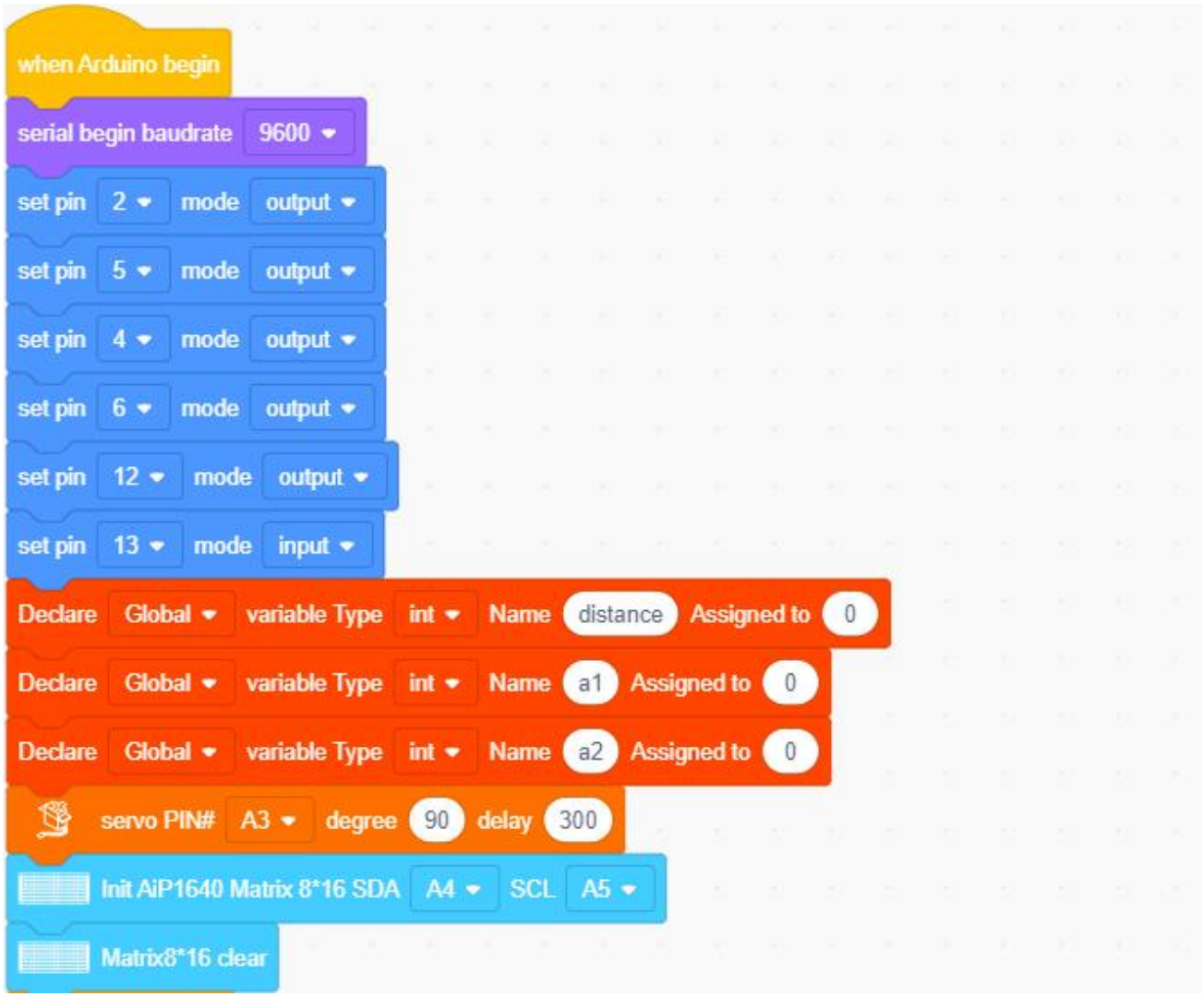
（9）

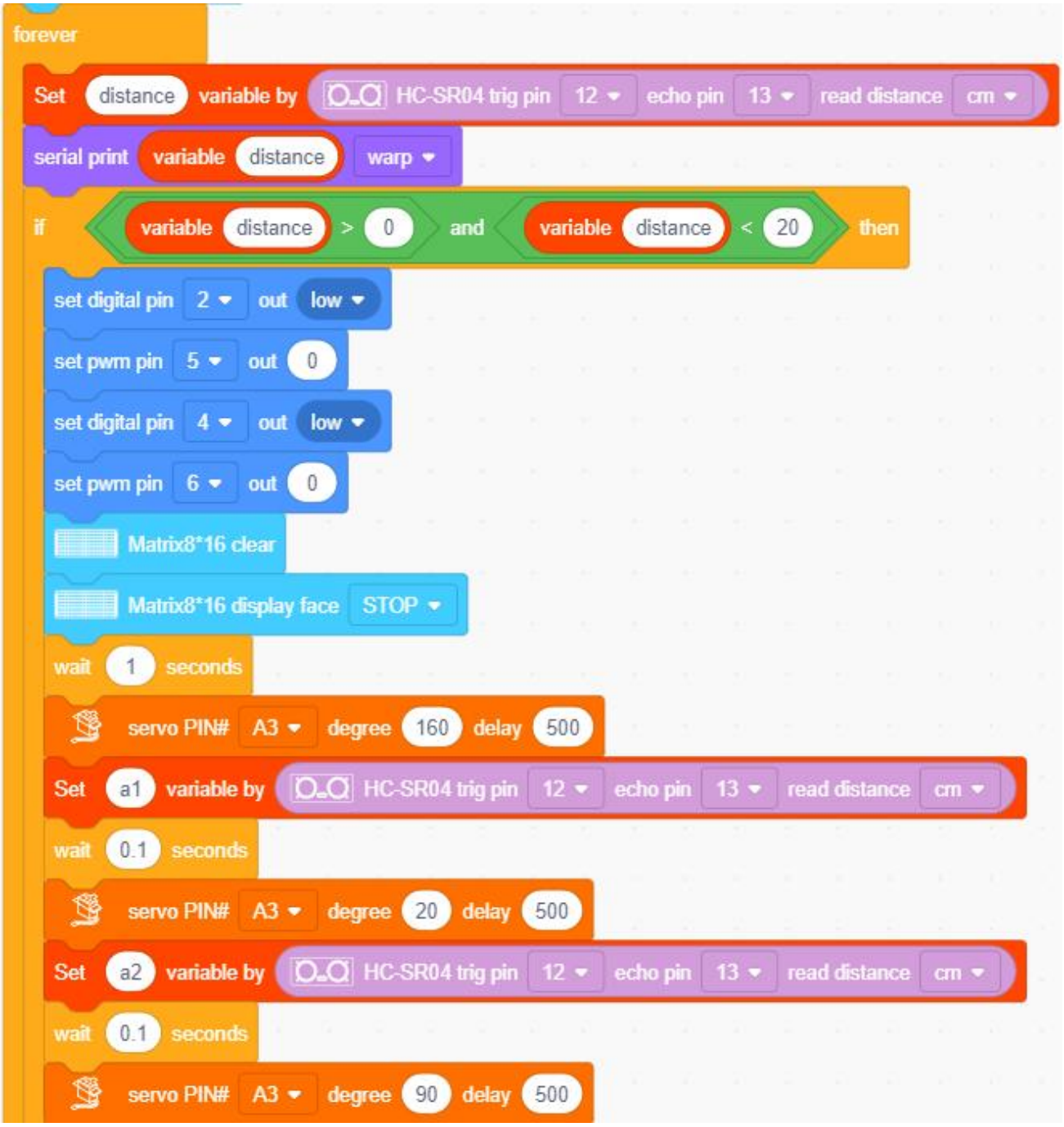

Control
Variables
> 50
< 50
= 50

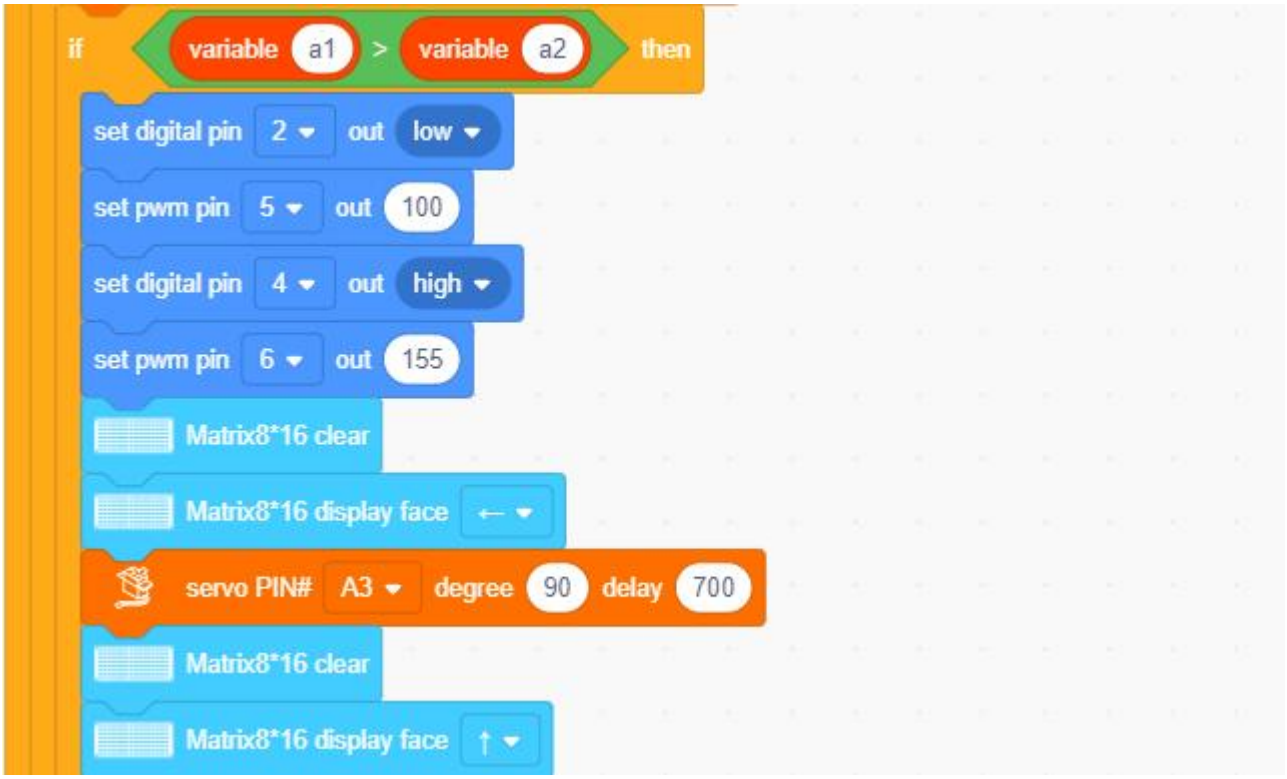
（10）

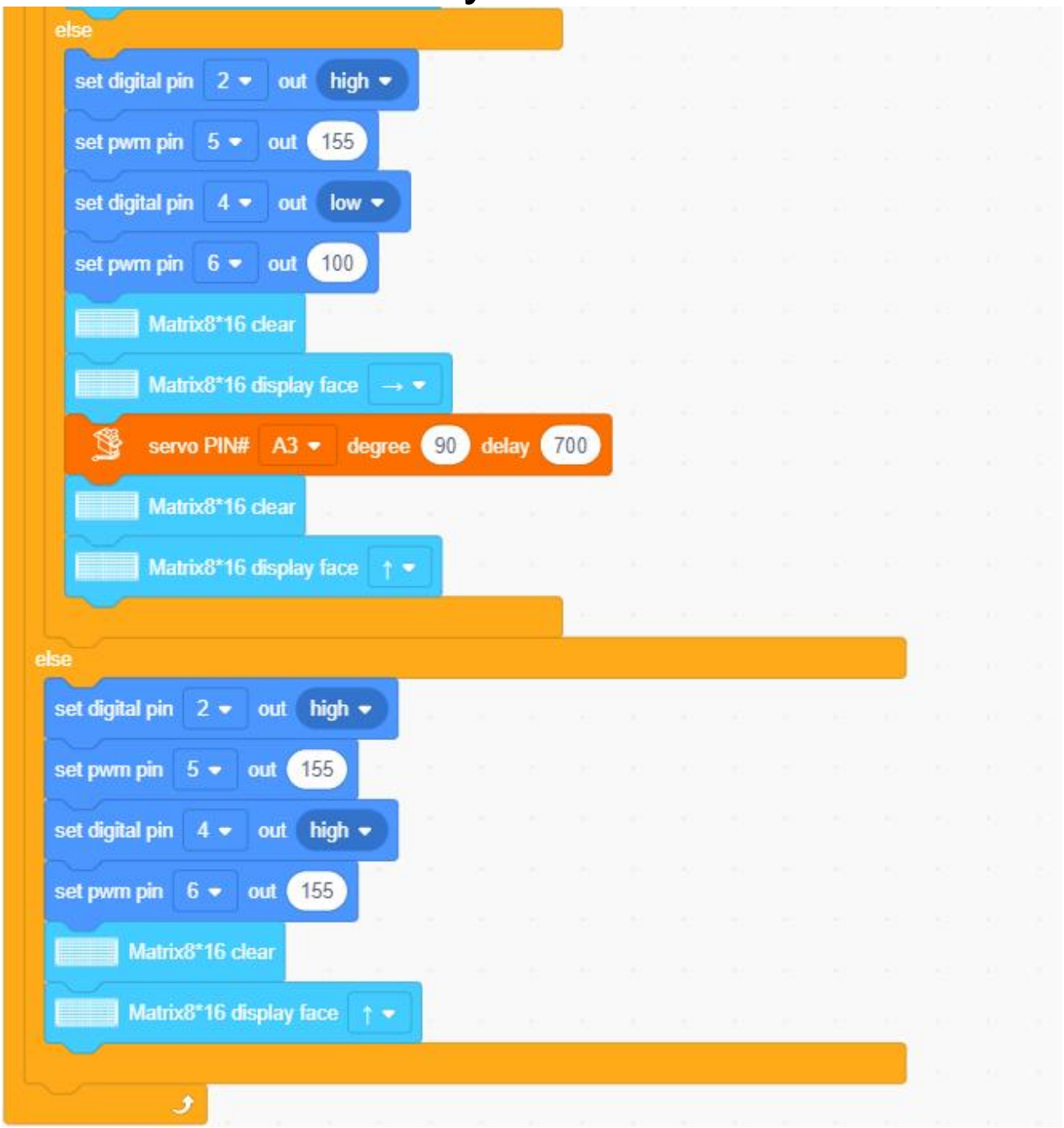


Complete Test Code




forever
Set distance variable by HC-SR04 trig pin 12 echo pin 13 read distance cm
serial print variable distance warp
if variable distance > 0 and variable distance < 20 then
set digital pin 2 out low
set pwm pin 5 out 0
set digital pin 4 out low
set pwm pin 6 out 0
Matrix8*16 clear
Matrix8*16 display face STOP
wait 1 seconds
servo PIN# A3 degree 160 delay 500
Set a1 variable by HC-SR04 trig pin 12 echo pin 13 read distance cm
wait 0.1 seconds
servo PIN# A3 degree 20 delay 500
Set a2 variable by HC-SR04 trig pin 12 echo pin 13 read distance cm
wait 0.1 seconds
servo PIN# A3 degree 90 delay 500


if
variable a1 > variable a2 then
set digital pin 2 out low
set pwm pin 5 out 100
set digital pin 4 out high
set pwm pin 6 out 155
Matrix8*16 clear
Matrix8*16 display face ←
servo PIN# A3 degree 90 delay 700
Matrix8*16 clear
Matrix8*16 display face ↑



5.Test Result

After successfully uploading the code to the V4.0 board, connect the wirings according to the wiring diagram, power on the external power then turn the DIP switch to ON.

The smart car moves forward and automatically avoids obstacles. When there is no road ahead, the servo will drive the ultrasonic sensor to scan the left, middle and right distances, and the car will turn to the open side. Meanwhile, the 8X16 LED board will display the corresponding status pattern.