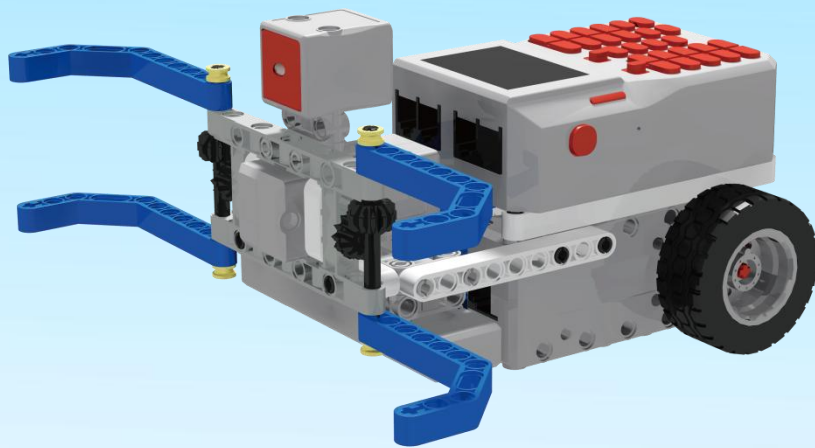


Artificial Intelligence Education

Robot Course



Suitable kit: MPBOT S2

Compiled and Edited by Artificial Intelligence and Robotics Education Research Center,

Huzhou Research Institute, Zhejiang University

Contents

01 Recording Sound.....	01
02 Violinist.....	08
03 Orderly Traffic.....	15
04 Path Planning.....	22
05 Express Delivery to My Home.....	31

01 Recording Sound

Knowledge points

How to record sound

Recording engineer

Use of recording module

Course tasks

Little sound engineer

Recording sound

Build

Time Phonograph

Course duration

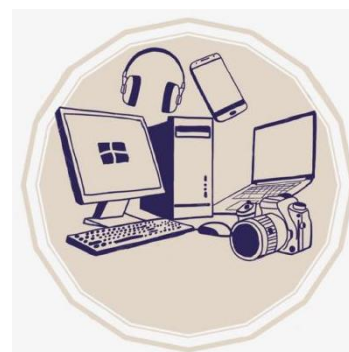
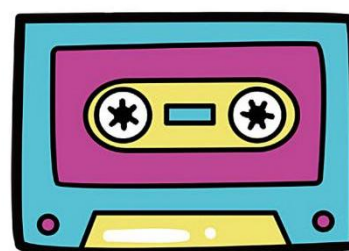
60-90 minutes

Scenario introduction(10 min)

1. How to record sound

Children, we can neither see nor touch sound, we can only listen to it with our ears.

How to record sound has always been a question worth thinking about. The teacher has prepared several pictures, let us understand the changes in the way of recording sound.



If you observe carefully, you will find that with the development of the times, there are more and more ways to record sounds, and the recorded sounds are becoming clearer and clearer.

2. Recording engineer

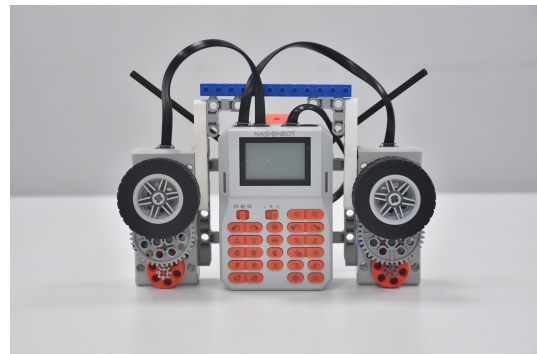
In the 1920s, recording technology achieved greater breakthroughs, more sounds could be recorded, and the recording effect also had a qualitative leap. At the same time, a group of great figures emerged - recording engineers. In the following hundred years of history, the profession of recording engineer has appeared widely

in the fields of radio, film, stage, audio and video, advertising, etc., playing a vital role in sound recording and dissemination.



Analysis and production (25 minutes)

Build: Time Phonograph (For detailed construction, refer to the building manual)



First challenge: Little sound engineer

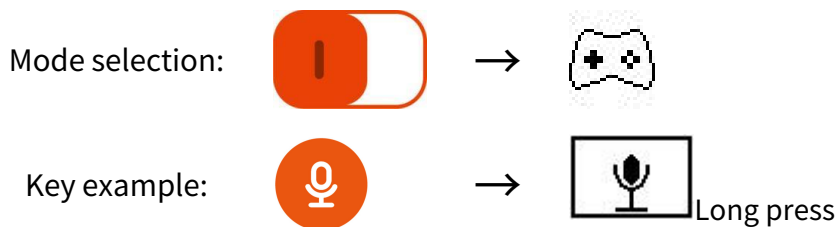
Situation: Children, we have just learned about the development of recording equipment and the profession of recording engineer. In real life, there are many places where recording is needed. Then, please try to use the controller in your hand to record a piece of audio.



Task: Record audio in real-time mode.

