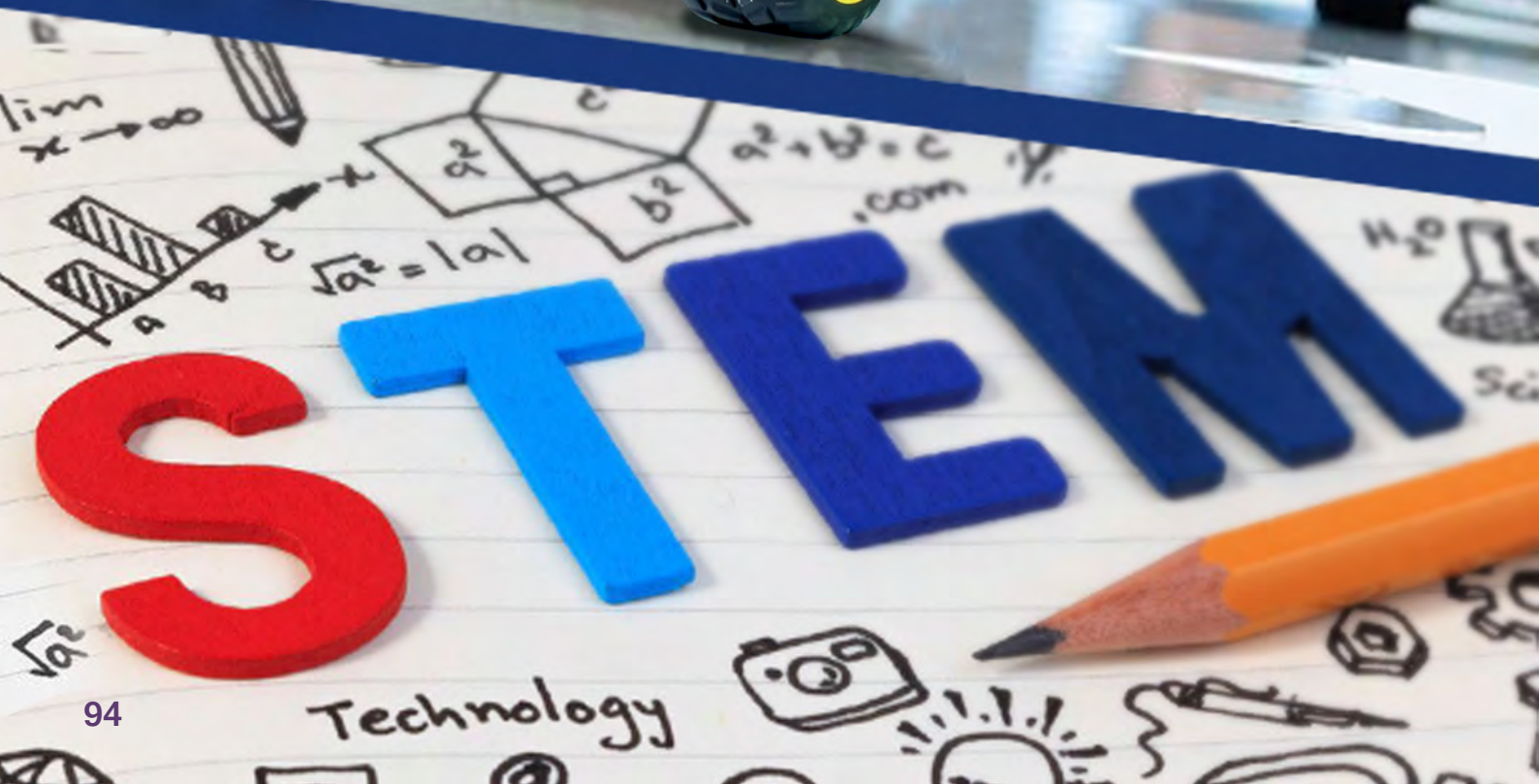


STEM

**NEW TECHNOLOGY FILLS UP GAPS IN EXPERIMENTS AND SOLVES
EXPERIMENTAL PROBLEMS**



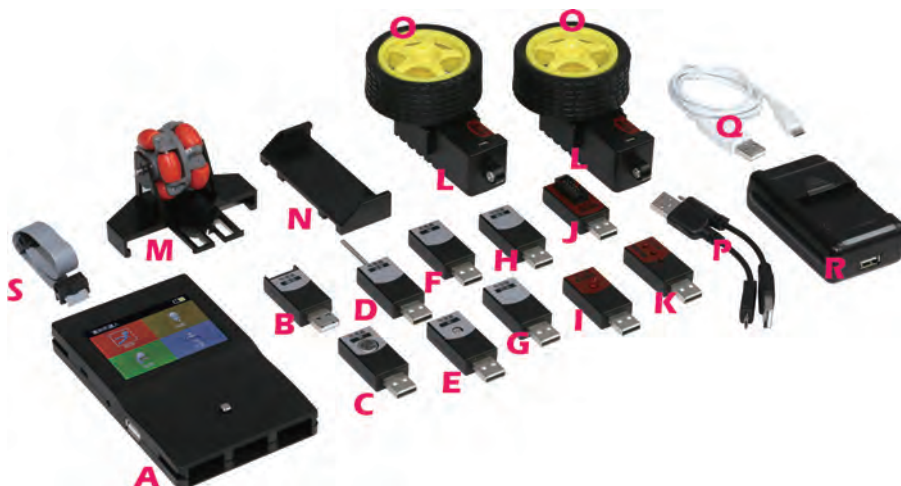
Robot Modular V2.0

Utility Model Patent Application No.: 201420295246.1

LW-Q751

Design Ideas:

The design ideas of our Robot Modular accords with STEM education requirements. STEM education integrates with Science, Technology, Engineering, Art and Mathematics so that the focus is on that the originally splintered different objects becomes a new entirety. the integration through interdisciplinary knowledge as well as solving real-world context on hands is emphasized on STEM education. Based on practical experiences over years and on the concept of “modular combination”, the robot modular is developed with three parts “sensors, actuators and controller”. Moreover, this design improves and enrichs three parts in accordance with the principle of modular design. Students can independently match module, compile control program and solve practical problems according to function needs, and then their everlasting learning interests and thirst for knowledge will be motivated.



Components of Robot Modular:

Controller (A), **Sensors (B-H)**— tracking sensor (B), sound sensor (C), temperature sensor (D), light sensor (E), magnetic sensor (F), far-infrared sensor (G), trigger sensor (H).

Actuators (I-L)—dummy lamp (I), actuator application extension module (J), traffic light(K), electromotor(L)

