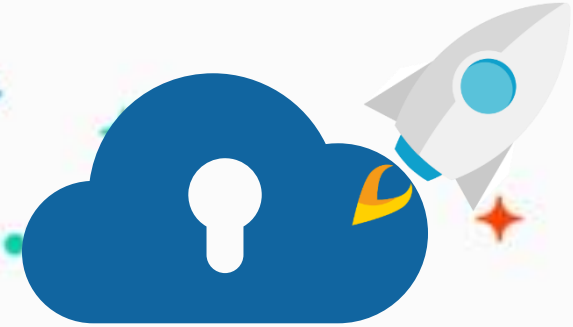

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Lesson 10. Traffic Lights

LECTURER:

Lesson Objective

Learning Objectives

1. Understand the history of the development of traffic lights.
2. Understand ways to improve the efficiency of traffic lights.

Possible Difficulties

1. Touch the button to switch traffic lights.
2. Alternately control the "passing" and "no passing" modes.

Background Information





Background Information



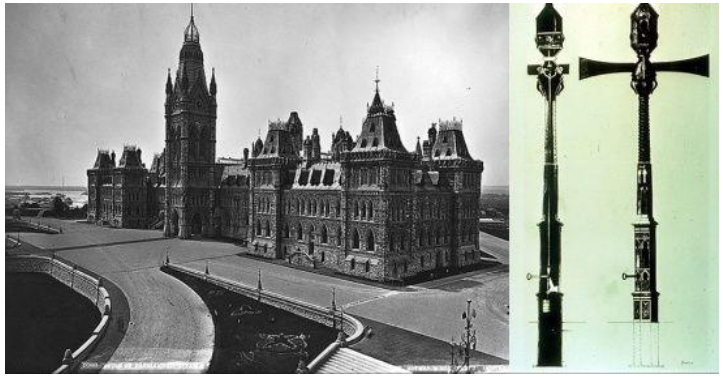
The origin of traffic lights can be traced back to Britain in the early 19th century. At that time, some European countries including the United Kingdom had popularized horse-drawn carriages, but they did not have signaling equipment to guide pedestrians and horse-drawn carriages.

Therefore, whether no matter on the mountain trails or the bustling avenues in the city center, there are often accidents where horse-drawn carriages run over people, which not only endangers the safety of pedestrians but also often causes traffic chaos and congestion.

Background Information

At that time in York City in central England, women's clothing was not arbitrary, and the two colors of red and green represented different identities of women. Among them, a woman in a red dress means she is married, while a woman in a green dress must be unmarried. Inspired by women's red and green dresses, signal light engineer J. P. Knight put forward the idea of designing traffic lights with red and green colors, and quickly put them into practice, and traffic lights gradually came into being.

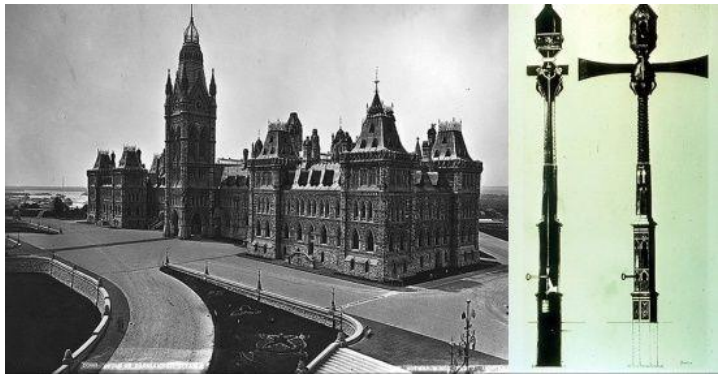
Background Information



On December 10, 1868, the first traffic signal light in history appeared in front of the Westminster Parliament Building in the United Kingdom. This traffic signal light was about 7 meters high, and a red and green rotatable gas lantern was hung on its top.

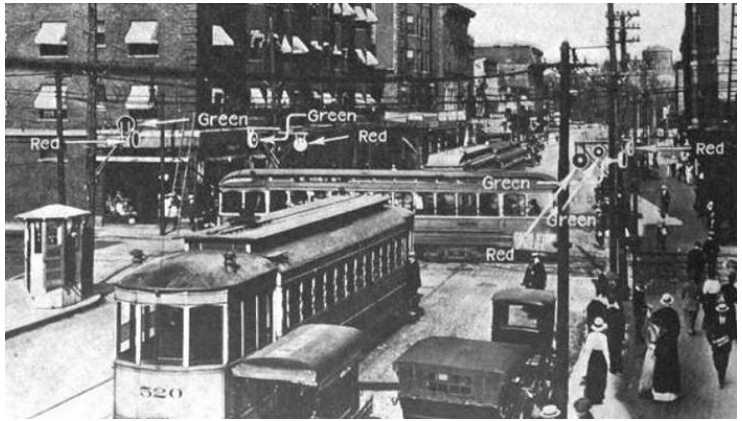
In order to switch between the red and green lanterns, a policeman with a long pole must stand under the lantern and pull the lantern through a belt to change the color.

Background Information



Later, a red lantern was added in the middle of the signal lantern. Green and green lampshades, with red and green glass alternately blocking the front. The gas lamps are not lit during the day, and only the red and green lampshades are switched to guide people to move forward or stop; at night, the gas lamps are lit to illuminate the red and green lampshades.

Background Information



In 1912, an American policeman, Lester Wire, worried about the growing traffic, came up with the first electric traffic lights. On August 5, 1914, in Cleveland, Ohio, USA, engineers installed two pairs of red and green lights at an intersection. The world's first electric traffic lights are only red and green, without yellow lights like modern traffic signals. This simple move set the pattern for road planning around the world, revolutionizing traffic in congested cities.

Background Information



In 1920, a policeman named William Potts in Detroit, Michigan invented the first four-way and three-color traffic lights. In addition to red and green, yellow, as a third color, was introduced. Detroit becomes the first city to implement four-way, three-color traffic lights. In the same year, four-way, three-color traffic lights were installed in major cities around the world. Modern traffic lights still use this famous model, available in three different colors.



Knowledge Introduction

Knowledge Introduction



Simply relying on the hand-operated traffic lights of the traffic police has exposed many shortcomings in the actual use process. First of all, if the police on duty cannot accurately judge the road conditions, it is very likely that they will become more and more chaotic. Secondly, this simple signage instruction cannot be used at night, which greatly limits the scope of its application.

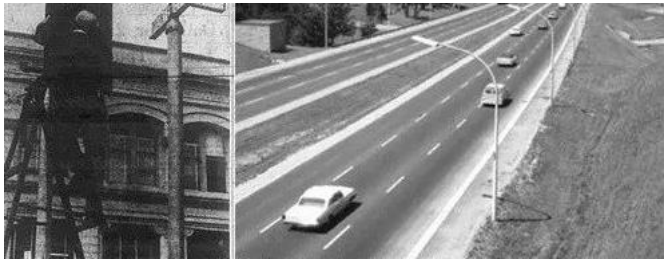
At the same time, with the birth of the first internal combustion engine car, horse-drawn carriages were gradually replaced by faster and easier-to-operate cars. At this time, the use of standardized and effective traffic lights became an urgent problem that people needed to solve.

Knowledge Introduction



The police officers need to control the switching of the signal lights in the sentry box set up around the signal lights. If necessary, they can also control the length of the signal light switching time according to the actual traffic conditions at the intersection. It can be seen that the awareness of "leaving time for preparation" was produced as early as the first batch of electric signal lights appeared.

Knowledge Introduction



For the first time, an automatically controllable signal light appeared on the streets of Toronto, Canada. The signal light uses computer chips to control traffic signals. At the same time, an automatic control system includes traffic lights at multiple intersections. The conversion of all signal lights is controlled by computers. , The police only need to conduct unified monitoring at designated locations, which greatly reduces the pressure on the traffic police.

Knowledge Introduction



With the development of technology, today we will see more traffic lights with mature functions, such as more efficient traffic lights, which prohibit pedestrians from passing under normal circumstances or turn on the green light for pedestrians for a long time, and pedestrians can control traffic by pressing buttons on the side of the road Lights are switched so that cars can travel between cities more efficiently.

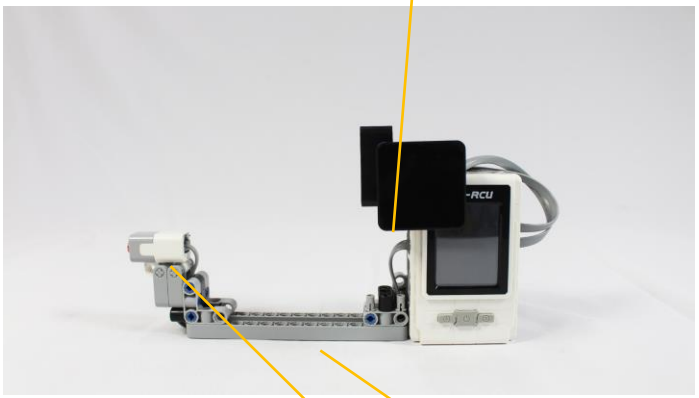
Today, we will make such a convenient traffic light.



Practice

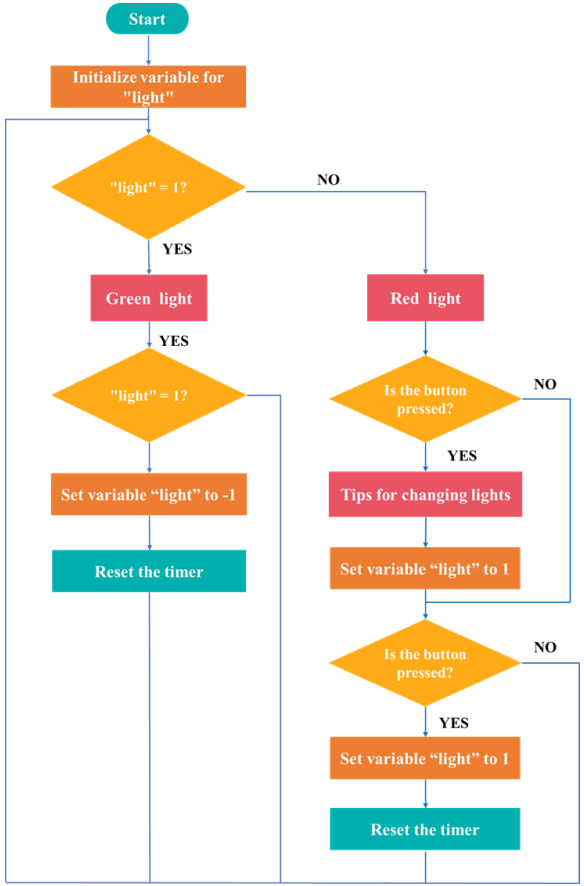


New Knowledge



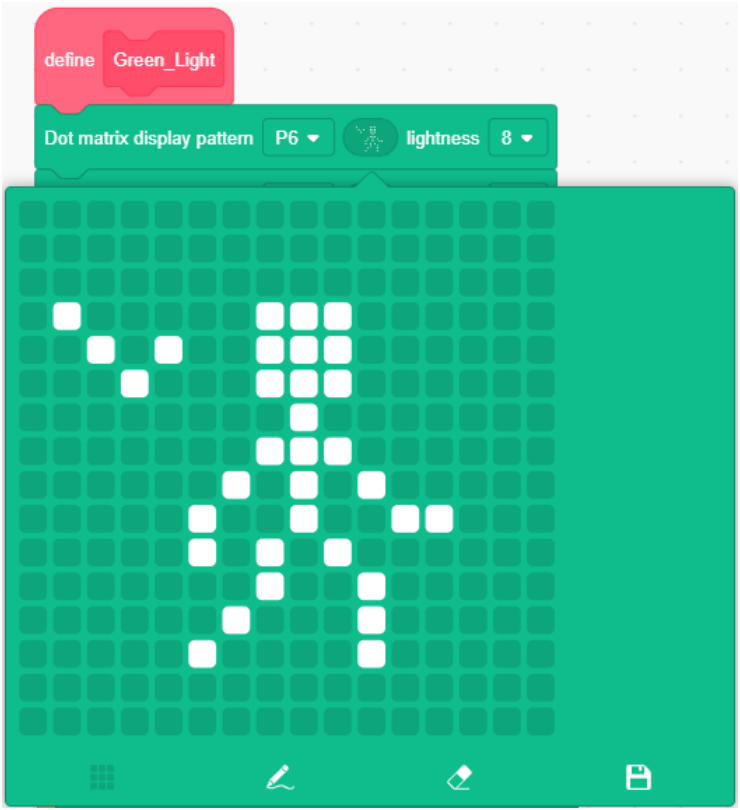
According to the building manual, build a traffic light with a dot matrix screen. In addition to periodically changing the state of passing or no passing, it can also make it easier for pedestrians to cross the road by pressing buttons.

