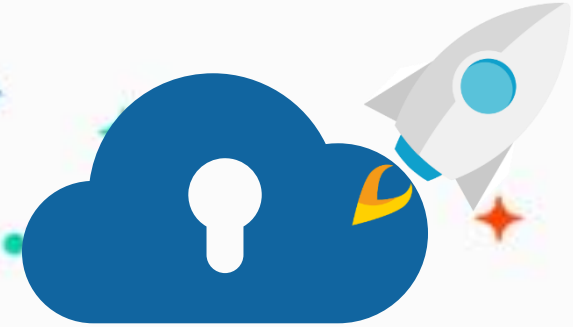

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Lesson 32. Regional Weather Station

LECTURER:

Lesson Objective

Learning Objectives

1. Learn about weather stations.
2. In-depth understanding of temperature and humidity sensors.

Possible Difficulties

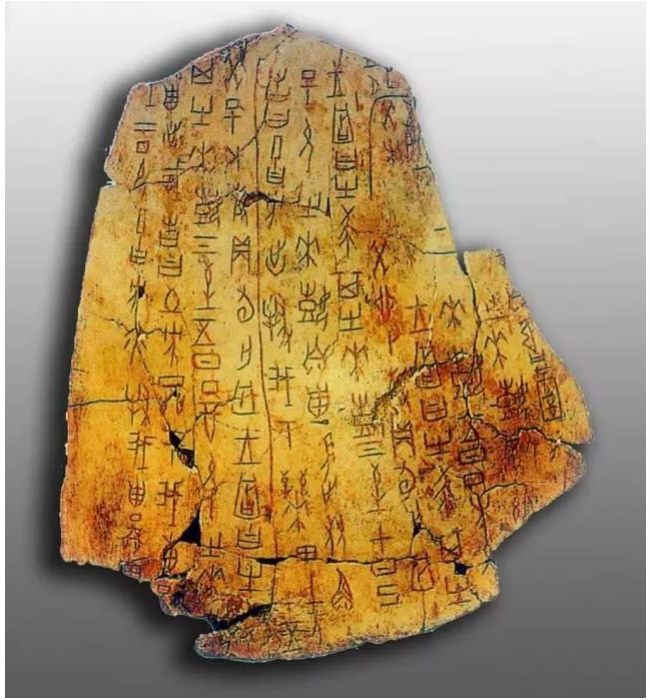
1. The simulated windmill rotation at the weather station is affected by two factors.
2. Different types of lighting effects.