Accessories (M-S)—front wheel bracket (M), rear wheel bracket (N), wheel (O), electromotor connecting wire (P), USB cable (Q), battery charger (R), Connecting wire for Bit Output Actuator (S).

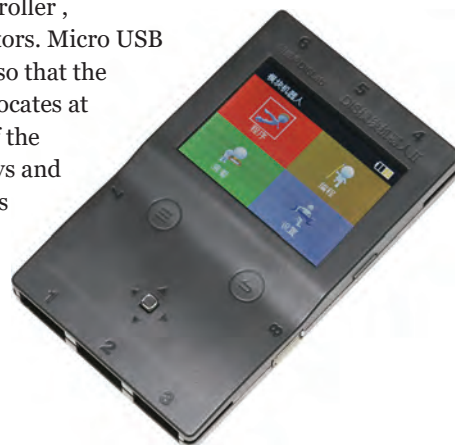
Controller:

Robot modular V2.0 controller is the core component of the whole system. In the controller , there are 8 ports , which can be randomly connected with different sensors and actuators. Micro USB port which can be connected with a computer located at the left side of the controller, so that the programme download and management can be easy to conducted. The power button locates at the right side of the controller. One piece of colored LCD screen locates at the upper of the controller. Succinct UI can be convenient used to communicate with users. 2 touch keys and 1 control bar locate at the bottom of the controller. There is a battery cabin which holds rechargeable lithium batteries in the reverse side of the controller.

Acquisition of Control Program:

Robot modular V2.0 can acquire control program by following ways:

- (1) Self-stored control program is kept in the “program” menu of main interface of the controller, and the control program can be selected by the control bar.
- (2) Simple programming cart can be conducted with the cart after entering into the “programming” menu in the main interface of the controller.
- (3) Independently design control program. Run the special software of the modular robot, the program design can be conducted by using graphical programming, Before the robot runs,the program can be downloaded into the controller through USB interface after completing the design.