Programming knowledge: Understanding of recording module

The recording module is one of the important components of the controller, integrating recording and broadcasting functions. The working principle of the recording module is to convert sound into signals and store them, and transmit the stored signals to the speakers for playback during broadcasting. Press the recording button on the left side of the controller. When the recording icon is displayed on the screen, you can start recording. After the recording is completed, the audio will be automatically played once.



Reflection & Optimization (15 minutes)

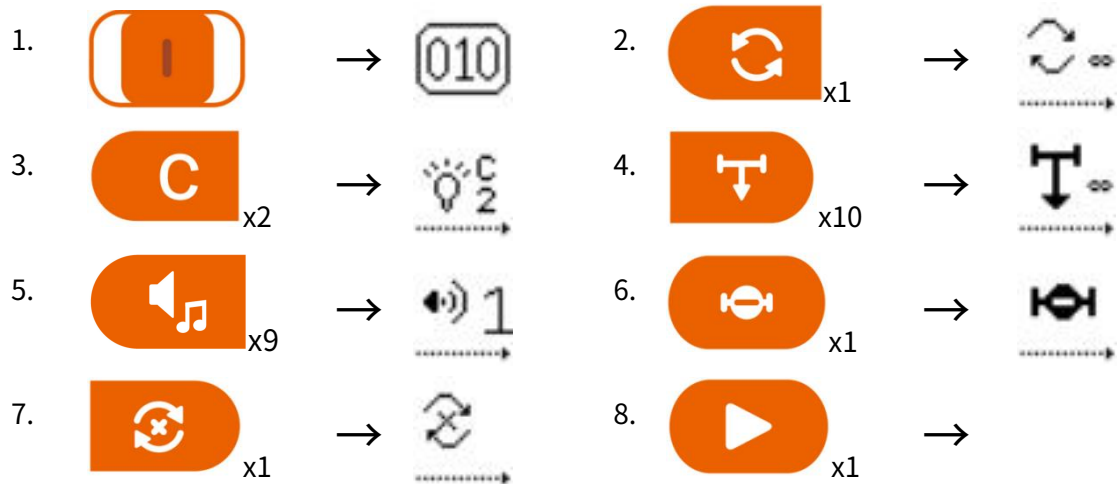
Second challenge: Recording sound

Situation: You have just recorded the sound, so please try to use the key programming mode to trigger the sound playback, and the motor drives the recorder gear to start rotating. Play the recorded sound.

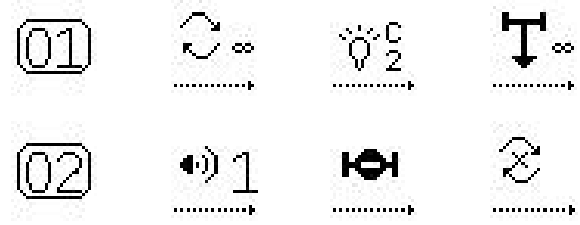


Task: Program the control sensor to play the recorded audio after recognition.

Key example:



Programming Example:



Extension (10 minutes)

In real life, besides recorders, what other devices can record and play audio?

Mobile phones, computers, voice recorders, etc.

Student Worksheet

Name: _____

Class: _____

Scenario Introduction

Children, we can neither see nor touch sound, we can only listen to it with our ears. Since ancient times, how to record sound has always been a question worth thinking about. The teacher has prepared several pictures, let us learn about the changes in the way of recording sound.



Analysis and production

Build: Time Phonograph (For detailed construction, refer to the building manual)



First challenge: Little sound engineer

(Read the question and fill in the correct option number in the brackets.)

1. Which of the following buttons is the recording button? ()



2. Which of the following modes should I choose for recording? ()



A. Real-time control

B. Key-programming

C. Bluetooth connection

Reflection & Optimization

Second Challenge: Recording sound



Extension

In real life, besides recorders, what other devices can record and play audio?

02 Violinist

Knowledge points

The charm of music

Violinist

Principles of simple turbines

Course tasks

A violinist in performance

Play “the little star”

Build

Violinist

Course duration

60-90 minutes

Scenario introduction (10 min)

1. The charm of music

Music can stimulate feelings and emotions. Different music types and tracks can convey different emotions and artistic conception. For example, cheerful music can make people feel happy and excited, while sad music can cause people to think and reflect. Music can help people express and release their emotions, and make people feel resonance and emotional connection. Music can bring enjoyment and pleasure, and music can also bring aesthetic enjoyment, so that people can feel the feeling and value of beauty. Music can also promote social interaction and communication. Music is a global language, and people from different cultural backgrounds can communicate and communicate through music.



2. Violinist

Violin is a kind of plucked instrument, which belongs to the high-pitched part of the stringed instrument family. Its timbre is clear and pure, and it can play high-pitched, passionate and profound music. It is one of the most important instruments in western classical music. Violinists are musicians who



specialize in playing the violin and usually play an important role in the field of

classical music. Violinists usually perform in large concert halls, theaters, music festivals and other places. In the performance, violinists need to convey the emotion and artistic conception of music through their own skills and performances, so that the audience can feel the beauty and strength of music.

Analysis and Production (25 minutes)

Build: Violinist (For detailed construction, refer to the building manual)



The first small challenge: A violinist in performance

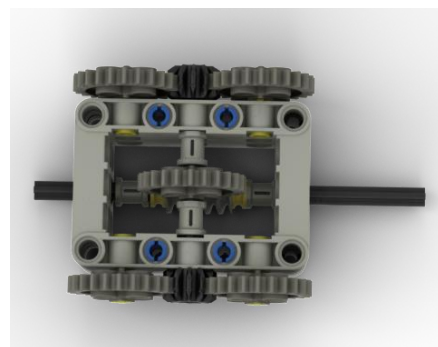
Situation: Violinists usually perform in large concert halls, theaters, music festivals and other places, and they also perform together with other musicians. Have you ever heard the band sing? Have you ever seen a violinist play the violin? Let's build a violinist today and enjoy the charm of music.

Task: Let musicians play the violin through programming

Programming knowledge: The function of turbine

The function of turbine has the following three points:

Vertical transmission: it is very convenient for turbine and worm to build vertical transmission,

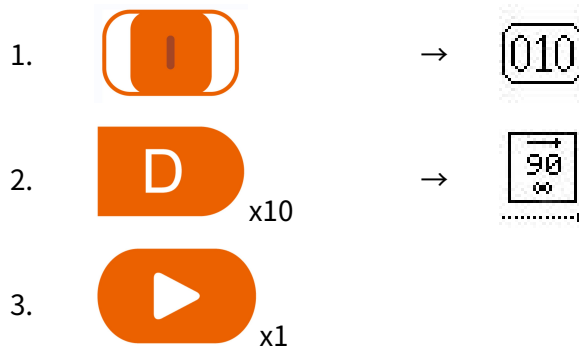


which takes up small space and is very easy to use.

Deceleration function: the speed of the motor in Lego is still relatively large, so the speed can be greatly reduced by using turbines.

One-way transmission: Worm gear and worm are famous for one-way transmission, so it must be used if one-way transmission is needed.

Key Example:



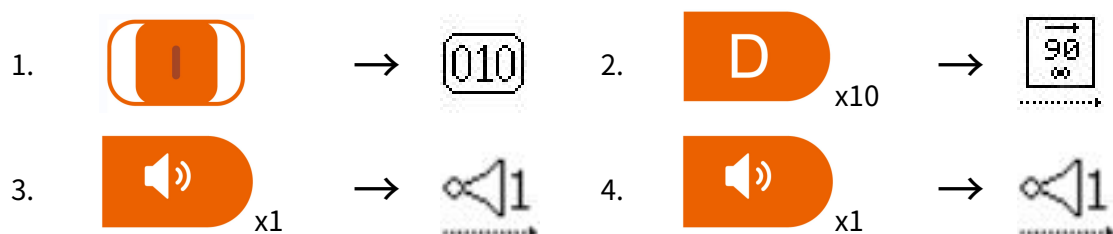
Reflection & Optimization (15 minutes)


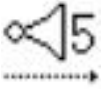

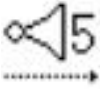

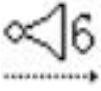

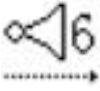

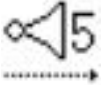

The second small challenge: Play “the little star”

Situation: Now our violinist has been able to pull the strings to play, but it seems that no music has been played. Then let's make the violinist play a wonderful piece of music through programming!

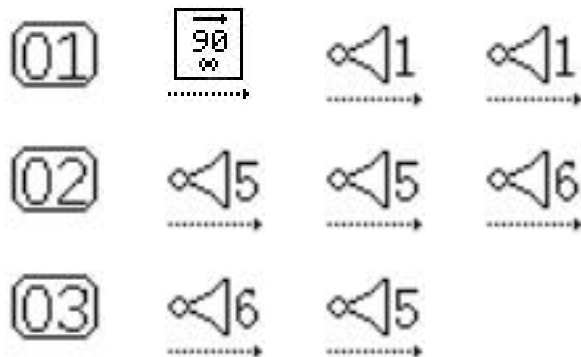
Task: Let the violinist control a piece of music while playing the violin.

Key Example:



- | | | | | | | | |
|----|--|---|---|-----|---|---|---|
| 5. |  x5 | → |  | 6. |  x5 | → |  |
| 7. |  x6 | → |  | 8. |  x6 | → |  |
| 9. |  x5 | → |  | 10. |  x1 | | |

Program example:



Extension (10 minutes)

Boys and girls, besides violinists, who else should be in a band?

Guitarist, Bassist, Drummer, Keyboardist.

Student Worksheet

Name: _____

Class: _____

Scenario Introduction

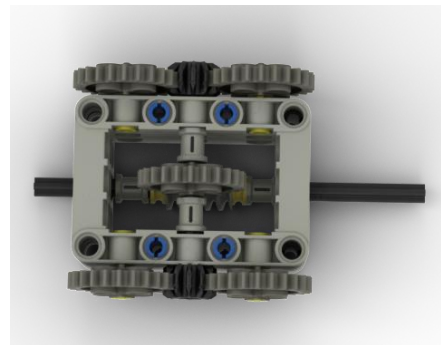
Violinists usually perform in large concert halls, theaters, music festivals and other places, and they will perform together with other musicians. Have the children ever heard the band sing? Have you ever seen a violinist play the violin? Let's build a violinist today and enjoy the charm of music.

Analysis and Production

Build: Violinist

The first small challenge: A violinist in performance

(read the topic and think about the correct answer)



Exercise: What are the characteristics of the simple turbine in this construction?

()

- | | |
|-------------------------------|--------------------------------|
| A. Deceleration function | B. Acceleration function |
| C. Bidirectional transmission | D. Unidirectional transmission |

Reflection & Optimization

The second small challenge: Play “the little star”

Thinking: Can you make up other children's songs by programming themselves? Or is there any other way we can play music?

Extension

Boys and girls, besides violinists, who else should be in a band?



03 Orderly Traffic

Knowledge points

Understand traffic lights

Traffic commander

Synergistic application of colored lights
and motors

Course tasks

Safety tips

Orderly traffic command

Build

Orderly traffic command

Course duration

60-90 minutes

Scenario introduction (10 min)

1. Understand the traffic lights

Children, do you remember the driving rules of traffic? Yes, the red light stops, the green light goes, and the yellow light is on. Wait a minute. Then do you know why the traffic lights should choose red, yellow and green? Because whether it is day or night, these three colors are best recognized and distinguished. The red light of the red light has strong penetrating power, can travel far, and can be seen clearly in bad weather. Besides being easy to identify, green also represents security and peace, giving people a sense of security. And yellow is a warm color, very soft, which can give people a buffering effect of slowing down.



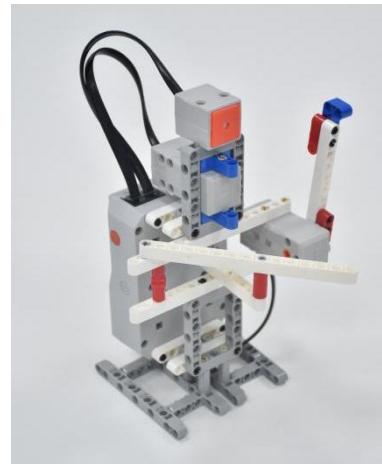
2. Traffic Commander

Traffic commanders play an important role in maintaining traffic order. Traffic commanders need to discourage and correct non-motor vehicles and pedestrians from running red lights and jaywalking. When the traffic is congested or the speed of vehicles is slow, assist the traffic police to divert traffic, and direct non-motor vehicles and pedestrians to go their own way and pass quickly. Traffic commander is one of the important roles in maintaining road order.



Analysis and Production (25 minutes)

Build: Orderly traffic command (For detailed construction, refer to the building manual)


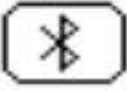






The first small challenge: Safety tips

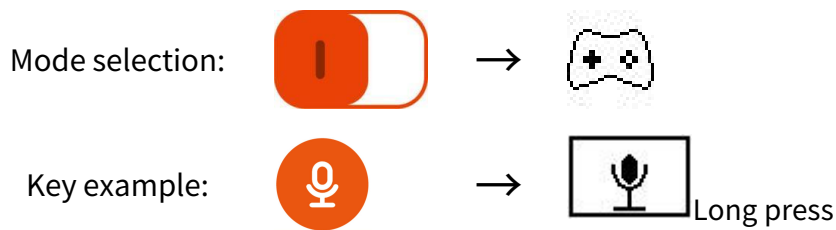
Situation: In our daily life, we need to observe the traffic lights when crossing the road, but for the special people with visual impairment and some careless people, we can't observe the traffic lights well, so please record the two audio clips of "allowed traffic" and "forbidden traffic" to remind people crossing the road.

Task 1: Set advanced mode

Key Example:

1.  → 
2.  x2 → Settings
3.  x1 → Enter
4.  x1 → 

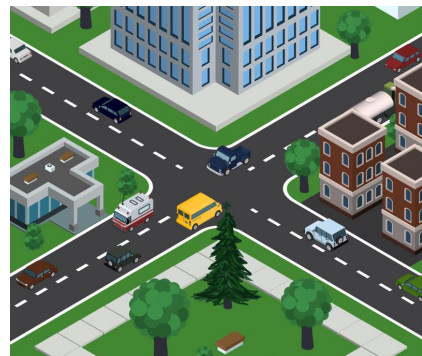
Task 2: Record two pieces of audio in real-time control mode



Reflection & Optimization (15 minutes)

The second small challenge: Orderly traffic command

Situation: Traffic controllers need to wave their arms and change their gestures all the time, which is a very exhausting job. In some simple cases, small robots can be used for traffic control. So please use the equipment in your hand, use the motor and steering



gear to control the traffic command gestures, change the traffic lights with colored lights, and play the recording when the red light and green light are on.











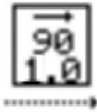



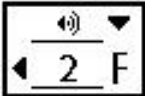




Task: Programming and controlling the changes of traffic command gestures, colored lights and recording.

Programming knowledge: cooperative application of colored lights and motors

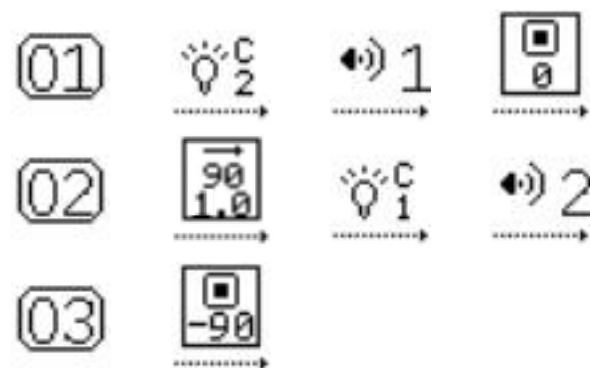


Colored lights can display different colors of lights, which can well complete the display function of traffic lights. The motor realizes the change of traffic gestures, the colored lights realize the function of traffic lights, and the colored lights and the motor work together to complete orderly traffic command.

Key Example:

1.  →  2. _{x2} → 
3.  Press and hold to select and play the "Allow Access" recording. →  → 
4. _{x3} →  5. _{x1} → 
6. _{x1} → 
7.  Press and hold to select and play the "No Access" recording. →  → 
8. _{x1} →  9. _{x1}

Program example:



Extension (10 minutes)

Besides traffic lights, what other facilities can maintain traffic operation on the road?

Traffic signs, zebra crossings, guardrails, street lamps, etc

Student Worksheet

Name: _____

Class: _____

Scenario Introduction

Boys and girls, do you remember the traffic rules? Yes, the red light stops, the green light goes, and the yellow light is on. Wait a minute. Then do you know why the traffic lights should choose red, yellow and green?

Analysis and Production

Building an example: orderly traffic command

The first small challenge: safety tips (read the topic and fill in the serial number of the correct answer in brackets)



Exercise: The gesture in the cartoon on the right indicates which of the following instructions? ()

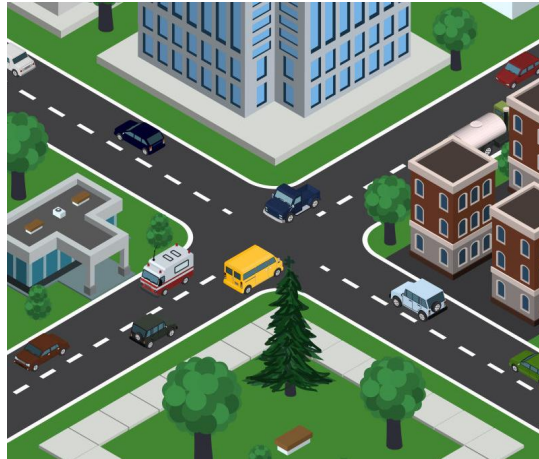
A. Stop

B. Go straight

C. Turn right

Reflection & Optimization

The second small challenge: orderly traffic control



Extended Exploration

Besides traffic lights, what other facilities can maintain traffic operation on the road?

04 Path Planning

Knowledge points

Satellite positioning and GPS navigation

Navigation engineer

Integrated 5-grayscales sensors

Course tasks

Intersection selection

Path planning

Build

Little patrol car

Course duration

60-90 minutes

Scenario introduction (10 min)

1. Satellite positioning and GPS navigation

Children, do you know satellite positioning and GPS navigation? Yes, satellite positioning and GPS navigation appear in every aspect of life. The satellite positioning system is a very advanced positioning system based on artificial satellites. It can provide accurate geographical location, vehicle speed and precise time information anywhere in the world. Since its introduction, GPS has attracted many users with its high precision, all-weather, global coverage, convenience and flexibility.



2. Navigation engineer

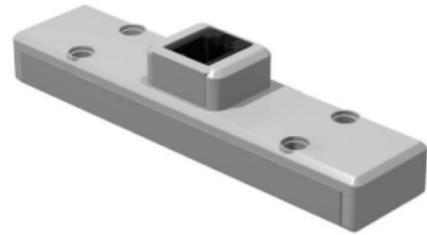
While we enjoy the convenience brought by satellite positioning and GPS navigation systems, we have to mention the profession of navigation engineer. Navigation engineers not only master the



basic theories and knowledge of navigation engineering, but also have strong professional capabilities in navigation electronic equipment development, navigation algorithm software development, etc. In the fields and departments of aviation, aerospace, transportation, military, public security, etc., they carry out the











Programming knowledge: Integrated 5-grayscale sensor

Grayscale sensor is a kind of sensor. Grayscale sensor can detect different colors and convert them into signals that can be recognized by the robot. Using grayscale sensor to patrol the line



can make the car run along the black line and automatically correct the direction when deflection occurs.

Key Example:

1.  → 
2.  x1 → 
3.  x1 → 
4.  x1 → 
5.  x1 → 

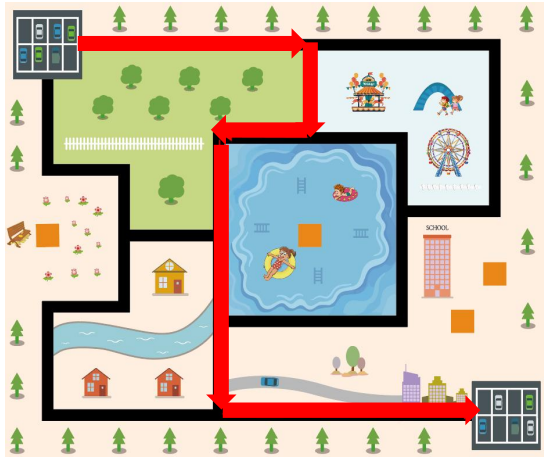
Reflection & Optimization (15 minutes)

The second small challenge: Path planning

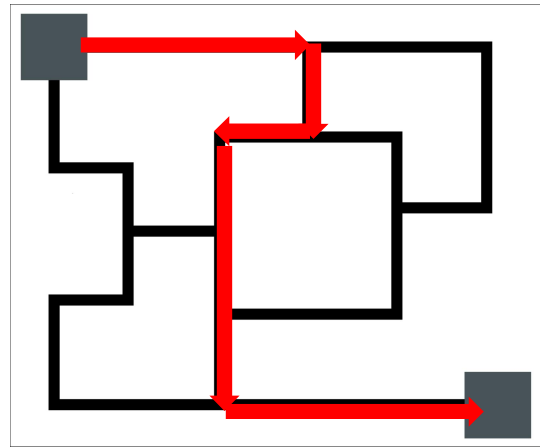
Situation: You have just been able to make the car turn at the correct intersection.

Next, please try to use the line patrol command to make the car drive along the black line from one base to zero base. The red arrow is the schematic route.

Task: Use the line patrol command to program and control the car to reach the base.



Printed Map











DIY Map

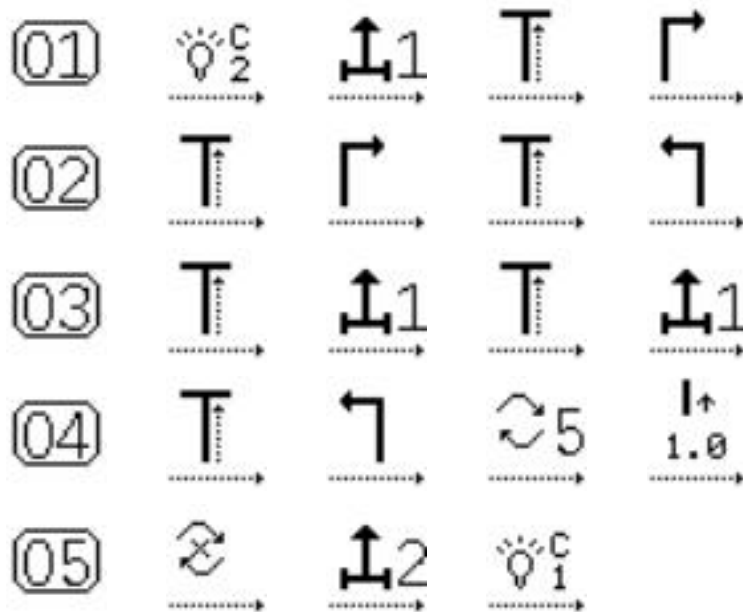
Note: The map can be made by sticking black tape on a white surface or map. Note that the width of the tape should not exceed 2cm. Different tape materials have different effects on grayscale. It is recommended to perform black and white calibration before running the program.

Key Example:

- | | | | | | | | |
|-----|--|---|--|-----|--|---|--|
| 1. | | → | | 2. | | → | |
| 3. | | → | | 4. | | → | |
| 5. | | → | | 6. | | → | |
| 7. | | → | | 8. | | → | |
| 9. | | → | | 10. | | → | |
| 11. | | → | | 12. | | → | |
| 13. | | → | | 14. | | → | |
| 15. | | → | | 16. | | → | |

17.  _{x1} → 
18.  _{x2} → 
19.  _{x1} → 
20.  _{x1} → 

Program example:



Extension (10 minutes)

What are the methods for route planning in real life?

Use maps for planning, use mobile phone software for navigation, use car system for navigation, etc.....

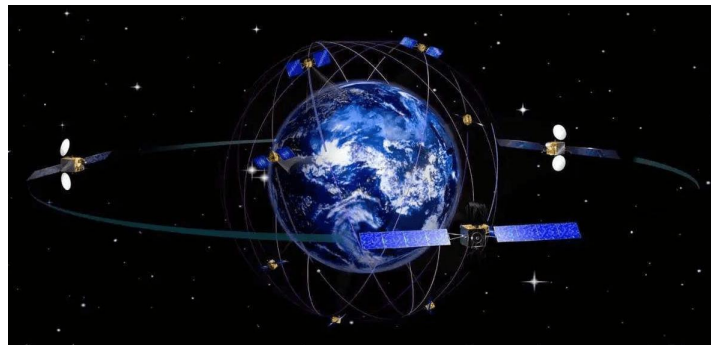
Student Worksheet

Name: _____

Class: _____

Scenario Introduction

Children, do you know satellite positioning and GPS navigation? Satellite positioning and GPS navigation appear in every aspect of life. The satellite positioning system is a very advanced positioning system based on artificial satellites.



Analysis and Production

Build: Little patrol car

The first small challenge: Intersection selection

Exercise: Which of the following buttons is for turning right at an intersection? ()



Extension

What are the methods for path planning in real life?



05 Express Delivery to My Home

Knowledge points

Huge Internet of Things

Courier

Precise control of servo motor angle and

line patrol combined application

Course tasks

Where is the express deliveries?

Delivery to my home

Build

Little courier

Course duration

60-90 minutes

Analysis and Production (25 minutes)

Build: Little courier (The project is the same with Little patrol car in previous lesson)

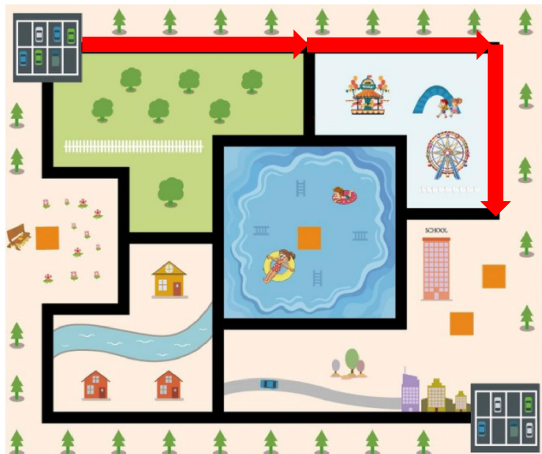


The first small challenge: Where is the express deliveries?

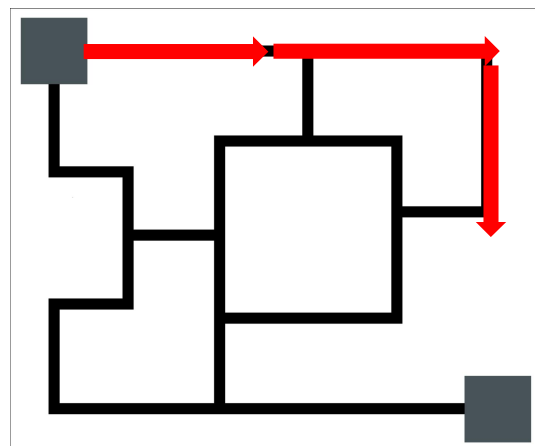
Situation: In daily life, most express deliveries are stored in express delivery stations.

When we go to pick up express deliveries, we need to find the station first, which is troublesome. So please use the device in your hand to find the "Express Delivery Station".

Task: Programming controls the car to reach the designated place.



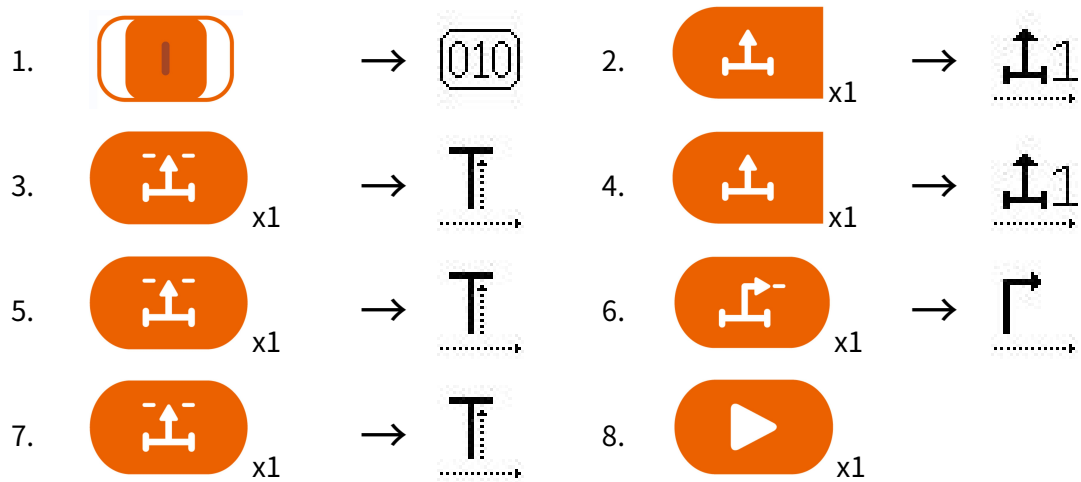
Printed Map



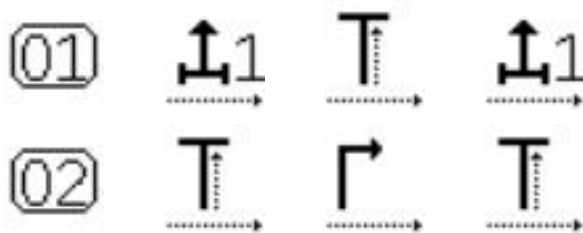
DIY Map

Note: The map can be made by sticking black tape on a white surface or map. Note that the width of the tape should not exceed 2cm. Different tape materials have different effects on grayscale. It is recommended to perform black and white calibration before running the program.

Key Example:



Program example:

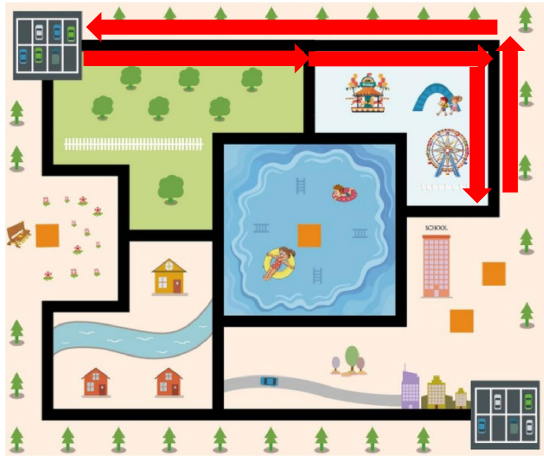


Reflection & Optimization (15 minutes)

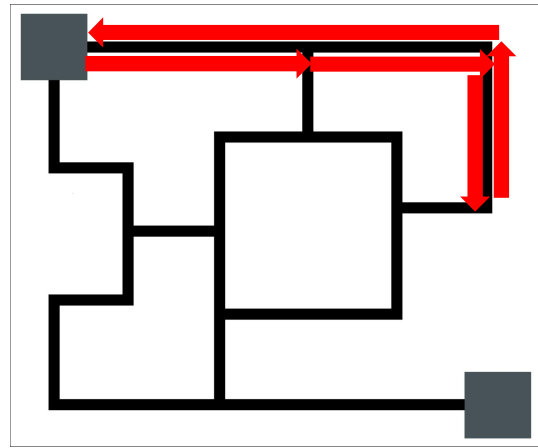
The second small challenge: Delivery to my home

Situation: The car starts from the base, drives along the black line to the express station, picks up the "express" and brings it back to the base. The red arrow route is an example route.

Task: The program controls the car to bring the module back to the base. (The map is as follows)



Printed Map



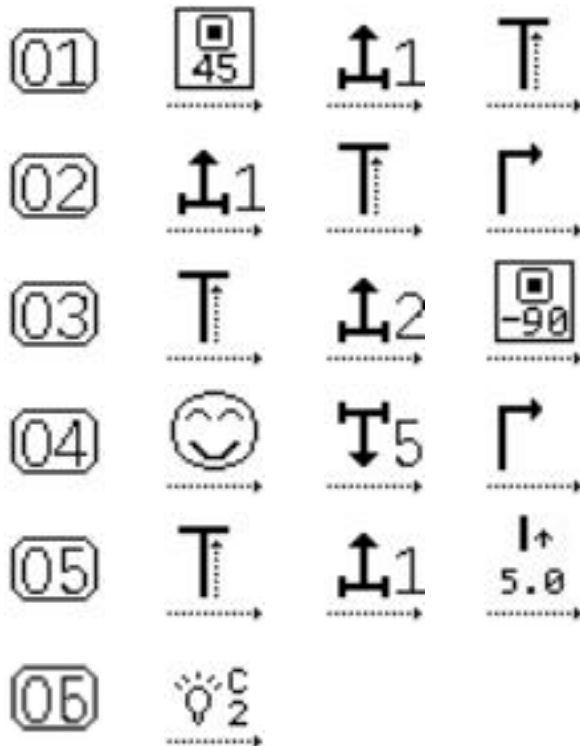
DIY Map

Note: The map can be made by sticking black tape on a white surface or map. Note that the width of the tape should not exceed 2cm. Different tape materials have different effects on grayscale. It is recommended to perform black and white calibration before running the program.

Key Example:

- | | | | | | | | | | |
|-----|--|----|---|----|-----|----|----|---|--|
| 1. | | → | | 2. | | x4 | → | | |
| 3. | | x1 | → | | 4. | | x1 | → | |
| 5. | | x1 | → | | 6. | | x1 | → | |
| 7. | | x1 | → | | 8. | | x1 | → | |
| 9. | | x2 | → | | 10. | | x1 | → | |
| 11. | | x1 | → | | 12. | | x6 | → | |
| 13. | | x1 | → | | 14. | | x1 | → | |
| 15. | | x1 | → | | 16. | | x1 | → | |
| 17. | | x2 | → | | | | | | |

Program example:



Extension (10 minutes)

Children, what other robots that can deliver goods have you seen in your life?

Hotel food delivery robots, unmanned retail vehicles, "Little Donkey" logistics

unmanned vehicles, etc.

Student Worksheet

Name: _____

Class: _____

Scenario Introduction

Children, have you ever received a parcel? Have you ever received a parcel through a courier driverless car? Do you want to know how the driverless car delivers the goods to each child? By learning this lesson, we will better understand how the courier driverless car works.



Analysis and Production

Build: Little courier

The first small challenge: Where is the express deliveries?

Exercise: In the following two program examples, what are their functions respectively? ()

Extension

Children, what other robots that can transport goods have you seen in your life?