Background Information

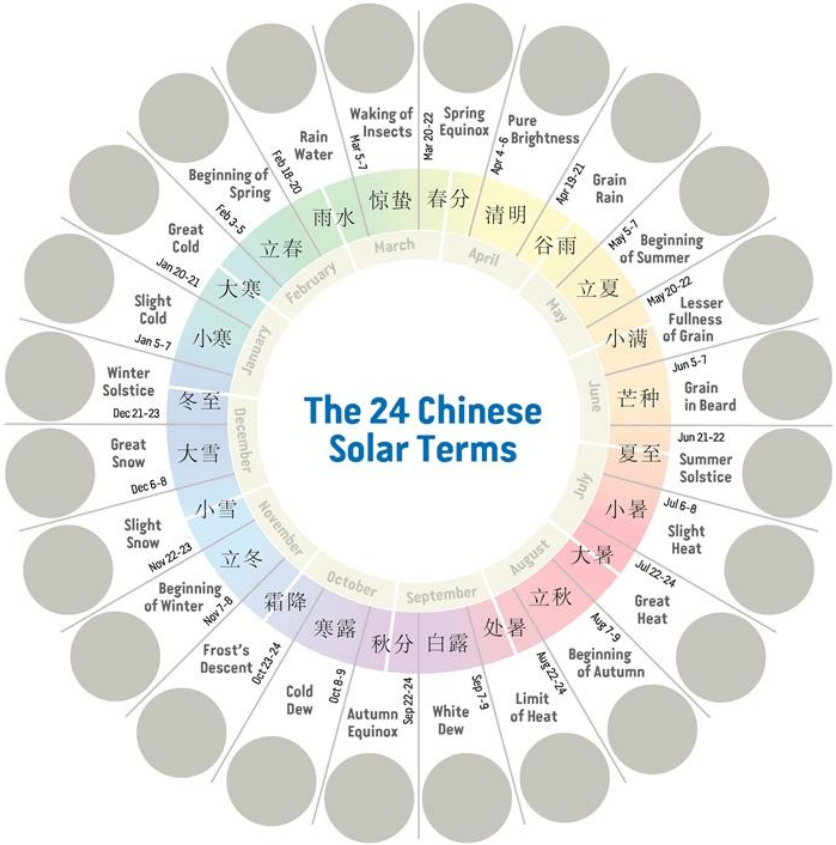


Context Import



About 3,600 years ago, the ancestors had already started making weather forecasts. There is an unearthed oracle bone inscription that predicts the weather. It says that divination on Renyin day will rain on Gui day, followed by a storm. It can be seen that the weather forecast at that time relied on divination, but its accuracy is questionable.

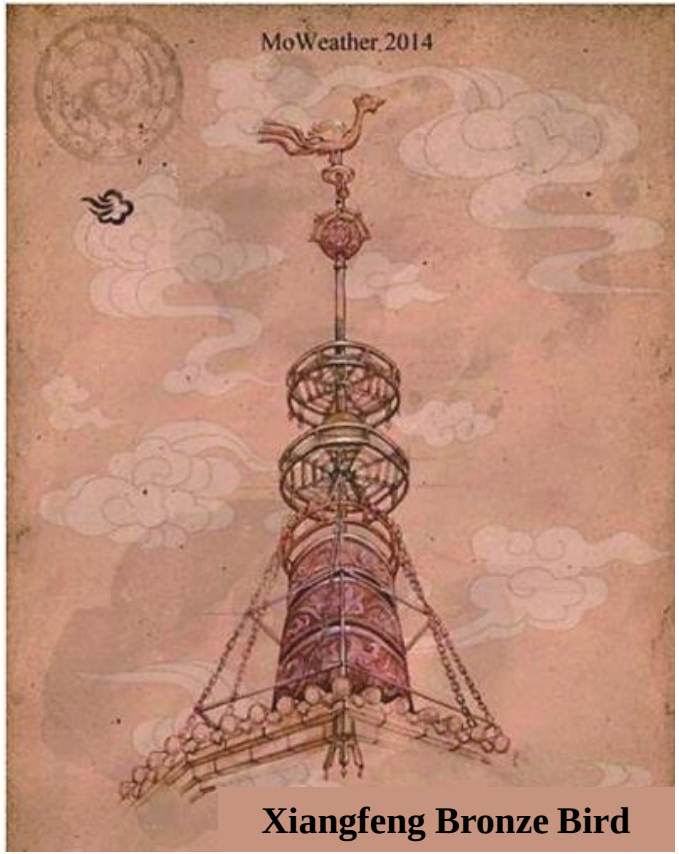
Context Import



(Sources: *Chinese Academy of Social Sciences, Beijing Chinese-Foreign Translation & Information Service, cipgtrans.com; designed by Pamela Tobey*)

During the Spring and Autumn and Warring States Periods in China, the 24 Chinese solar terms were basically formed, which can reflect seasonal changes and guide agricultural activities, such as "before and after Qingming, plant melons and beans", "summer solstice is windy and hot, Chongyang has no rain and winter is sunny", "autumn equinox" It is early, the frost is late, and the cold dew is the time for planting wheat" and so on. The twenty-four solar terms have become a universal "four seasons weather forecast".

Context Import



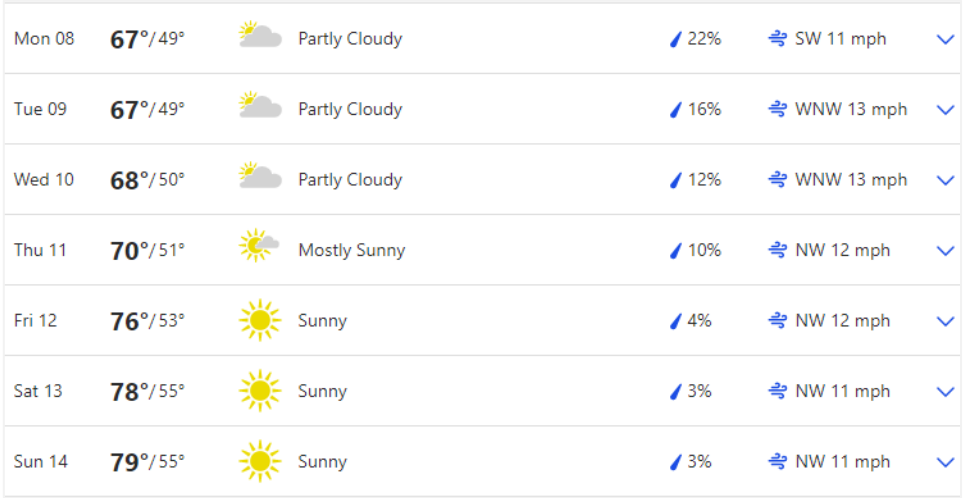
Xiangfeng Bronze Bird

In the Han Dynasty, the astronomer Zhang Heng invented the earliest wind direction instrument in the world - Xiangfeng Bronze Bird, that is, a five-foot-high pole was erected on the open ground, and a flexible copper bird was mounted on the pole. Turning direction predicts wind direction and wind force. Xiangfeng chickens on European roofs were not recorded until the twelfth century, a thousand years later than Zhang Heng's records of Xiangfeng copper birds.



Knowledge Introduction

New Knowledge



Mon 08	**67°**/49°	Partly Cloudy	22%	SW 11 mph	
Tue 09	**67°**/49°	Partly Cloudy	16%	WNW 13 mph	
Wed 10	**68°**/50°	Partly Cloudy	12%	WNW 13 mph	
Thu 11	**70°**/51°	Mostly Sunny	10%	NW 12 mph	
Fri 12	**76°**/53°	Sunny	4%	NW 12 mph	
Sat 13	**78°**/55°	Sunny	3%	NW 11 mph	
Sun 14	**79°**/55°	Sunny	3%	NW 11 mph	

In modern times, people can accurately forecast the weather through scientific analysis of weather data in various regions. At present, the accuracy rate of weather forecast is as high as 80%. The accuracy rate of weather forecast will decrease as the forecast time becomes longer. The longer the forecast, the more difficult it is to predict.

So where do these weather data come from?

New Knowledge



The forecast data of the weather forecast comes from weather stations around the world. Various information such as temperature, humidity, and wind direction in different regions are analyzed and judged by the weather department, and finally a reasonable and reliable weather forecast is obtained. As small as whether it will rain tomorrow, as large as the temperature change in the future, all need data support from the weather station.

New Knowledge

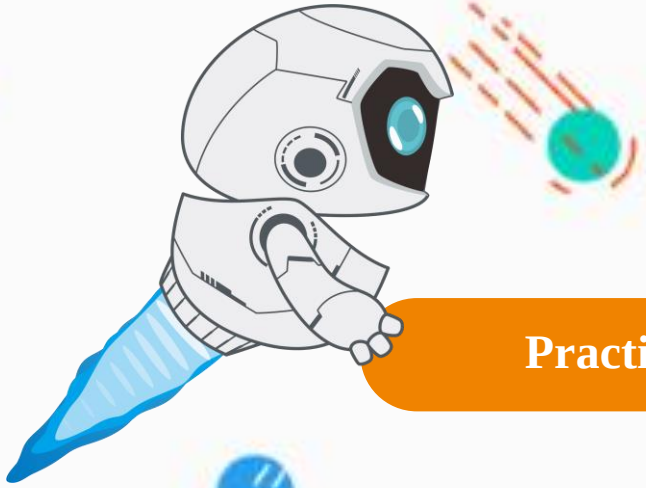


A general weather station includes the following instruments: barometer, thermometer, rain gauge, anemometer, hygrometer, and wind vane.

Most of the current weather stations are automatic weather stations, which are controlled by electronic equipment or computers, and automatically carry out meteorological observation and data collection and transmission.

