Temperature-Humidity Sensor module Experiment
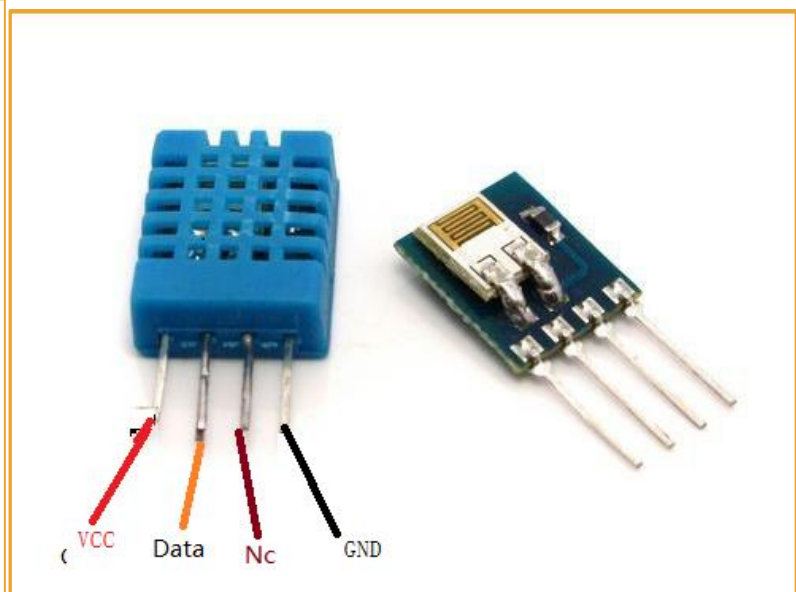
Introductiont of Temperature-Humidity Sensor

DHT11 digital temperature-humidity sensor is a compound sensor containing calibrated digital signal output.

It utilizes special digital module acquisition technology and humidity-temperature sensor technology to ensure a high reliability and excellent long-term stability.The sensor consists of a resistance-type moisture element and a NTC temperature measuring element, and it is connected to a high-performance 8 bits microcontroller.

Temperature-Humidity Sensor module   Temperature-Humidity Sensor

Pin Description

1, VDD: Connect the positive pole of power supply (3-5v)

2, DATA: Serial DATA, single bus, must be connected to a pull-up resistor close to 5.1k, so the DATA is always at a high level during idle time.

3, GND: Connect the negative electrode of the power supply

4, NC: Dangling pin

Working Principle of DTH11

DHT11 communicates with the microprocessor through a single bus. It only needs one thread to send 40 data at a time, big end..

Data Format

8 bits integer data of humidity + 8 bits decimal data of humidity + 8 bits integer data of temperature + 8 bits decimal data of temperature + 8 bits parity bit

Communication mode

Adding the integer to the decimal of humidity and temperature, only keeping low 8 bits. The communication agreement of Microprocessor (M0) and DHT11: the host-slave structure. DHT11 is the slave, while M0 is the host. The slave can only respond when the host is calling.
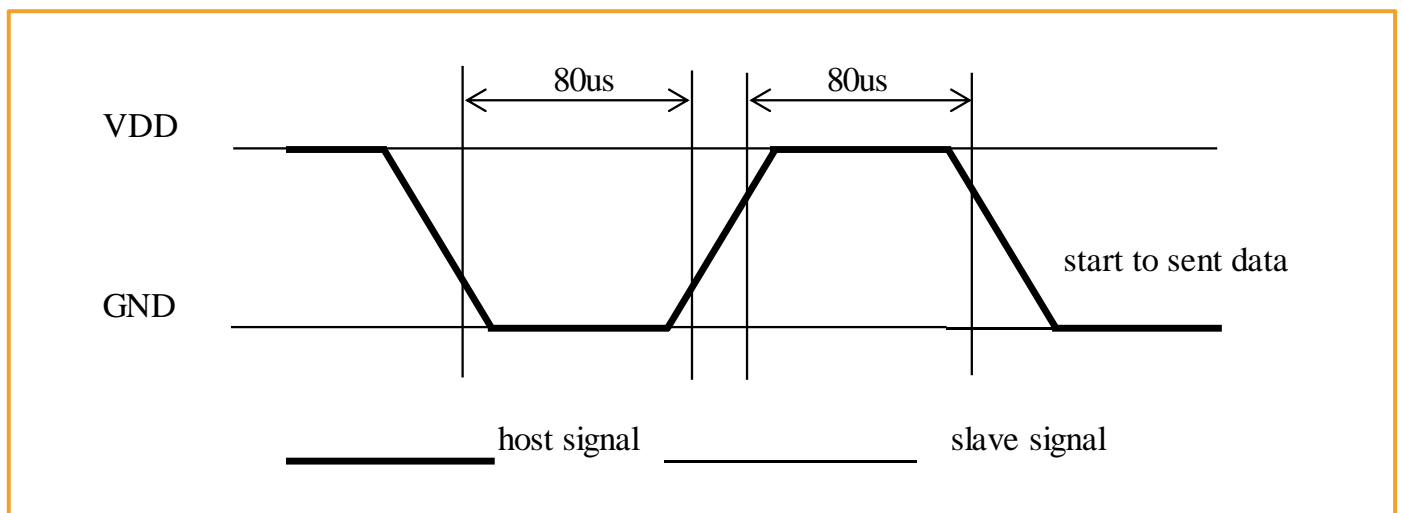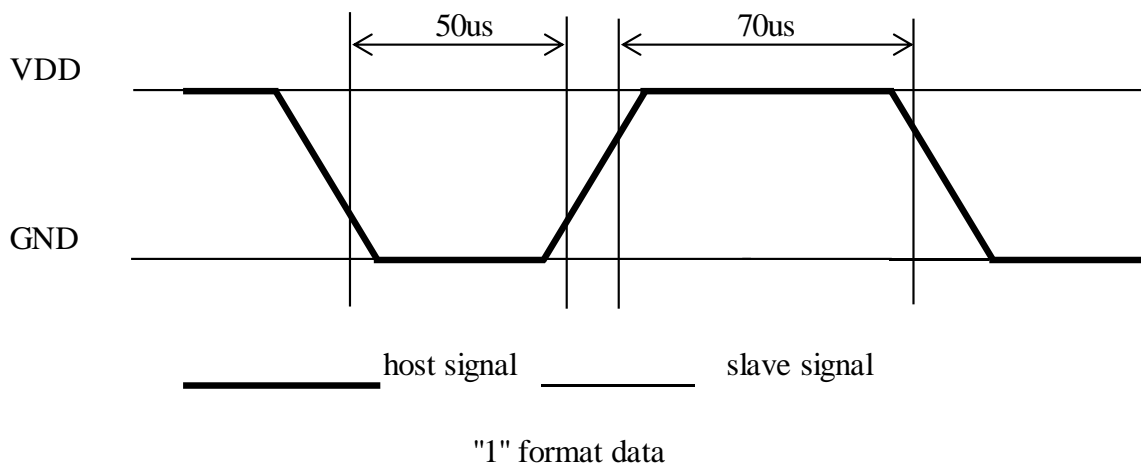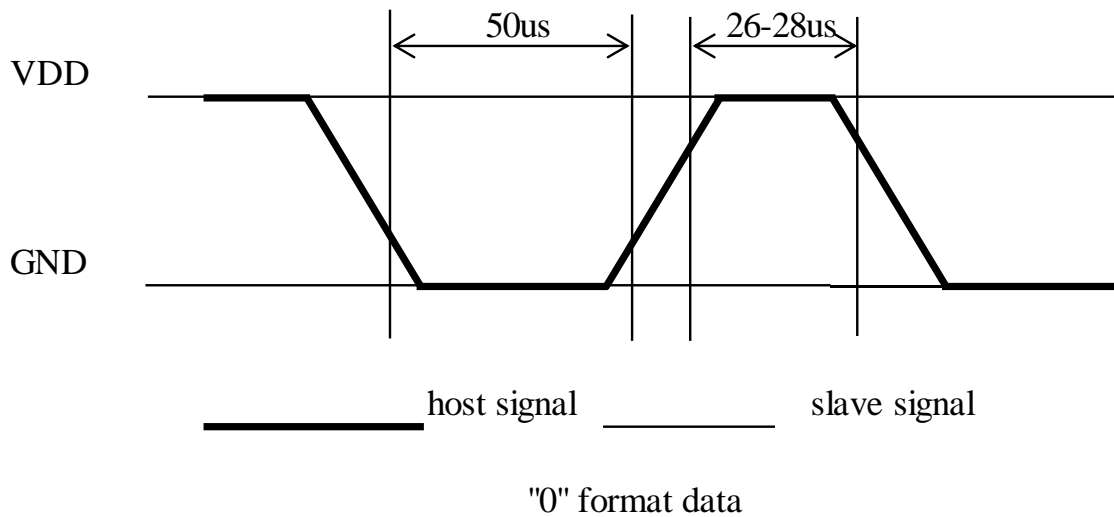
Detailed Process

M0 sends start signals -> DHT responses signals -> DHT informs M0 that it is ready to accept signals - > DHT sends the prepared data - > DHT ends signals - > DHT internally retests the environmental temperature and humidity, records the data for the next start signal from M0.

Obtained by the process, the data M0 collected each time is always the last-time DHT data. If we want to get real-time data, then M0 can collect two successive data, but, officially, reading DHT many times continuously is not recommended. If the interval time of each read is more than 5 seconds, it is enough to get accurate data. DHT needs 1s to stabilize when it is powered up.
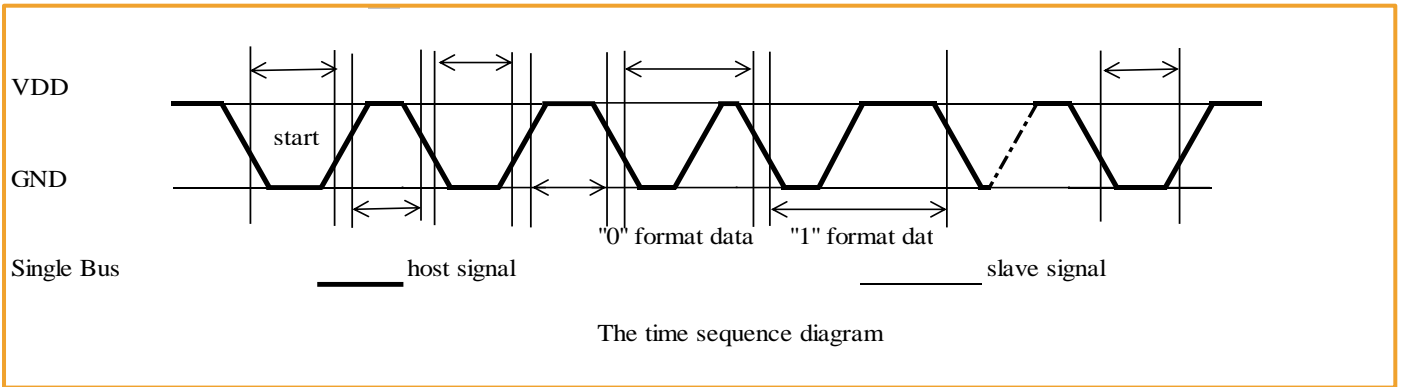
M0 Start Signal

1, Setting the DATA pin as the output state and outputs high level
2, Then the DATA pin outputs low level, the duration is more than 18ms, after being detected, DHT is from low power mode - > high speed mode.
3, Setting the DATA pin as input state, it turns into high level because of the pull-up resistor, so as to complete a start signal.

VDD

GND

>18ms

The pulled-down host bus

host signal   slave signal

The host sends a start signal

THD Response Signals, Ready Signals

(when the M0 DATA pin outputs low power, DHT switches from low power consumption mode to high speed mode, waiting for the DATA pin to enter high level)

1. DHT outputs the low level of 80us as the response signal
2. DHT outputs 80us high level, notifies microprocessor to be ready to receive data
3. Send 40 data continuously (last data)

VDD

GND

80us   80us

start to sent data

host signal   slave signal

DHT Data Signals

"0" format data: 50us low level + 26-28us high level
"1" format data: 50us low level + 70us high level

VDD

GND

50us

26-28us

host signal _____ slave signal

"0" format data

VDD

GND

50us

70us

host signal _____ slave signal

"1" format data

DHT End Signal

The DHT DATA pin outputs 40 pieces of DATA, and turns into the input state after continuously outputting low level 50us. The DATA is switched to a high level due to the pull-up resistance. The DHT internally retest the ambient temperature and humidity, recording data from the external next start signal.

VDD

start

GND

"0" format data "1" format dat

Single Bus   host signal   slave signal

The time sequence diagram

The purpose of this experiment is to detect the temperature and humidity in the air using the temperature-humidity sensor. The sensor will send collected data to the ARDUINO board. After processing, the results will be reflected in the LCD, the first line shows the temperature, the second shows the humidity.

Component List

◆ Keywish Arduino UNO R3 mainboard

◆ Breadboard

◆ USB cable

◆ LCD1602 * 1

◆ DTH11 sensor * 1

◆ Several jumpers

The experiment purpose

◆ Learn how temperature and humidity sensors work
◆ Arduino UNO is used to obtain the value of the temperature and humidity sensor module and display the value through the LCD 1602 display screen.

Wiring of Circuit

arduino Uno	lcd1602
GND	GND
VCC	VCC
A4	SDA
A5	SCL

arduino Uno	Temperature-Humidity Sensor

GND	GND
VCC	VCC
8	DATE（OUT）
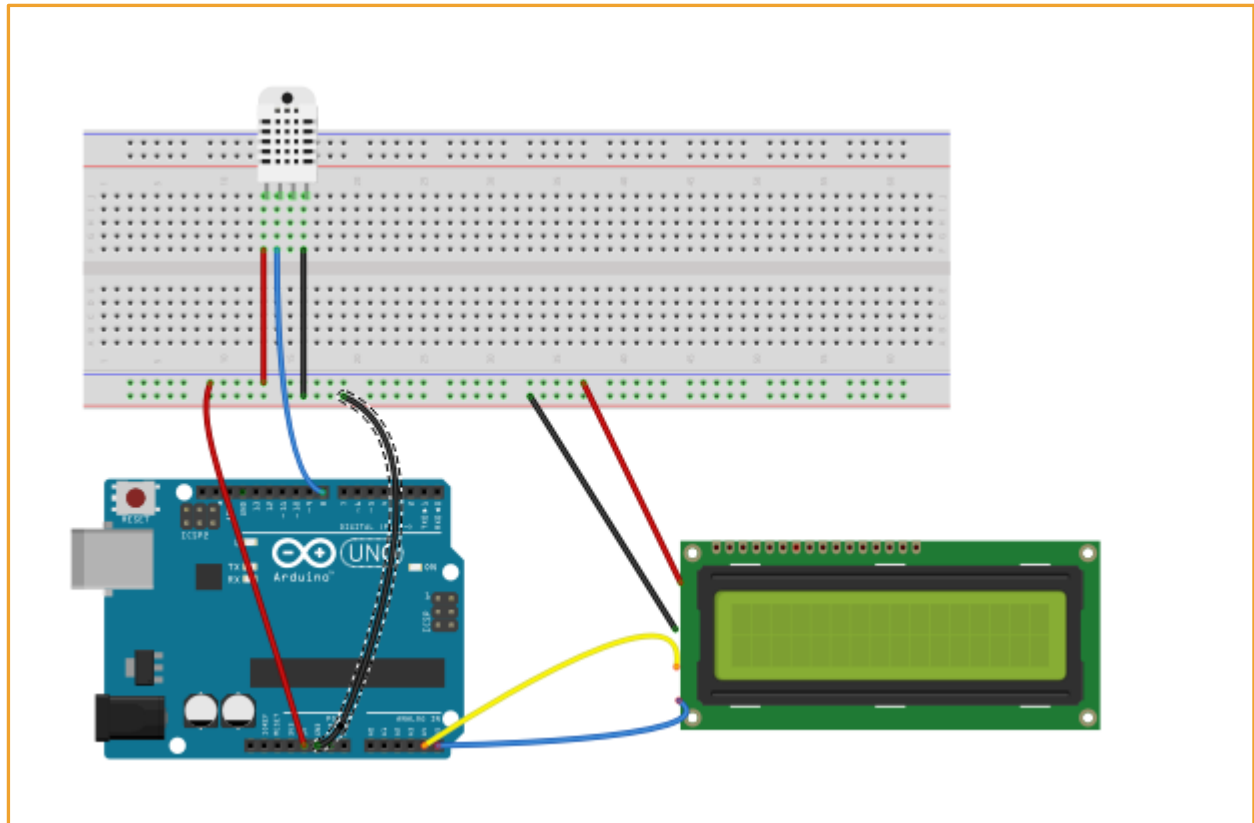
Arduino IDE Code

```cpp
#include "dht11.h"
#include <Wire.h>
#include "LiquidCrystal_I2C.h"

#define  DHT11PIN   8
dht11 DHT11;

LiquidCrystal_I2C lcd(0x27, 16, 2);  // set the LCD address to 0x27 for a 16 chars and
2 line display

void setup() {
   pinMode(DHT11PIN,INPUT);
   lcd.init();                    // initialize the lcd
   // Print a message to the LCD.
   lcd.backlight();
}

void loop() {
   int chk = DHT11.read(DHT11PIN);
   lcd.setCursor(0, 0);
   lcd.print("Tep: ");
   lcd.print((float)DHT11.temperature);
   lcd.print("'C");

   // set the cursor to column 0, line 1
   // (note: line 1 is the second row, since counting begins with 0):
   lcd.setCursor(0, 1);
   // print the number of seconds since reset:
   lcd.print("Hum: ");
   lcd.print((float)DHT11.humidity, 2);
   lcd.print("%");
   delay(200);
}
```
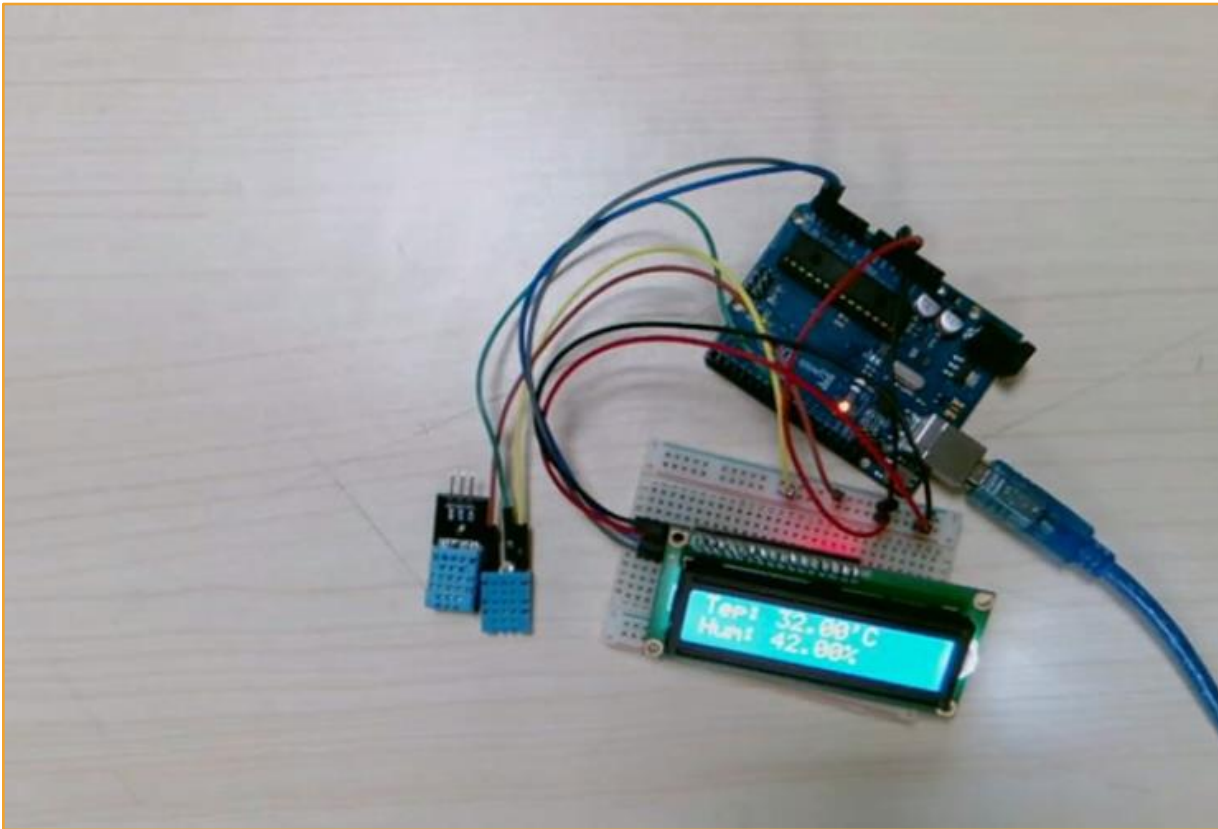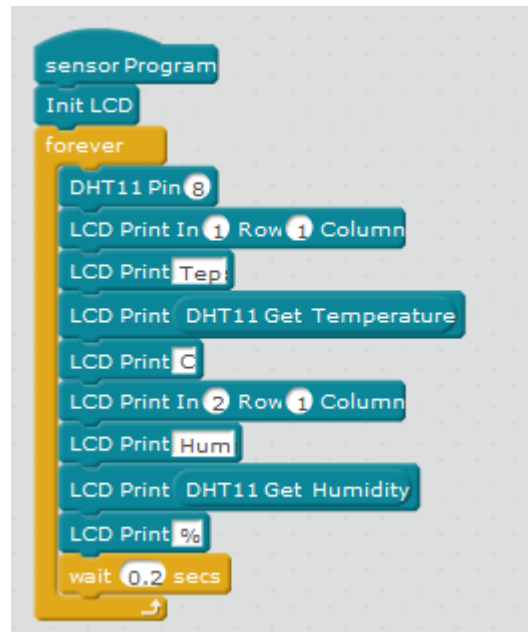
Experiment Result

If you have a sensor V5.0 expansion board in your kit, you can connect it according to the wiring method shown below, which is more convenient.
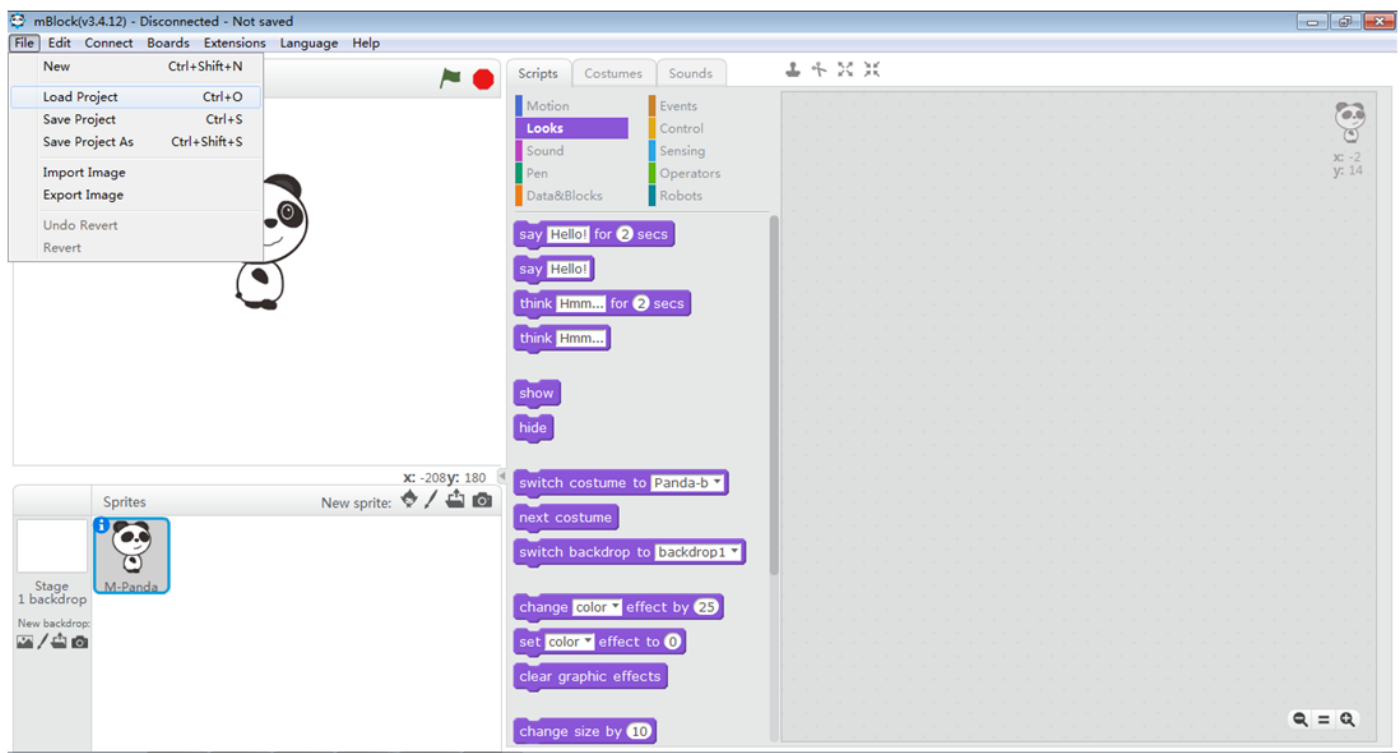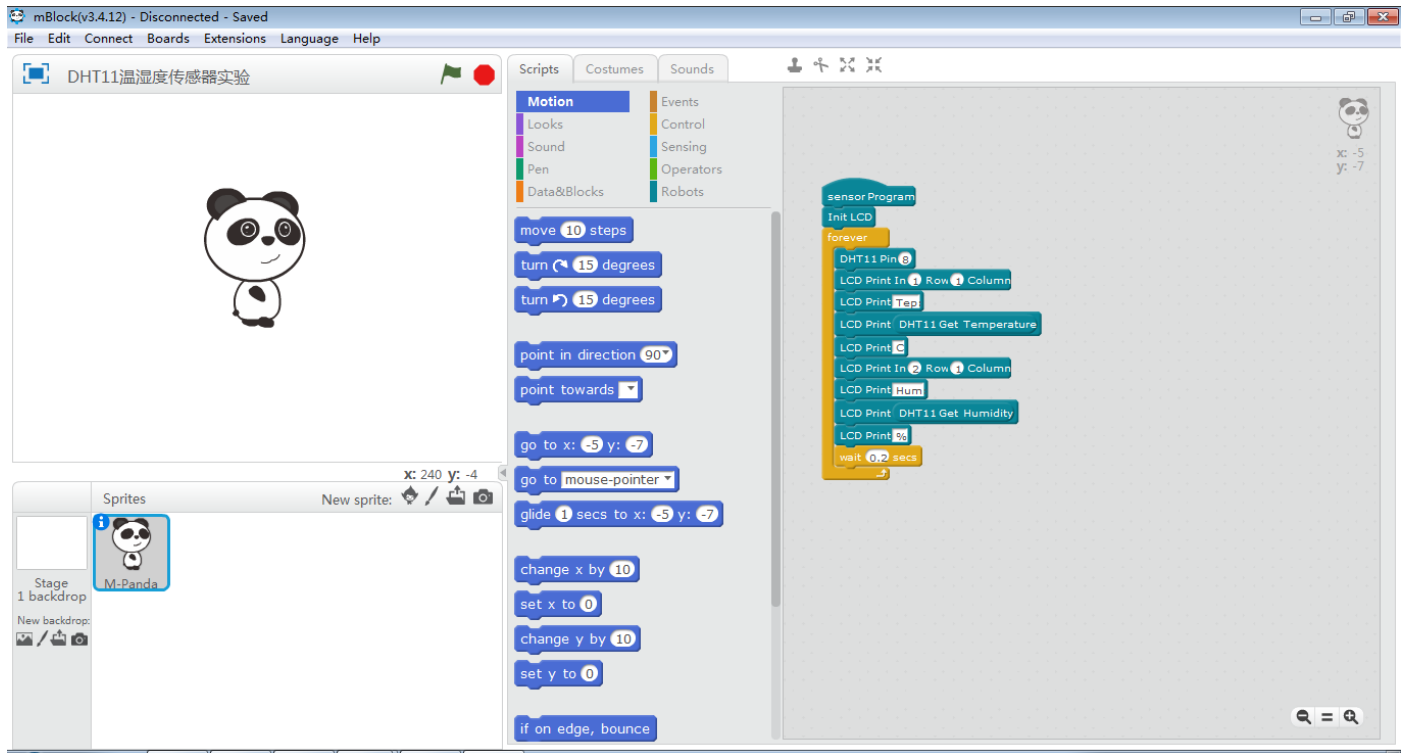
MBlock graphical programming program

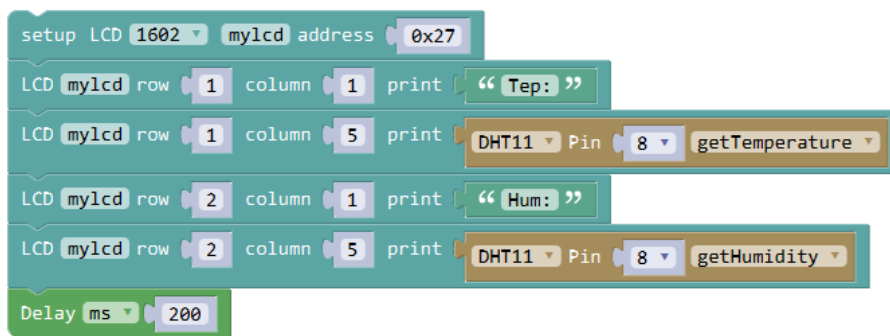The program writen by mBlock is shown in the figure below:

You can also open the program file directly with mblock, which is a. Sb2 file. Here are the steps to open it:

Mixly graphical programming program

MagicBlock graphical programming program