Practice | Flow Chart



The red/green light (passing / no passing) of the dot matrix screen is controlled by variables. When a certain light lasts long enough, it will switch to another light. When the red light is in the direction of pedestrians, it can be temporarily switched to the green light by pressing the button. .

The variable is 1, which corresponds to the green light, and the variable is -1, which corresponds to the red light; using the controller time is convenient to detect the button status at any time, so the time needs to be reset every time the condition for changing the light is met.



Draw patterns

Draw the passing and no passing patterns for the dot matrix screen by yourself.

Two patterns are used to indicate the direction of pedestrians, and the other two patterns are used to indicate the direction of vehicles.

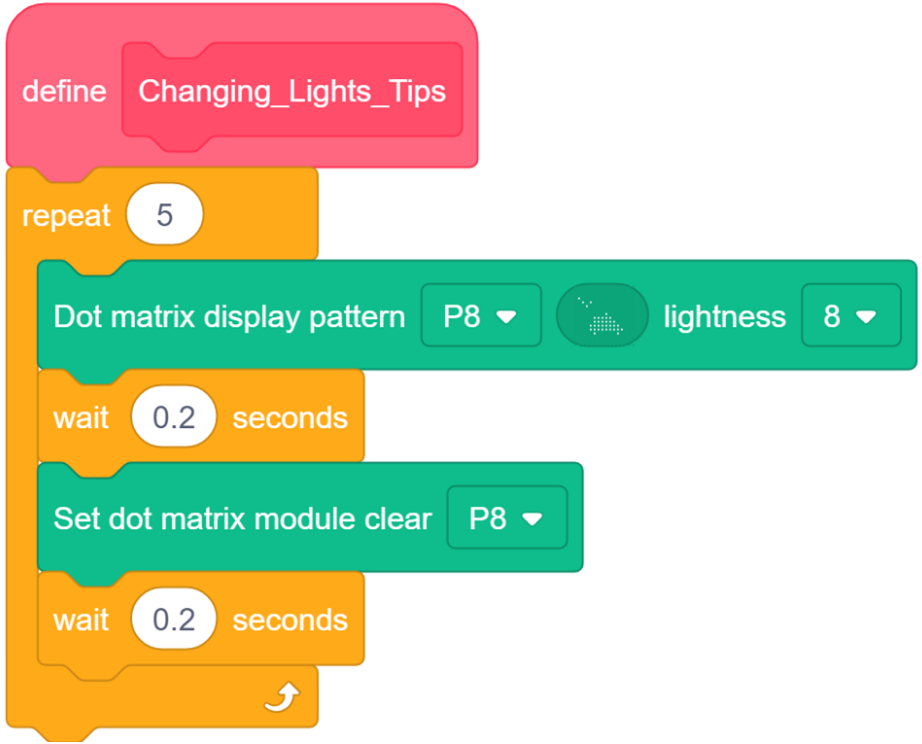
Practice | Programming



Function – light up LEDs

Make two functions that turn on the LED lights.

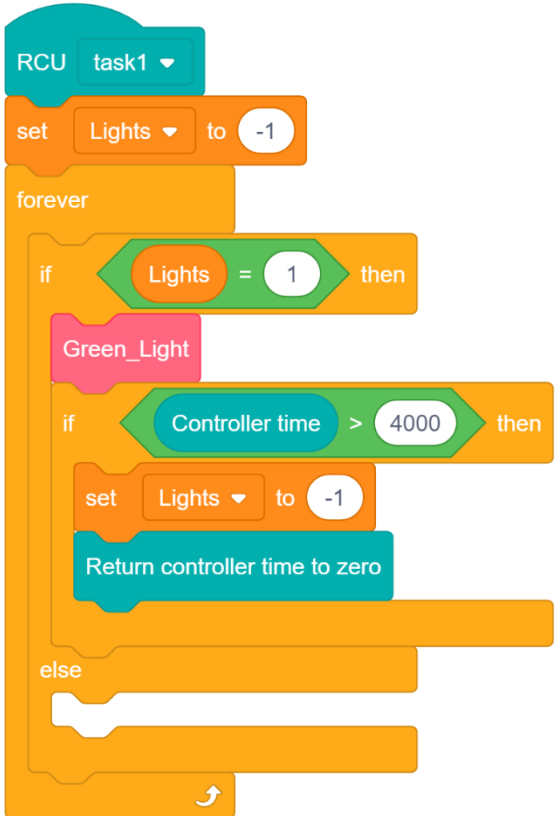
When making it, it should be noted that the green light in the direction of vehicles is equal to the red light in the direction of pedestrians.



Function – Changing light tips

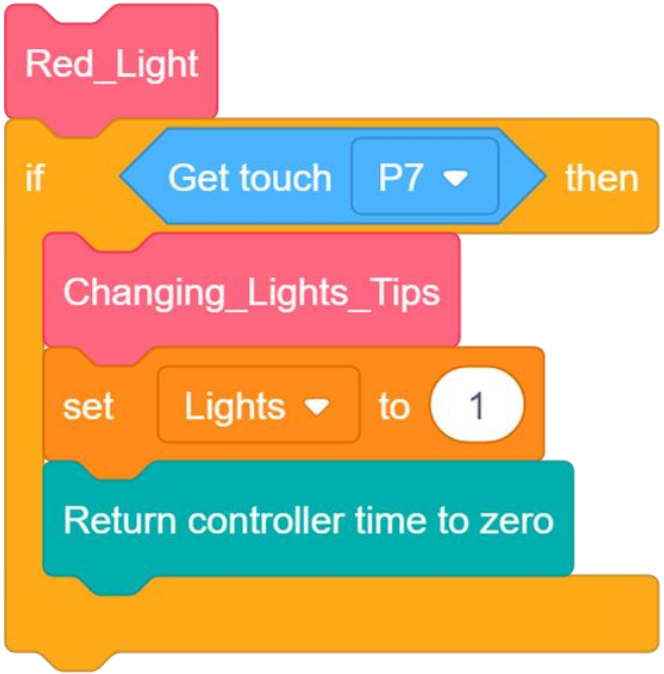
Make a function module, the light change reminder is used to remind the vehicle that the light is about to be changed.

Practice | Programming



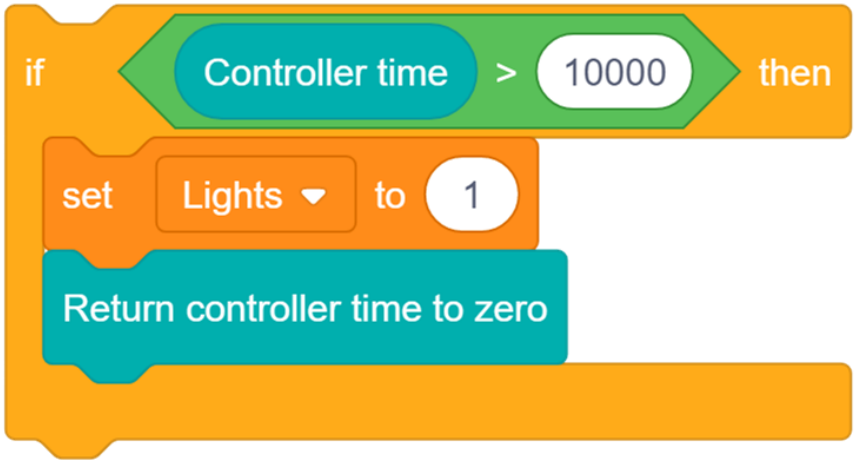
The main structure of the program

The main structure is used to judge the value of the light variable and change the variable value to switch the state of the light after the duration exceeds the specified value.



Button to change lights

When the red light is on, the button detection function needs to be added, and the time must be reset after changing the light.

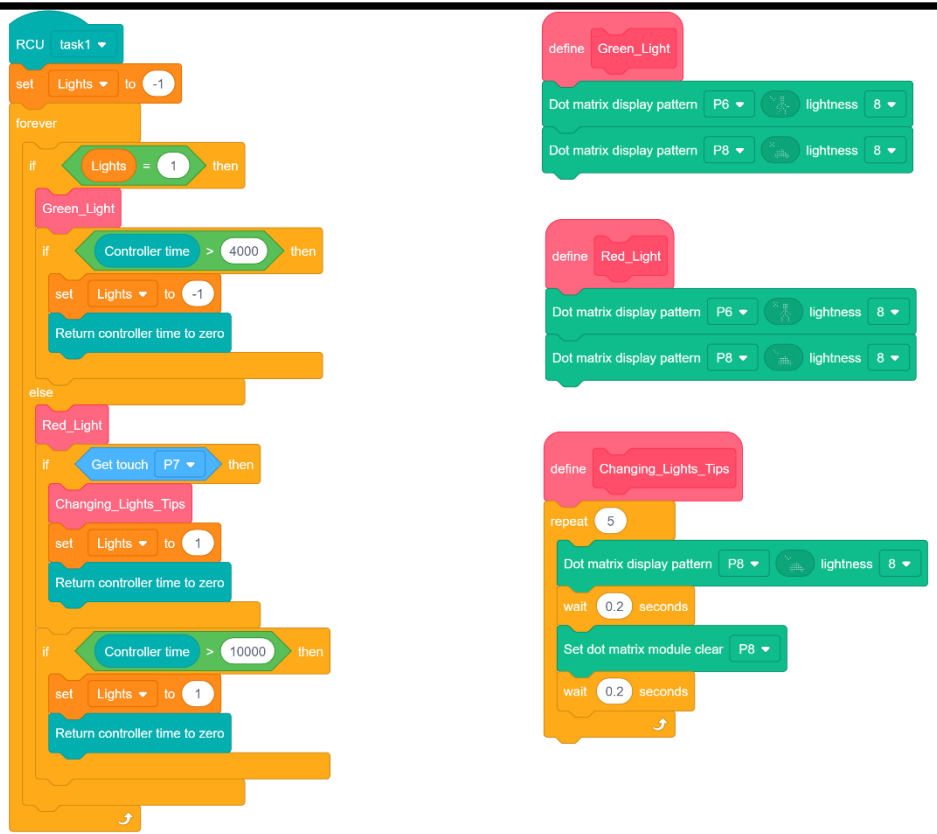


Change lights When the timeout is reached

After the red light is on, it is also the same as the green light, and the light needs to be changed after the time exceeds.

The longer the red light time is set, the easier it is for vehicles to pass directly.

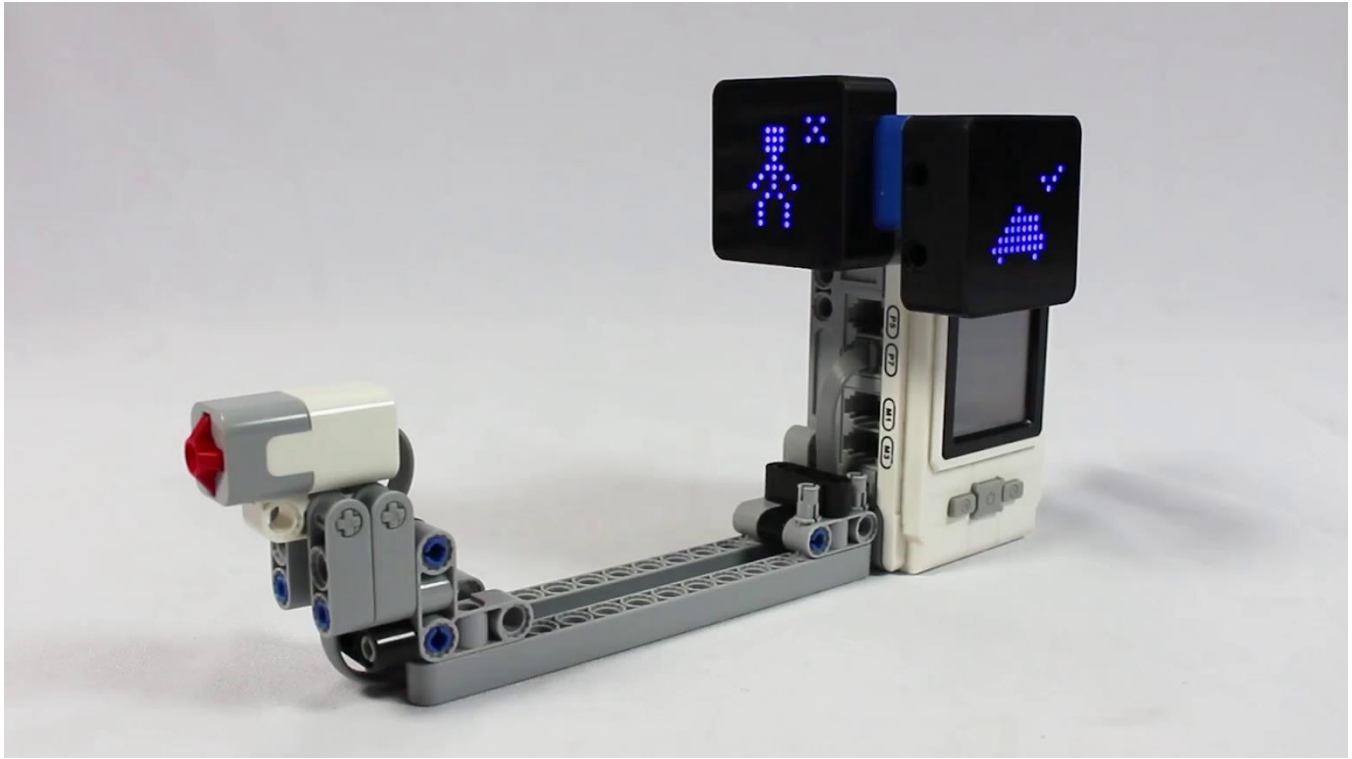
Practice | Programming

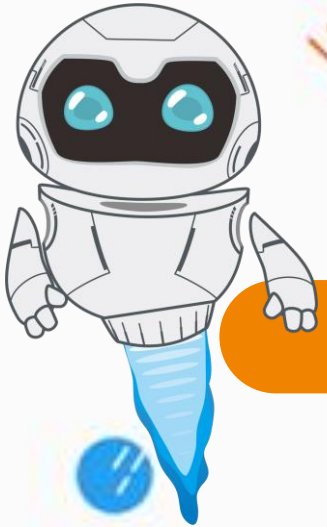


Integrate the program

Integrate the program according to the flow chart.

Practice | Programming





Results



Program Optimization

In this lesson, we have implemented the function of convenient traffic lights for pedestrians to switch lights through buttons. During red lights, pedestrians can press the button at any time to temporarily turn the traffic lights into green lights.

Next, modify the program, and there will also be a reminder for normal periodic lamp changes.

Requirements: As long as the traffic lights are changed, the light-changing reminder will light up to remind vehicles and pedestrians in time.

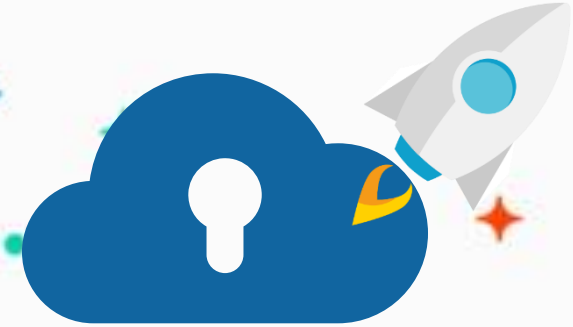
Further Reading

Traffic lights that detect vehicle horns

Automatic traffic signals are a huge success, they work by changing the signal at regular intervals. But this can sometimes cause waiting vehicles, because even if there is no traffic passing from the opposite side, it may be a red light. So some people began to think about a better traffic signal system to make traffic smoother.



An inventor named Charles Adler Jr. created a traffic light that could detect the honking of vehicles and change the signal accordingly. A microphone is mounted at the pole of the signal and once the vehicle reaches the signal all it needs to do is honk and the lights will change. However, this introduces the problem of vehicular honking, causing noise pollution to those living nearby. Therefore, this traffic light was later canceled.



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Thanks!

LECTURER: