HS-AOI Multipurpose Car
Learning kit assembly instructions

Product Introduction

The multi-functional trolley is an intelligent trolley composed of ultrasonic module, tracking sensor, infrared obstacle avoidance module, servo, drive motor and other accessories.

This kit can realize ultrasonic infrared automatic obstacle avoidance, ultrasonic infrared follow-up, intelligent tracking and other functions.

You can also modify the sample program through programming software such as Arduino IDE and Mixly or write new programs yourself to control the smart car.

* Purchase or bring your own infrared receiving module, infrared remote control, Bluetooth module can be extended to mobile phone Bluetooth APP remote control, infrared remote control and other functions.

> This product must be paired with a U+ program card
> (U+ PROGRAM CARD) USE
> U+ Program card Support Arduino IDE, Programming software such as Mixly, Ardublock, Scratch, etc
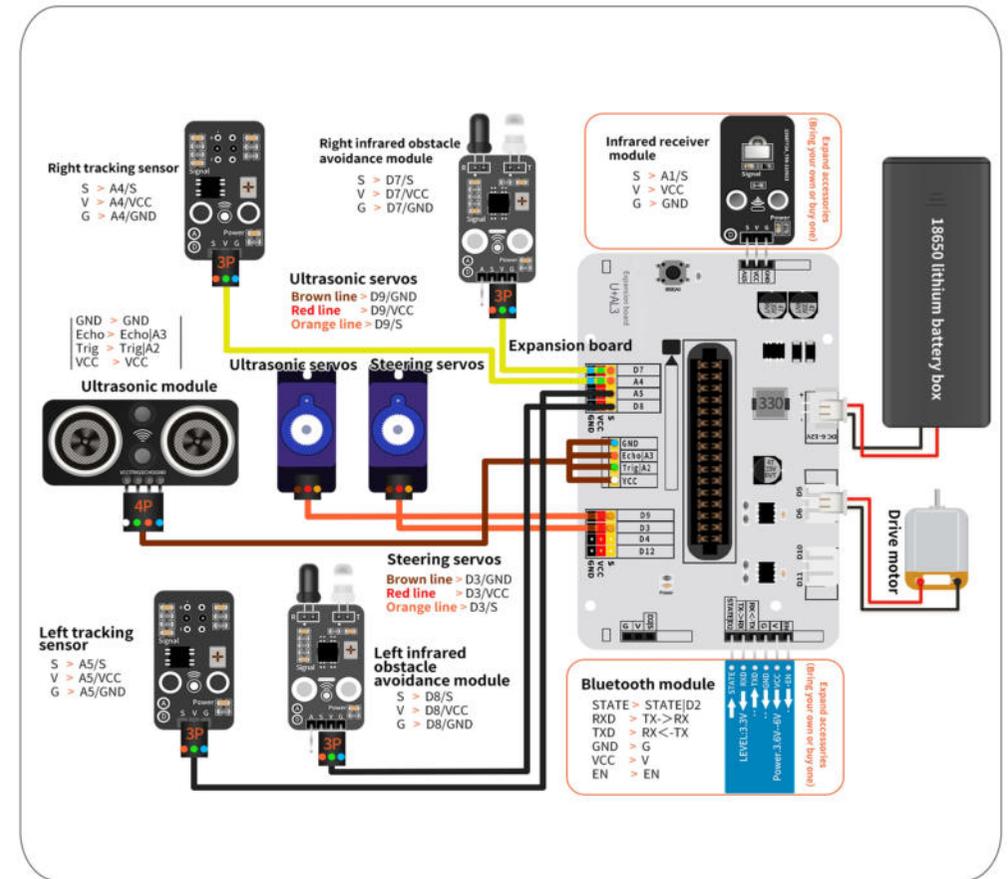
Preparation of tools and assembly considerations

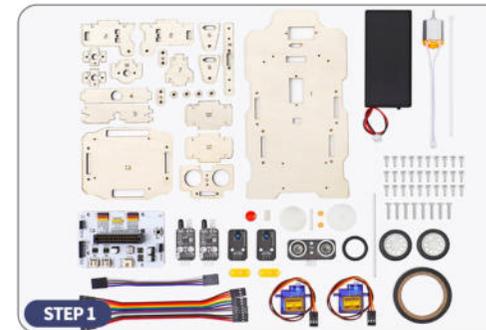Self-equipped assembly tools: 3mm diameter Phillips screwdriver, scissors.

Self-provided debugging tools: 1 computer with Windows 7, 8, 10, 11 operating system, 1 U+ program card, 1 data cable, 1 pair of 18650 lithium battery.

If you want to easily assemble the kit, you need to read the assembly manual carefully, assemble step by step

Warning: Persons under the age of 14 must be under the guidance of a professional teacher or knowledgeable adult!
The assembly and debugging of the product require the use of relevant tools, please take safety precautions when assembling to avoid injury!
This product is a teaching and experimental product, please do not use its function as a daily necessities, there will be instability!
When you are not using this product, please turn off the power switch on the battery compartment and remove the battery, keep the battery safe!

● Circuit wiring reference diagram

Right tracking sensor
S > A4/S
V > A4/VCC
G > A4/GND

Right infrared obstacle avoidance module
S > D7/S
V > D7/VCC
G > D7/GND

Infrared receiver module
(Bring your own or buy one)
S > A1/S
V > VCC
G > GND

Ultrasonic servos
Brown line > D9/GND
Red line > D9/VCC
Orange line > D9/S

GND > GND
Echo > Echo|A3
Trig > Trig|A2
VCC > VCC

Ultrasonic module

Ultrasonic servos   **Steering servos**

Expansion board

Left tracking sensor
S > A5/S
V > A5/VCC
G > A5/GND

Left infrared obstacle avoidance module
S > D8/S
V > D8/VCC
G > D8/GND

Steering servos
Brown line > D3/GND
Red line > D3/VCC
Orange line > D3/S

Bluetooth module
STATE > STATE|D2
RXD > TX->RX
TXD > RX<-TX
GND > G
VCC > V
EN > EN

18650 lithium battery box

Drive motor

● Prepare all accessories and wood materials, and carefully check the number on the materials when assembling the wood materials.**(The board has a number side as the front and no number as the back)**
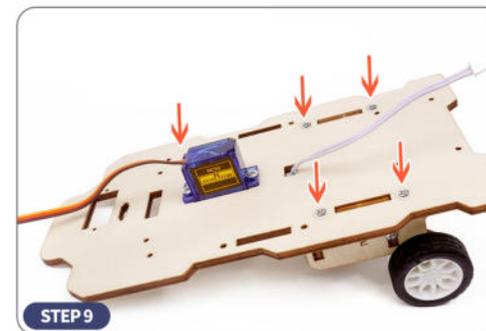

STEP 2

● The worm gear is mounted on the motor shaft and loaded into one-third of the depth.

STEP 3
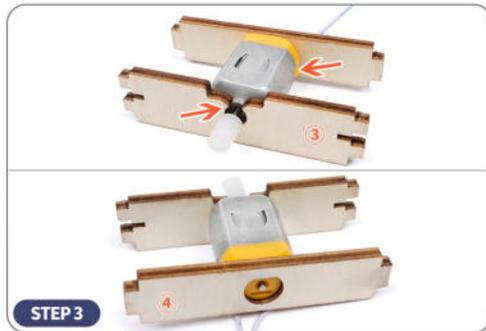
● Snap the drive motor into the card slot of the (3) and (4) plates.

STEP 4
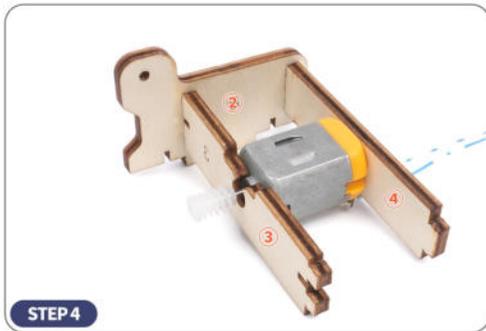
● Referring to the above figure, first install a (2) plate on the (3) and (4) plates, and pay attention to the installation direction of the (2) (3) plates when installing.

STEP 5

● First, the white gear is mounted on the 8cm axle, and then the gear shaft is installed in the shaft hole of plate 2.

STEP 6

Screw selection

Length 7mm
Coarse screw

● The other (2) plate is put on the gear shaft and mounted on the (3) and (4) plates, and fixed with 7mm rough screws.

STEP 7

● Install the two wheels on the 8cm axle, pay attention to leave 0.3mm gap between the wheel and the board, no clearance will lead to increased wheel resistance.

STEP 8

● First pass the drive motor power cable through the wire hole of board (1), and then install the drive motor module on board (1).When installing, pay attention to the narrow side of the servo mounting port facing the inside.

[3]

STEP 9

● First flip the (1) plate, then fix the drive motor module with 7mm rough screws, and then install the steering servo with 7mm rough screws.

STEP 10
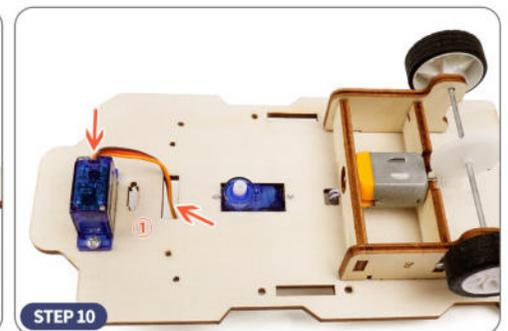
● Then flip the (1) plate, use two 7mm coarse screws to install the ultrasonic servo on the (1) board, and then pass the servo wire through the wire hole.
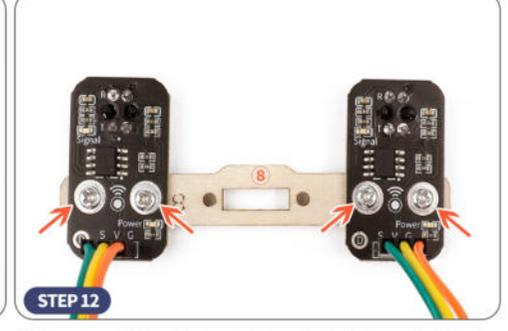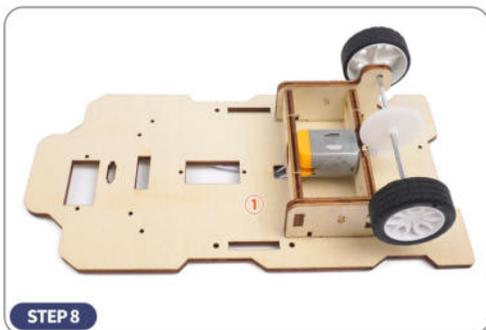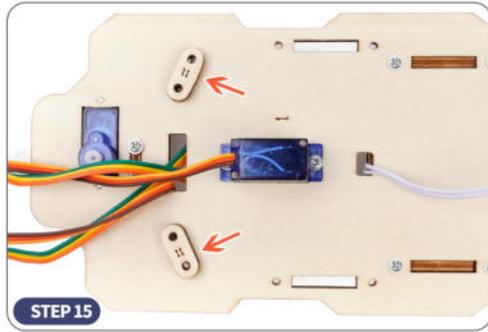
STEP 11

● Install plate (7) on board (1) and secure board (7) from the top with 7mm rough screws.

STEP 12

● Plug two 3P DuPont wire terminals into each of the two tracking sensors, and then install the two tracking sensors on board (8) with 7mm rough screws.

STEP 13

Right tracking sensor   Left tracking sensor

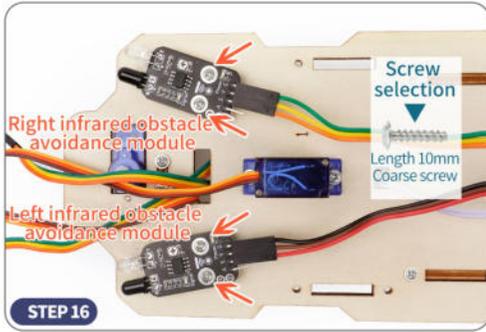● Install plate (8) on board (7) with 7mm rough screws.

STEP 14

● Plug the two 3P DuPont wire terminals on the two infrared obstacle avoidance modules, and the terminals are plugged into the three pins of S V G, and A is suspended.
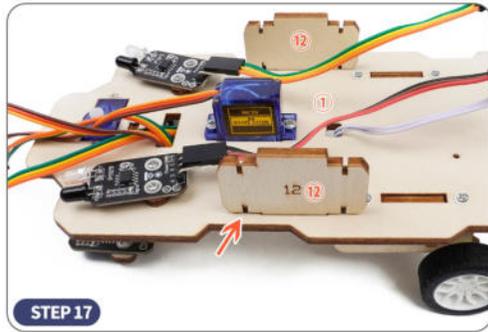
[4]

STEP 15
- Stack two (11) plates on board (1) and align the holes.

Right infrared obstacle avoidance module
Left infrared obstacle avoidance module
Screw selection
Length 10mm
Coarse screw
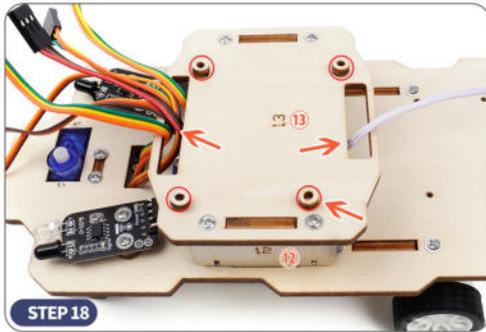**STEP 16**
- Install the module on board (1) with 10mm screws through the left and right infrared obstacle avoidance modules and board (11).
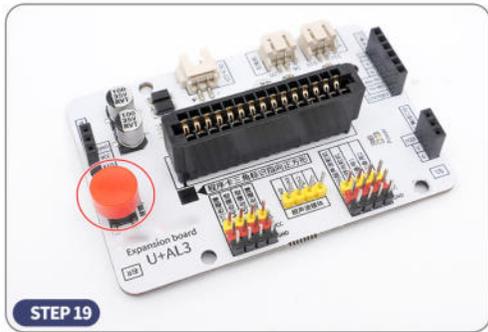

STEP 17
- Install two (12) plates on board (1) with 7mm rough screws.

STEP 18
- Pass all the wires in front through the wide slot wire hole of plate (13) and the drive motor wire through the narrow slot wire hole of plate (13). Then use 7mm rough screws to install the (13) plate on two (12) plates, and finally stack the four small spacers on the (13) plate and align the holes.
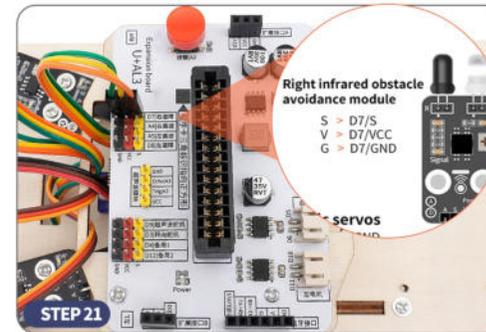

STEP 19
- Install the red keycap on the U+AL3 expansion board.
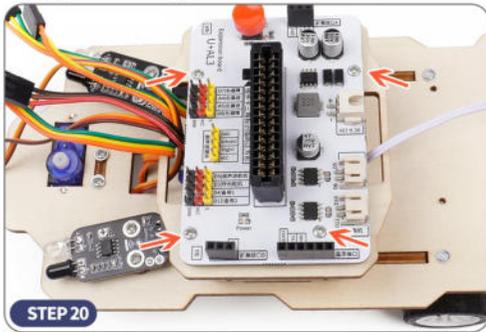
STEP 20
- Install the U+AL3 expansion board on board (13) with 10mm screws,
 Note: Be sure to place spacers between the expansion board and board (13).

[5]

Right infrared obstacle avoidance module
S > D7/S
V > D7/VCC
G > D7/GND
STEP 21
- Refer to [Circuit Wiring Diagram] and STEP16 Plug the right infrared obstacle avoidance module wire terminal into the [D7|right obstacle avoidance] interface on the expansion board.
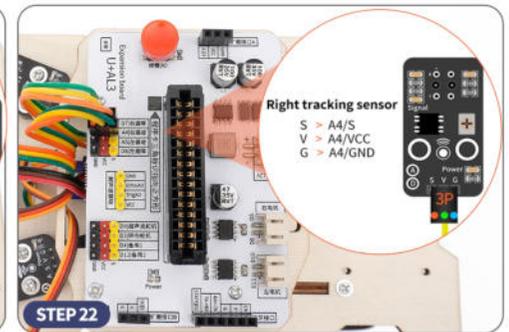
Right tracking sensor
S > A4/S
V > A4/VCC
G > A4/GND
STEP 22
- Refer to [Circuit Wiring Diagram] and STEP13 to plug the right trace sensor lead terminal into the [A4| Right Trace] interface on the expansion board.
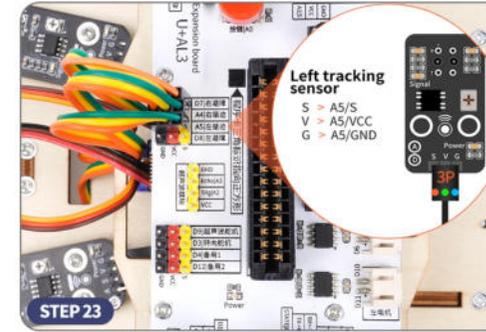
Left tracking sensor
S > A5/S
V > A5/VCC
G > A5/GND
STEP 23
- Refer to [Circuit Wiring Diagram] and STEP13 to insert the left trace sensor lead terminal into the [A5| left trace] interface on the expansion board.
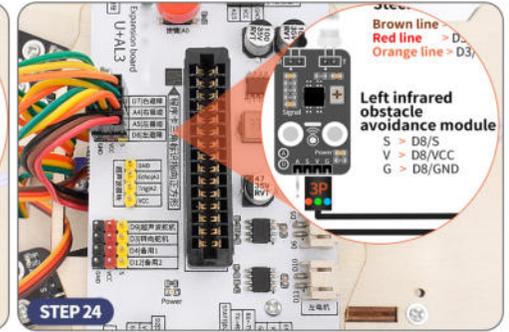
Left infrared obstacle avoidance module
S > D8/S
V > D8/VCC
G > D8/GND
STEP 24
- Refer to [Circuit Wiring Diagram] and STEP16 to insert the left infrared obstacle avoidance module wire terminal into the [D8| left obstacle avoidance] interface on the expansion board.
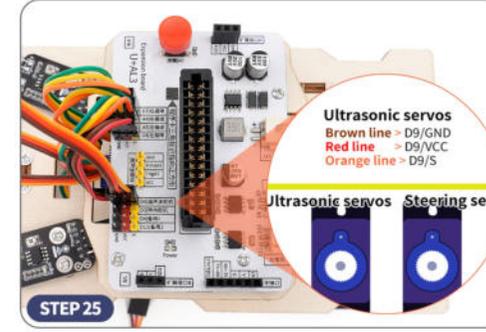
Ultrasonic servos
Brown line > D9/GND
Red line > D9/VCC
Orange line > D9/S
STEP 25
- Refer to [Circuit Wiring Diagram] and STEP 10 Insert the ultrasonic servo wire terminal into the [D9| ultrasonic servo] interface on the expansion board.Please check the port order before inserting it, as incorrect insertion may burn the board.
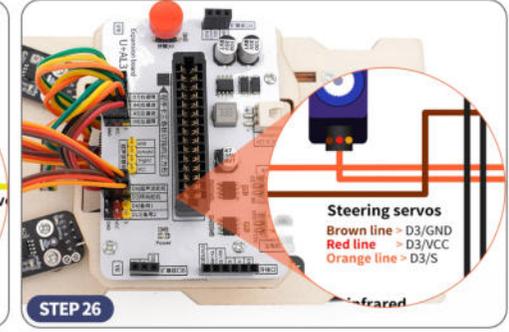
Steering servos
Brown line > D3/GND
Red line > D3/VCC
Orange line > D3/S
STEP 26
- Refer to the [Circuit Wiring Diagram] and the [D3| steering servo] interface on the expansion board with STEP 9 to plug the steering servo wire terminal into the expansion board.Please check the port order before inserting it, as incorrect insertion may burn the board.

[6]

STEP 27

- Refer to [Circuit Wiring Diagram] and plug the motor wire terminals into the [D5|Right Motor] interface on the expansion board.

STEP 28

- Refer to the figure above, use 7mm rough screws to install the battery box on board (1).

STEP 29

- Put the 18650 battery into the battery compartment with the power switch on the side with the wire.

STEP 30

- Refer to [Circuit Wiring Diagram] to insert the wire terminals into the [DC 6-12V] power interface on the expansion board.

STEP 31

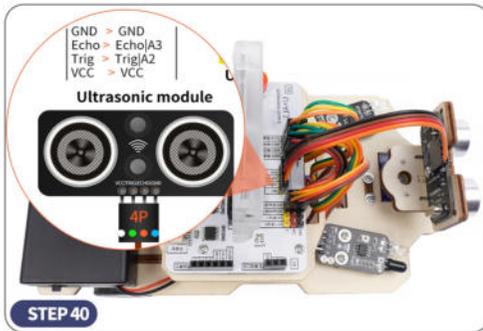- Use the Mixly software to upload the kit's initializer to the U+ program card.

STEP 32

Triangle identification

Square identification

- Insert the downloaded U+ program card into the card slot on the expansion board.
  Note the program card insertion direction, the program card triangle identification points to the expansion board slot square identification.

[7]

STEP 33

Screw to the left
Sensing distance
Gradually lengthen

Twist to the right
Sensing distance
Gradually shortened

10cm

potentiometer

- In the case of the infrared obstacle avoidance module is powered on, put the hand at the position 10cm from the infrared detection probe, and adjust the potentiometer of the infrared obstacle avoidance module with a small screwdriver, until the infrared obstacle avoidance module hand within 10cm of the distance of the module signal indication blue light becomes bright, and the hand 10cm away from the probe module signal indication blue light is off, the debugging is successful.

STEP 34

10cm

- Refer to step 33 to adjust another infrared obstacle avoidance module.
  (Infrared obstacle avoidance module and tracking sensor are optical sensors, and light will interfere with the sensor under strong light, which is not suitable for outdoor use.) Secondly, black obstacles in the environment can also cause interference to the sensor.)

STEP 35

Turn off the power

- Turn off the power by pulling the switch in the direction of OFF.

STEP 36

- Install the ultrasonic module on board (9) with 7mm rough screws.

STEP 37

- Plug a 4P DuPont wire terminal into the ultrasonic module.

STEP 38

- Referring to the picture above, first use 7mm rough screws to mount the yellow servo arm on board (10), and then use 7mm rough screws to install board (10) on board (9).
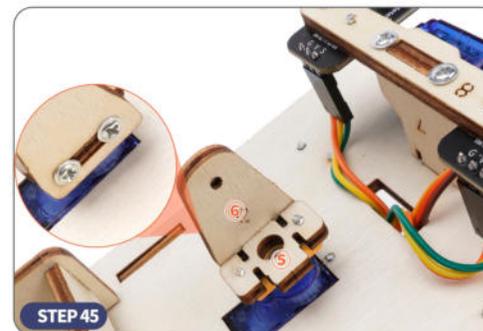
[8]

STEP 39

- First, install the ultrasonic module directly in front of the servo white hinge, and press down to stabilize, please operate carefully when installing, and then use 7mm coarse grain screws to fix the servo arm and servo.(After installation, there will be a slight deviation, which is a normal phenomenon, and the parameters need to be corrected in the program after all assembly is completed)
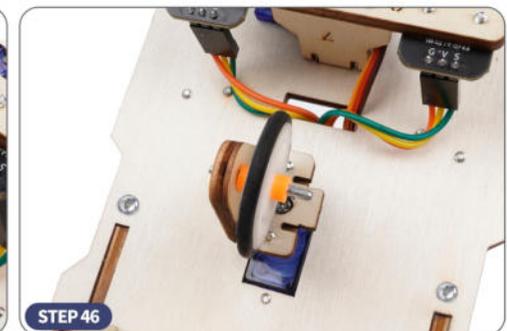
STEP 40

GND	>	GND
Echo	>	Echo|A3
Trig	>	Trig|A2
VCC	>	VCC

Ultrasonic module

4P

- Refer to [Circuit Wiring Diagram] to plug the 4P DuPont wire terminal of the ultrasonic module into the ultrasonic module interface on the expansion board.

STEP 41

- Use 7mm rough screws to mount the other servo arm on board (5).

STEP 42

- Referring to the picture above, first install the servo arm on the white hinge of the steering servo, and press down to stabilize, please operate carefully when installing, and then use 7mm coarse grain screws to fix the servo arm and servo. (After installation, there will be a slight deviation, which is a normal phenomenon, and the parameters need to be corrected in the program after all assembly is completed)

STEP 43

- Attach the black leather ring to the white wheel.

STEP 44

- Install the 2 cm shaft in the middle of the wheel and the orange retaining rings on both sides of the wheel as described in step 5.

STEP 45

- Install board (6) on board (5) and fix it from the side with 7mm rough screws.

STEP 46

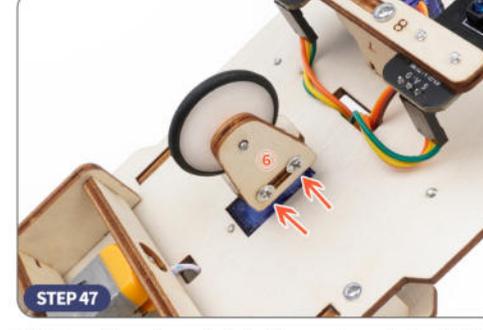- Insert one end of the wheel shaft into the shaft hole of plate (6).

STEP 47

- Put another piece of plate (6) over the axle, install it on plate (5), and fix it with 7mm rough screws.

STEP 48

- First, the longer wire is tidied up, stored in the hidden thread space, tied the upper wire with a cable tie, and then trimmed off the excess cable tie with scissors.
At this step, the smart car is made!
Note: Be safe when using scissors to avoid injury.

STEP 49

The ultrasonic module and infrared obstacle avoidance module automatically avoid obstacles

Press the key

- Ultrasonic infrared obstacle avoidance mode: press the red button to enter the automatic driving state, if it encounters obstacles in front of it, it will automatically dodge.

STEP 50

Follow objects 10cm ahead, backwards, and turns
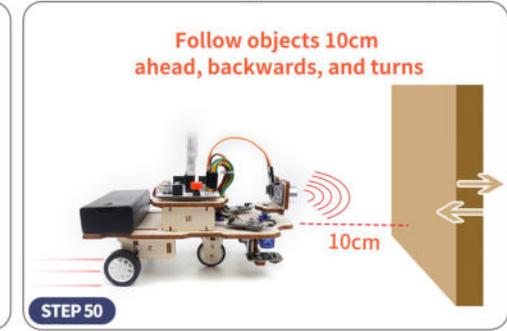
10cm

- Ultrasonic infrared following mode: the trolley will follow the object within 10cm in front of it forward, backward and turn.
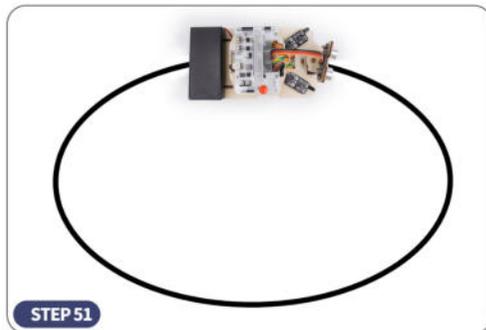
STEP 51

● Trail Mode: The trolley will follow the black track.

Note:
Must be in smooth or refractive index
Higher floor plan tracks.

STEP 52

● Track mode track production: use black tape to glue a runway 50cm wide and 80cm long, or stick irregular runway, the shape is customized, there can be no sharp bends and parallel overlap. Note: Tracks must be laid out on a smooth or high refractive index plan, as tracking sensors are sensed by light reflection.

Bluetooth module

Infrared receiver module

STEP 53

● Extended function: Plug in the infrared receiving module on the expansion board, and the Bluetooth module can be extended to mobile phone Bluetooth APP remote control, infrared remote control and other functions.

STEP 54

● You can modify the code of the sample program yourself to change the execution result of the car, and you can also rewrite the program yourself to control the smart car.

After the assembly is completed, you also need to check whether the installation is correct to avoid danger during commissioning!

1. Carefully check whether the whole kit has the wrong accessories, if there are wrong accessories, it will cause the whole kit to not operate normally.

2. Carefully refer to the circuit connection reference diagram to check whether the wire connection is correct, the wrong wire connection will cause the circuit to short circuit, burn the electronic components, and seriously lead to fire, explosion and other dangerous situations.

3. Carefully check whether the pins at the bottom of the circuit board accessories are in contact with other metals, and if there is contact, please check whether the accessories are not installed, resulting in the circuit board and other metals are not isolated.

4. Please check the power supply type and battery model used in this kit, the wrong use of the power supply or battery will cause fire, explosion and other dangerous situations.

5. If you encounter problems that you do not understand, please contact the online customer service of the official service website or find relevant professionals for consultation during working hours from Monday to Saturday 9:00-18:00, do not operate blindly, otherwise there will be danger.

Refer to the procedure below to debug the kit

| Download and install the U+ program card driver and install the pro- | Download the sample program to the U+ program card with the data cable. | Insert the U+ program card into the expansion board slot of the kit. | Turn on the kit power switch and the kit starts working. |

You may encounter the following problems during debugging, refer to the tips below to see if you can troubleshoot!

1. Check whether the wiring is loose or incorrectly connected, please refer to the circuit wiring diagram for details.

2. Check whether the battery has run out of power, it is recommended to replace the new battery.

3. Check whether the DuPont wire of the sensor and the expansion board is connected correctly, please refer to the circuit wiring diagram.

4. Check whether the U+ PROGRAM CARD program card has downloaded the program.

5. Check whether the U+ PROGRAM CARD program card is plugged in backwards, which will cause a short circuit, please refer to the [STEP4] card insertion method for inserting the card.