Study on obstacle avoidance



Study on “OR gate”



Study on “Movement tracking vehicle”

Automatic Control Switch

LW-O803

The control for external device based on sensor signals

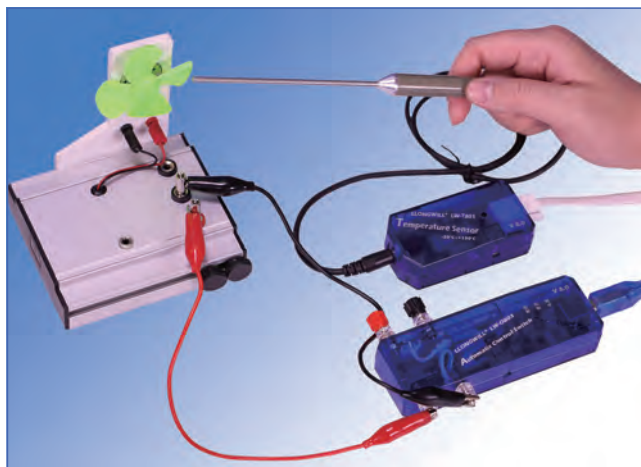


The Design ideas of Automatic Control Switch:

Sensors are the basis of automation; the essential of automatic control is the reaction of computer program based on the data measured by sensors.

Typical Applications:

A simple temperature control circuit (below); Sound-control circuit; Magnet-control circuit; Light-control circuit, etc.



Experiment device of simple temperature control circuit



Threshold setting interface

Automatic Control Actuator

LW-O702

Executing the instructions of the program based on sensor signals



The Design ideas of Automatic Control Actuator:

- The basic structure of automatic control actuator is the automatic control switch plus an actuator circuit.
- Set the threshold value in the feedback control software, then the actuator will be turned on when the sensor data reaches the threshold.

Typical Applications:

Based on "threshold feedback" program, three kinds of actions including indicator light, alarm and motor, can be executed.



An automatic control system composed of Pad terminal, actuator and fast response temperature sensor

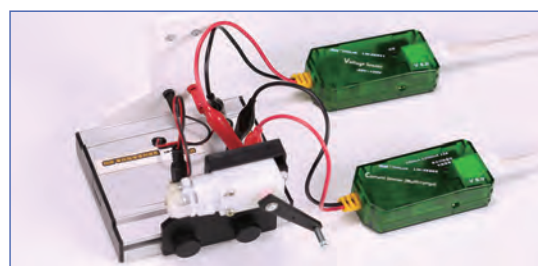
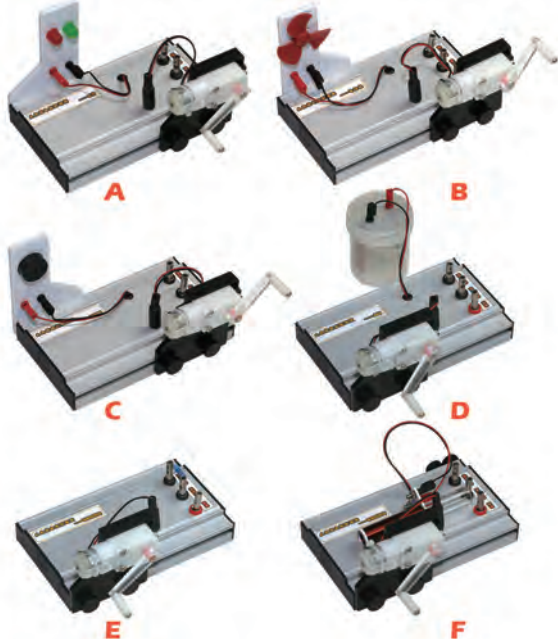


An automatic control system composed of Pad terminal, actuator and sound level sensor

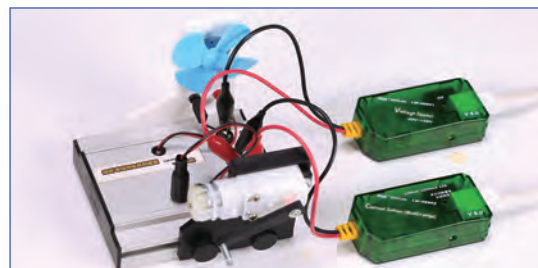
Series of Hand Generators

LW-XQ781

The hand generator packages consist of small bulb A, fan B, buzzer C, electroplating kit D, thermal- current effect kit E, magnetic current effect kit F.



Small bulb kit



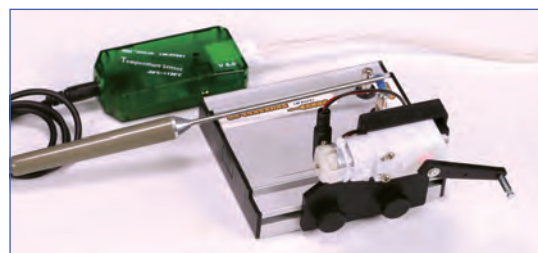
Fan kit



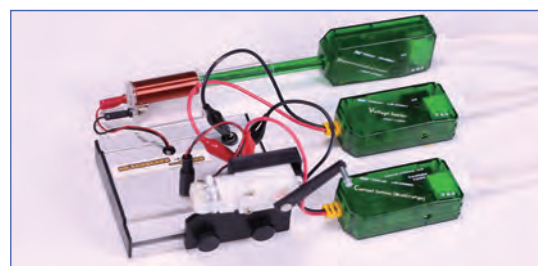
Buzzer kit



Electroplating kit



Thermal-current effect kit



Magnetic current effect kit

The structure of Series of Hand Generators:

Series of hand generators are structured with base, electric generator module, and other related electric modules. Those generators can be used together with multi-range current sensor, voltage sensor, temperature sensor and magnetic induction sensor.

Usages of Series of Hand Generators:

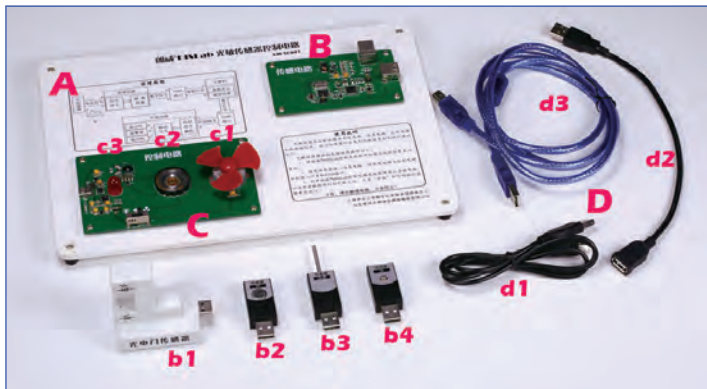
- 1. Fix the generator module to the base with a plastic cap bolt; Plug the Generator module wire into the base, and then plug the red wire and the black wire on the base into the corresponding ports on the modules individually.
- 2. Connect the multi-range current sensor and voltage sensor with corresponding terminals on the base. The probe of magnetic sensor should be placed into the central part of the solenoid magnetic effect of current device. The probe of temperature sensor should be well connected and fully touched with the resistance on the thermal-current effect.
- 3. Start the general software of primary school science; rotate the handle of generator module clockwise or counterclockwise, then the changes of current and voltage can be observed.

Sensor Control Circuits

The control circuits of the lsensor include the control circuit of photosensitive sensor (LW-SC001), the control circuit of acoustic sensor (LW-SC002), the control circuit of heat-sensitive sensor (LW-SC003), the control circuit of count sensor (LW-SC004), and the control circuit of timing sensor (LW-SC005).

The Components of Sensor Control Circuit:

A. Base plate; B. Sensing and communication circuit (b1. Photo gate sensor; b2. Optical sensor; b3. Temperature sensor; b4. Sound sensor); C. Actuator circuit (c1. Fan; c2. Buzzer; c3. Bulb)
D. Data cables (Including d1. Mini USB cable; d2. Sensor wire; d3. USB cable).



Photosensitive sensor control circuit



Acoustic sensor control circuit



Thermal sensor control circuit



Counting sensor control circuit



Timing sensor control circuit

Experiment Example:

- ▶ Install Sensor control circuit software into the computer, following the instructions.
- ▶ Connect the sensor to the circuit by wire.
- ▶ Connect the circuit to the computer by USB cable
- ▶ Connect the actuator circuit and computer by another USB cable with one Mini USB plug.
- ▶ Start the software and set the threshold value.



Logical Circuits

LW-6312 & LW-6338

Utility Model Patent No.: ZL200720017880.9
ZL200920027215.7

R&D Background:

Logical circuits, also called “digital circuits”. To enhance the ability of STEM education to solve the practical problems with multi-discipline knowledge, the visual perceptual materials must be used to present the logical circuits to make the students get a direct feel of logical circuits input and output, by which, the students' practice ability can then be promoted. That's why our Logical Circuits got specially designed.

Components:

At present there are two versions of Logical Circuits: V2.0A & V2.0B, corresponding serial numbers: Lw-6388, Lw-6312, of which, V2.0A is a full-functional version; V2.0B is a basic version. The common part is that both of them are modular designed, while they have difference in configuration. With the signal collector and software, a real-time communication between logical circuits and a computer is realized, by which, the abstract level signals in logical circuits can be displayed visually on the screen, so that a breakthrough on logical circuits experiment teaching comes into practice.

Logical Circuit V2.0 B:

Gate Circuits: AND gate OR gate NOT gate

Switches: Upper Switch, Middle Switch, Lower Switch

Sensors: Illumination Sensor
Temperature Sensor

Actuators: Bulb, Buzzer

Connectors: “One Input Two Output”
Connector

Accessory: Battery Box

Logical Circuit V2.0 A :

(Additional part based on V2.0B)

Sensors: Magnetic Induction Sensor,
Photo Gate Sensor, Sound Sensor

Actuators: Electromotor with light blocking
sheet and light blocking plate

Connectors: π -shaped Connector, Cross-
shaped Connector,
Signal Collector

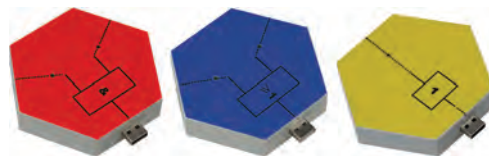
Accessories: Signal cables x 6, USB cables,
Software



Gate Circuits:

There are three types of gate circuits: AND gate (red), OR gate (blue), NOT gate (yellow), which are located in structured hexagonal boxes with circuit diagram printed on the surface. Also, the pilot light is installed. When the input signal in the gate circuit module is at high level (logical state:1), the corresponding pilot light on the module surface will be ON; while the input signal is at low level (logical state:0), the pilot light is OFF. On the side of gate circuit, input port and output port can be found, both of which are standard USB ports.

Different kinds of switching modules and sensor modules are available for the input port. The output port can be connected with different kinds of actuator modules.



Switches:

Consisting of the upper switch, the middle switch, and the lower switch. The switches located at a quadrilateral box with the printed circuit on the surface, shows “Close-Open”. On the side of the switch, the input interface and the output interface can be found, both of which are standard USB interfaces. For the logical state of switch module, it is positive logic, which means that the logical state will be “0” when the switch is “Open”; and “1” for “Close”.



Sensors:

The sensors are the source of logical circuits to control signals. Five types of sensors can respectively control illumination, temperature, sound, magnetic induction and motion (photo gate light-blocking). The induction rules of external signals for each sensor are as follows: (1) when the illumination sensor gets light illuminated, the resistance value decreases; when no light illuminated, the resistance value increases. (2) when the temperature sensor detected that temperature rises, the resistance value will decrease; when the temperature decreases, the resistance value will increase. (3) the sound sensor will output high electrical level when sound is detected;

and then recover to the low electrical level after a while. (4) when the magnetic induction sensor is close to the magnet, circuit will be connected, and high electrical level will be output; while away from the magnet, circuit will be disconnected, and then output low electrical level. (5) when light is blocked to photo gate sensor, resistance will increase, and low electrical level will be output; when light transmitting, the resistance will reduce, and high electrical level will be output. All these five sensors adopt quadrilateral box structure, with printed circuit diagram on the surface, and have standard USB interface configured as the output port for all kinds of switches, actuators or gate circuits. For sensors of illumination, temperature and sound, there is a sensitivity knob on the surface.



Actuators:

The actuators include a bulb, a buzzer, and an electromotor. Regarding the electromotor, it is equipped with a light blocking sheet and a light blocking plate. All these three kinds of actuators are structured with quadrilateral box, in which there are prompt words or patterns printed on the surface. A standard USB interface can be found on the side as an input port for connection of connectors, sensors or gate circuits. The actuating logic of these three types of actuators is: starts to act when high electrical level signal is received; stops when low electrical level signal is received of them, respectively.



Signal Collector:

The communication between the signal collector and a computer is realized with USB mode. In the two sides of a collector, there are six signal collecting channels A~F. The electrical level signals can be collected and uploaded through signal cables connecting with logical circuits.



Connectors:

Connector is designed for building up complex circuits and control signals and can be connected with all kinds of sensors, gate circuits, with a standard USB interface among them. The type connector can be lined by soft cables with high flexibility, by which not only control signals can be transmitted, but also the feedback signals that power up the equipment related to the circuit;

for building up transmitting be connected actuators and USB interface among them. The type connector can be lined by flexibility, by which not signals can be transmitted, feedback signals that equipment related Cross-shaped



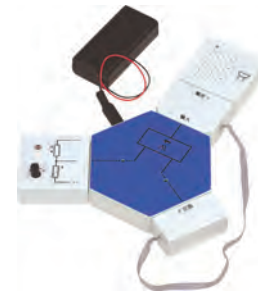
connector has 1 input port and 3 output ports to allocate signal into multiple channels at the same time. It can be used for both the output and input of the gate circuit.

As to the π -shaped connector, besides the connection function, it can be plugged with 2 signal cables, which is specially designed for the experimental logic analysis of the composite gates (signal test).

Teaching application of Logical Circuits:



Light-control circuit of flashing lamp



Light-control circuit of alarm light



Light-control circuit of street lamp



Mini Material Tension Tester

LW-XQ786



Components:

Mini material tension tester is composed of A. base, B. knob, C. clamp at the end of screw, D. clamp at the end of sensor and E. force sensor.



Pupils study the paper's tension experiment



Experiment interface of Mini Material Tension Tester

Notes:

- Width of the materials to be tested $\leq 3\text{cm}$, length $\leq 4\text{cm}$;
- The surface of the materials to be tested should be kept flat without any wrinkles and marks;
- Rotate the knob slowly, and keep the force sensor in its range.

Digital Geographic Field Kit (All in one)



Components:

Digital Geographic Field Kit consists of measuring sensors, data logger, pad terminal and data display module.

Sensors:

Measuring the data of important geographical environmental elements, such as, oxygen concentration in the air, acidity and basicity of water, air humidity, sound intensity, carbon dioxide concentration in the air, atmospheric pressure, surface temperature, flow rate of water, wind speed, salinity of water, soil temperature, soil humidity, geographic orientation and geographic coordinates.

Data Logger:

Data logger equips two different interfaces (wired interface and wireless interface), in which the wireless interface shall be used with wireless transmitter.

Pad Terminal and Data Display Module:

Pad Terminal is used to display, record and analyze collected data, and powered by AC adapter or portable power. Data display module can be directly plug-in measuring sensors and displays the data (refer to P5 for details) measured by sensors in real time. When switch is on, data display module will automatically store data in 4Hz frequency and the data can be exported into computer.

Software:

Contains data reading, combination of curves, computing tables and other functions. Through the data processing, more image of the exploration of the geographical environment can be obtained.

Accessories:

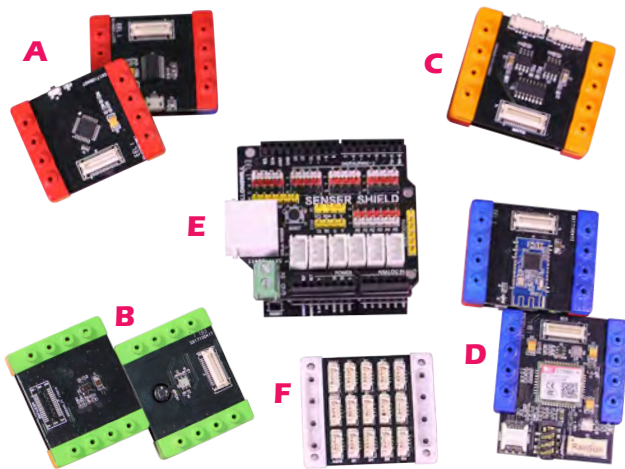
Including charger, connecting wire, portable power, matched data cables, sensor cables, etc.

Supermodule

LW-Q870

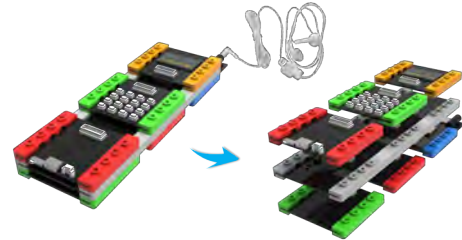
Components:

Each module is color-coded according to its role:
 Red—The core module, the brain and logic core of the project (A)
 Green—Input module, provides sensor data for the project (B)
 Yellow—Output module, provides output sound, display, action and other functions for the project (C)
 Blue—Communication module, provides wireless communication for the project, such as Bluetooth or WiFi (D)
 White—Extension module, enables compatible connections with various external modules through the transfer function.



- Bid farewell to complex connecting compatibility issues
- Contains more than 20 modules to distinguish functions from color
- Each module is connected by easily stacking
- With simple combination, you can DIY your own hardware

Supermodule research project—Modular Cell Phone:



Usage of sensors for the Supermodule research projects:

Force sensor controls motor speed, which can be used for load overweight display or alarm.

It contains power module 103, control module(USB) 104, motor drive module 302, Arduino compatible module 504, Arduino expanded version 505, motor, motor cable, force sensor, sensor cables, etc.