New Knowledge

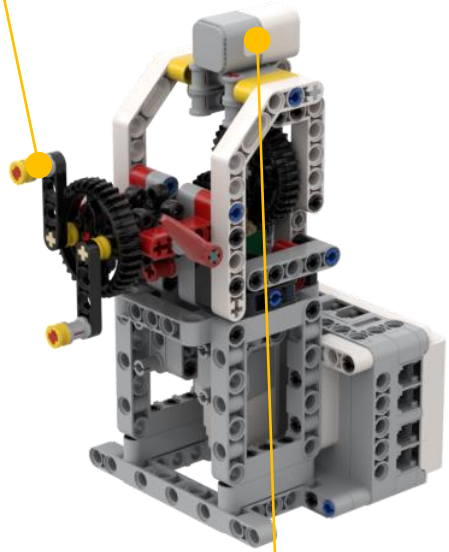
China's weather stations have continued to upgrade and develop, from the initial "wooden poles tied with cloth to see the wind direction" to unattended, and then from simple weather forecasts to helping local farmers get rid of poverty and become rich. Up to now, it can not only serve the people of the whole country, but also serve the whole world.



Practice

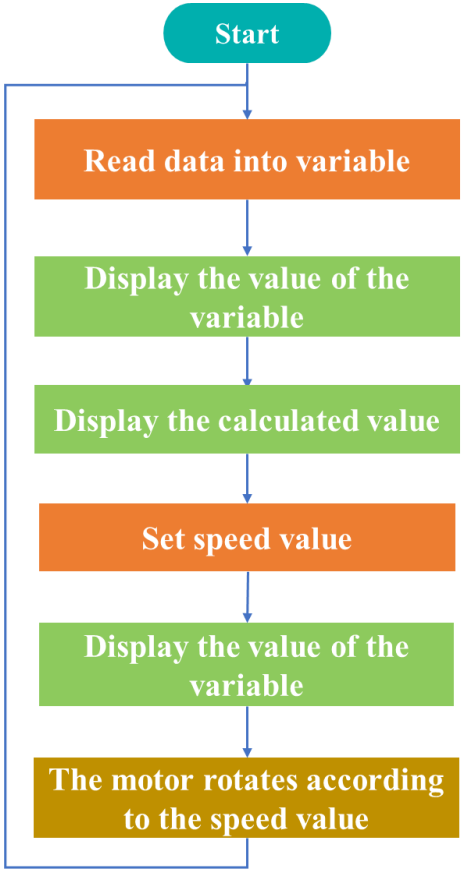


New Knowledge



Assemble a weather station according to the building manual to simulate an anemometer rotation.

Practice | Flow Chart

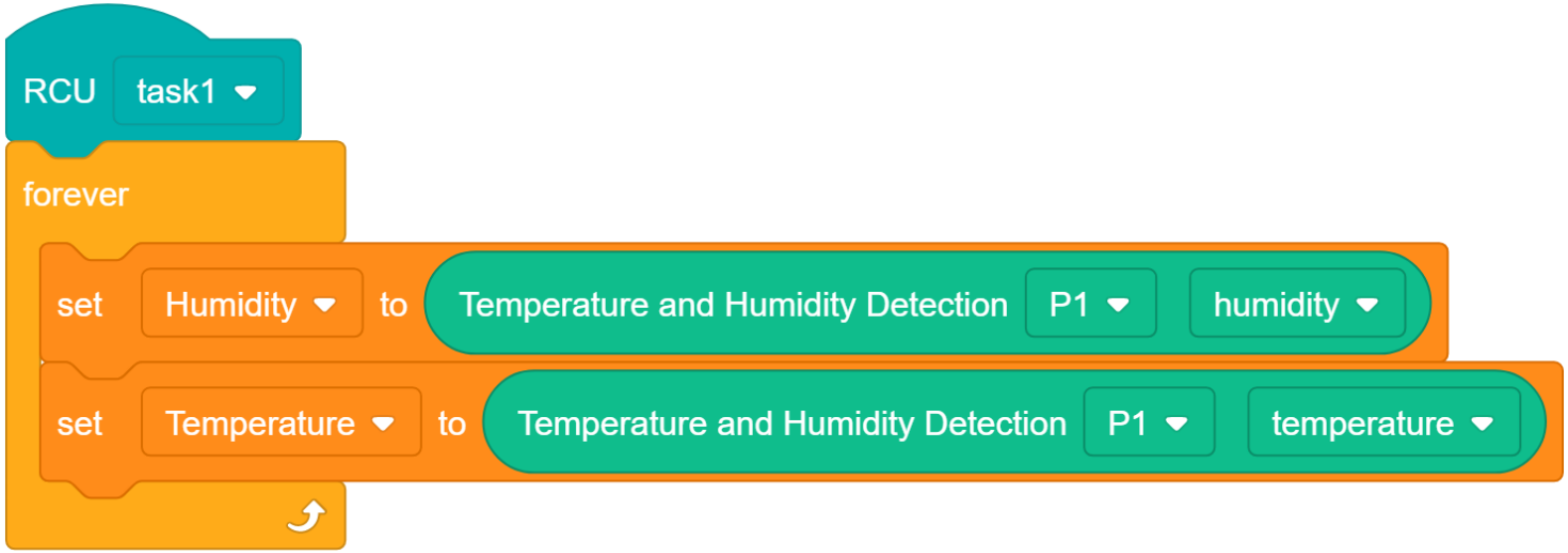


The motor adjusts its speed according to changes in temperature and humidity. The higher the temperature and humidity value, the faster the speed.

The sum of temperature and humidity can easily exceed 100 and reach the highest speed.

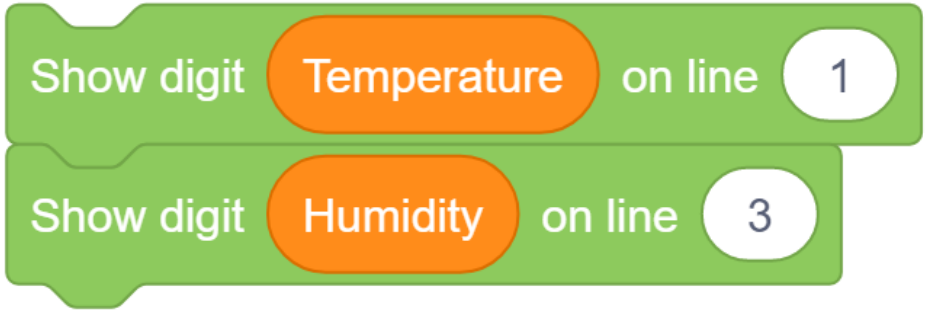
After converting the temperature and humidity according to the ratio of 3:7, the motor rotation can be controlled more reasonably.

Practice | Programming



Read the data

Store the two data of the sensor in two different variables.



Display the data

Display the values of these two variables to see if they match reality.

Practice | Programming

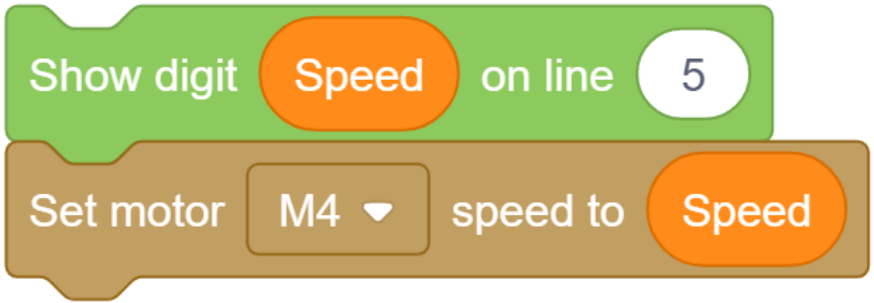


Set the speed

After the temperature and humidity are calculated according to the ratio of 3:7, the speed variable is assigned.

Humidity here is the main data that affects the speed, of course, the ratio can also be adjusted according to the specific situation.

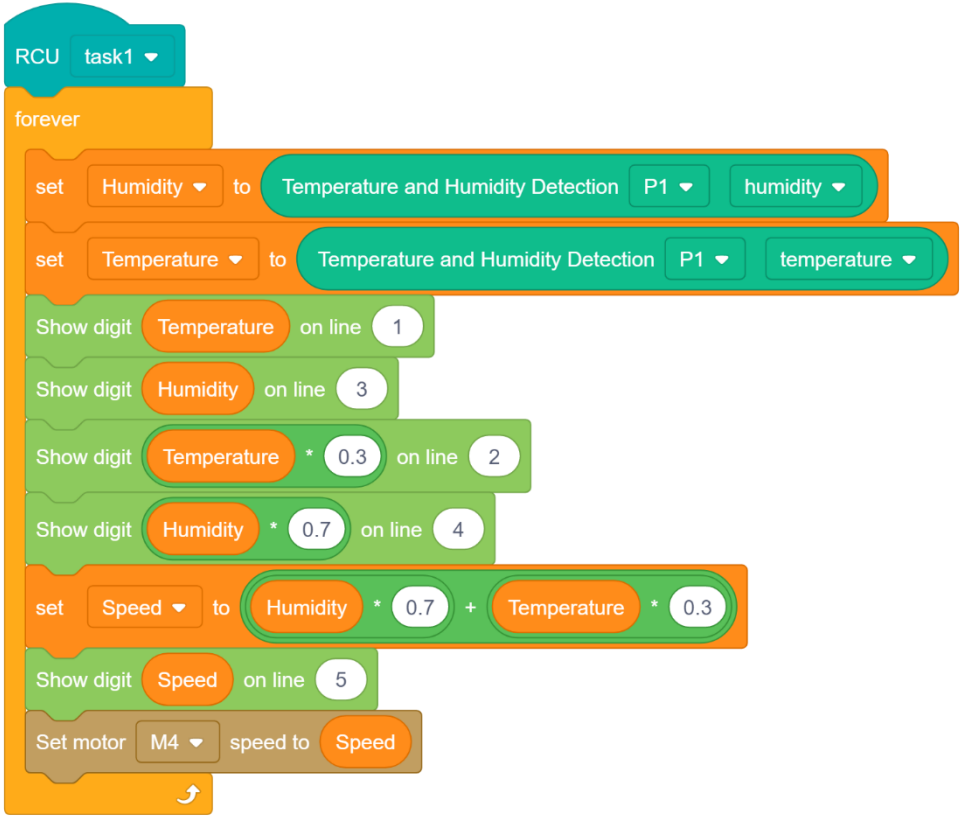
Practice | Programming



Motor rotation

Display the calculated value and let the motor rotate according to the speed value.

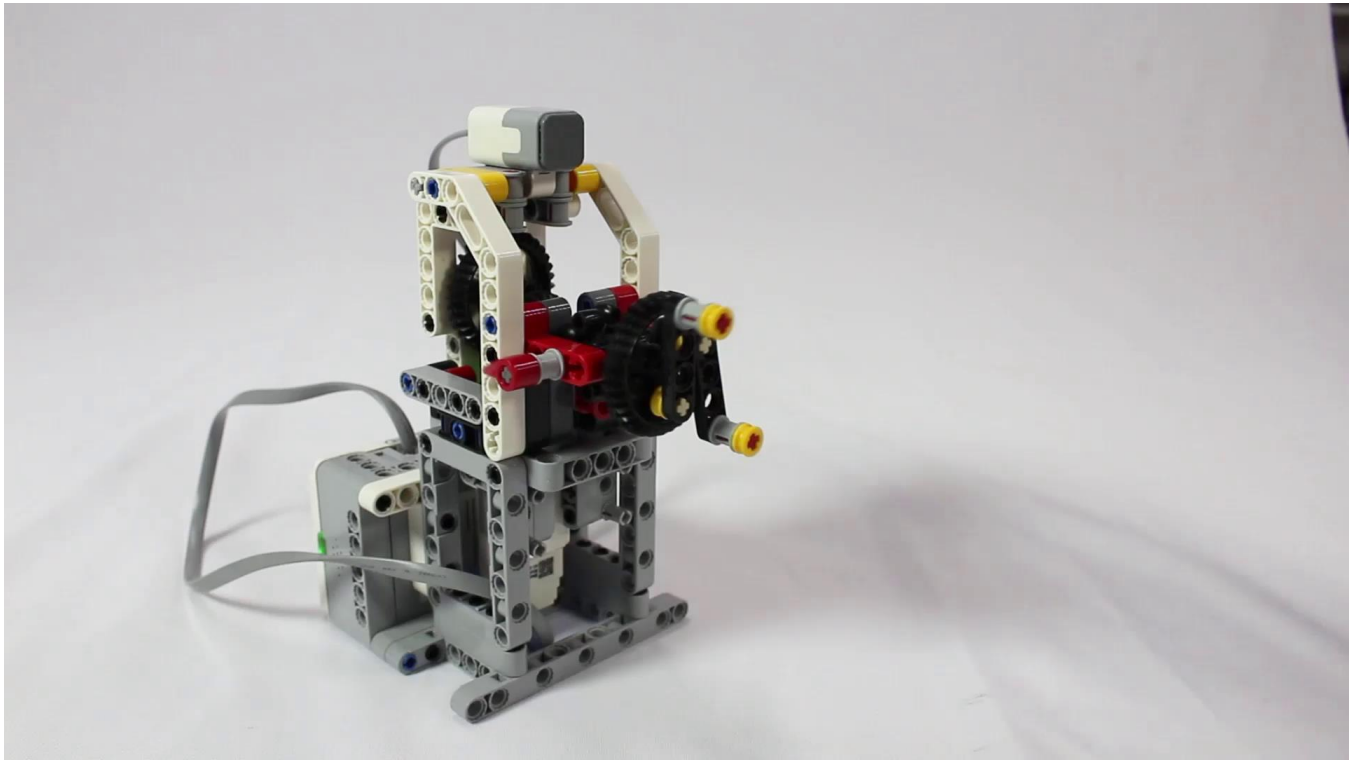
Practice | Programming

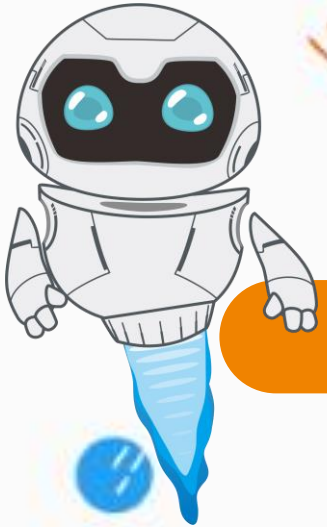


Integrate the program

Integrate the program according to the program flowchart.

Practice | Programming





Results

Program Optimization

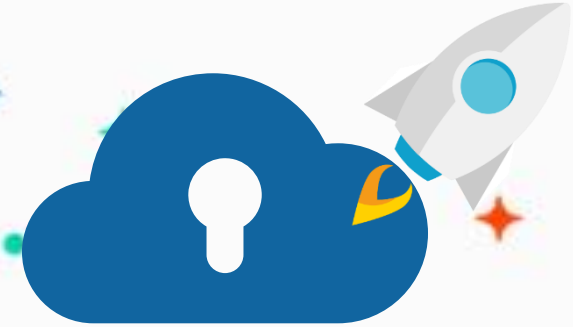
This lesson realizes that the simulated windmill rotates at the corresponding speed under different temperature and humidity.

Next modify the program so that temperature is the primary factor controlling the speed of the motor.

Requirement: Change the ratio of temperature and humidity so that the ratio of temperature is greater than that of humidity.

Further Reading

"Twenty-Four Solar Terms" is a product of ancient farming civilization. It is a knowledge system formed by ancient ancestors in compliance with farming seasons, observing the movement of celestial bodies, and understanding the changing laws of seasons, climate, and phenology in a year. The twenty-four solar terms were originally formulated according to the rotation of the dipper and the star shift. The Big Dipper rotates in a cycle, and the handle of the dipper rotates clockwise for a cycle, which is called a "year". The current "twenty-four solar terms" is formulated based on the position of the sun on the zodiac, that is, the annual trajectory of the sun is divided into 24 equal parts, every 15° is 1 equal part, and every 1 equal part is a solar term, starting from the beginning of spring , and finally the great cold. In the international meteorological circles, the twenty-four solar terms are known as "China's fifth great invention".



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Thanks!

LECTURER: