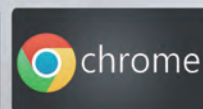
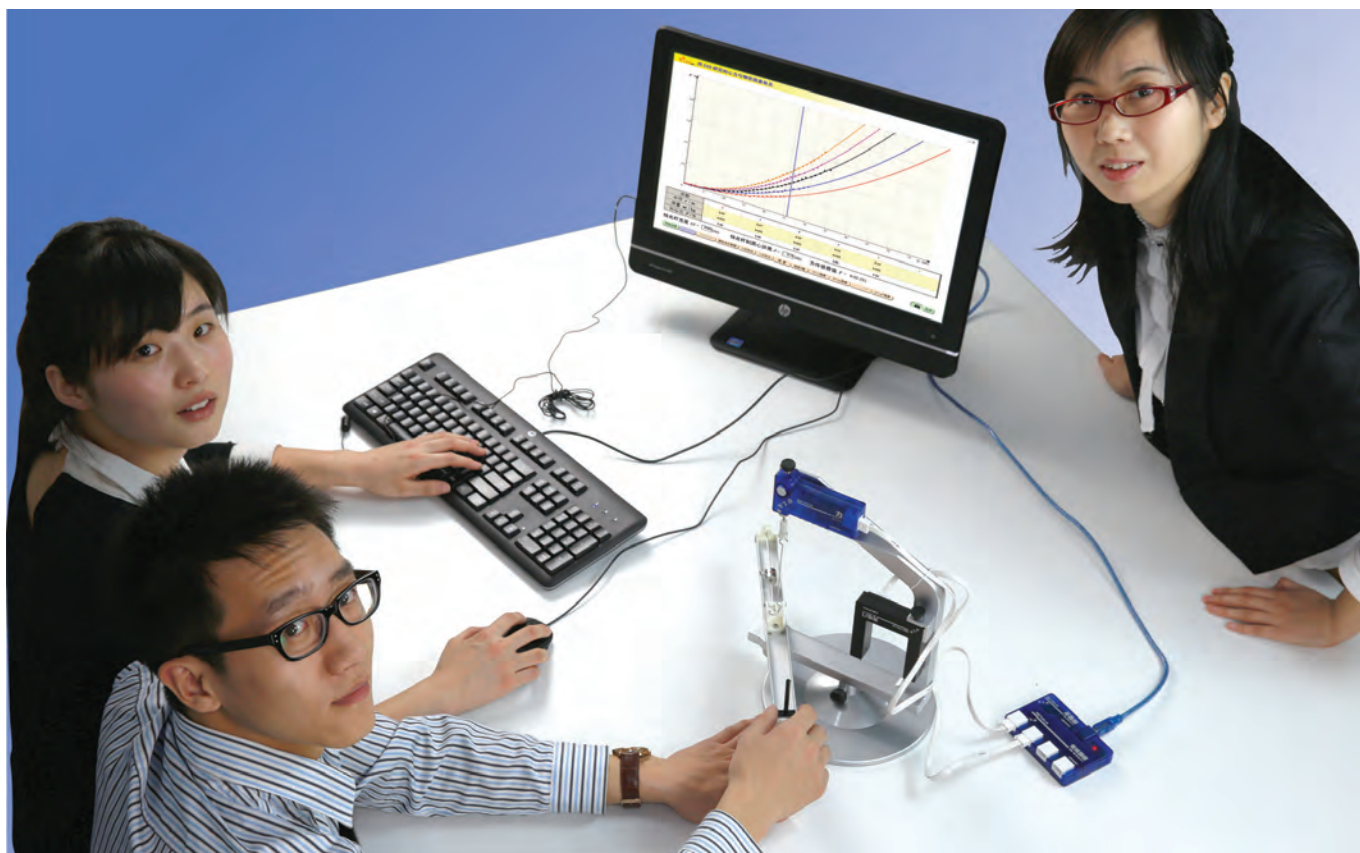


DISLab Software

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

Support Windows/Mac OS/Android/iOS/Chrome OS,
mobile/pad/computer and other platforms





Teaching Software

Categories of experiment software (classified by stage and purposes):

- Primary school science software: “Special + General” integrated software
- Secondary school science software: ♦ General software; ♦ Special physics software; ♦ Special chemistry software; ♦ Special biology software; ♦ General software; ♦ Special physics software; ♦ Special biochemistry software & chemistry software;
- Assistant software: ♦ Calibration software; ♦ Data loading software.
- Special software for intelligent lab equipment;
- Special software for acoustics.
- Digital weather station software----General-type integrated software.

Introduction:

Software is a bridge and bond for human-computer interaction and an important part of digital laboratory system. After more than ten years of teaching application, our software system has developed into a relative perfect software group, which includes “General Software”, “Special Software” and “Assistance Software”. These softwares are working with subjects in physics, chemistry, biology, environment science, primary science, covering the educational sections from primary school to high school.

Components of Software (Software name + product serial number):

- V8.0 software package—LW-S801
- Wireless centripetal force apparatus software—LW-S706
- Faraday's law apparatus I—LW-S707
- Faraday's law apparatus II—LW-S708
- Logical circuits apparatus V2.0A software—LW-S710
- Robot Modular V2.0 software—LW-S809
- 2-D motion special software package—LW-S705
- Acoustics special software package—LW-S702
- Digital photoelectric track system software package—LW-S820
- Conservation Law of Mechanical energy apparatus II software—LW-S822
- Electrostatic measurement software—LW-S823
- Photoelectric Range Finder Software Package—LW-S825
- Magic Board Software Package—LW-S826
- Primary school science software—LW-XS801
- Digital geographic field kit software—LW-S812
- Digital weather station software—LW-WS301
- Experiment Teaching and Evaluation System—LW-S831
- Teacher Information Management System—LW-S832
- Educational Equipment Information Management System—LW-S833

V8.0 Software Package

Loading of V8.0 Software Package:

Put DISLab V8.0 software disc into the driver of the computer, then the computer will run automatically. First of all, it will pop-up a welcome interface and a prompt interface of installation guide. By following the installation guide, users shall choose the path, starting installation program. After the installation, a window will be popped-up which shows that the installation is successful. After clicking “Complete” in the window, a shortcut icon of DISLab V8.0 software is generated on the desktop. Click the shortcut icon of DISLab V8.0 software, then you would open the initial interface of the software.



Initial interface



Desktop Shortcut



Initial interface of V8.0 software package

Function Introduction of General Software:

Fully Compatible

The General Software supports all kinds of V8.0 Sensors.

Plug and Play

Automatically display the data window once connecting a sensor, and the data window is automatically closed once disconnecting a sensor.

Multiple Display Mode

Besides some specific sensors, most sensors' display window can be shown in following three modes “Digital”, “Instrument” and “Oscillogram”. Users can select the display mode freely according to teaching request.

Data Collection in Parallel

Support 4 digital channels to collect data simultan-

LW-S801

eously and record. Especially, it supports 4 sound sensors to be connected into a data logger simultaneously.

Multiple Curves Display

There is a special combination display window to show multiple curves which have logical relations in one coordinate axis.

Freely Adjustable Coordinate Axis

In the combination display window, it supports to make a custom coordinate axis and zoom or drag the coordinate axis freely.

Curve Analysis

In the combination display window, it supports some advanced mathematical analysis for further uncovering physics laws based on the experimental curves by using some functions such as curve fittings, derivation, integration and so on.

Data Calculation

The experimental data can be recorded in the calculation table and the experiment result can be calculated according to the formula via the embedded compiler in software.

Sensoring loop control

It uses sensors as a signal source to build up an automatic control system. Based on the data measured by sensors, one can set a controlling threshold value and send an instruction signal to the actuator.

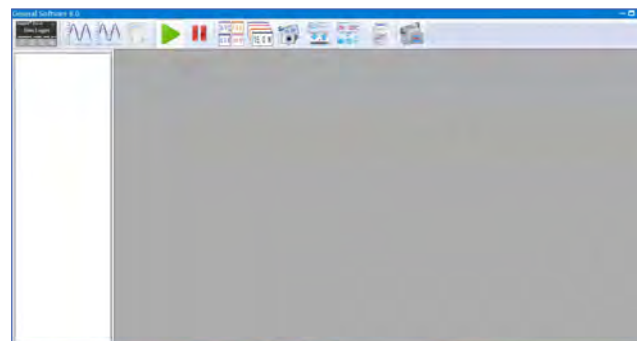
Teaching Management

It supports the interaction between teachers and students using internal network. Students can submit their experiment report to teachers via the software and teachers can give their feedback after receiving the report.

Function Introduction of V8.0 General Software:

Main interface--main interface of the general software mainly includes: title bar, main menu bar, toolbar, control panel region, window display region and status bar.

Observing the function diagram in the toolbar, the open modes of the main functions of our general software, especially for the particularly standing out the usage meaning of "computation table" and "combination curves" will be introduced and well learned.



Main interface of General Software

Special Software for V8.0 Physics:

In the principle of “less operation procedures, lower operation difficulties, focusing on experimental requirements”, in special software for physics, the independent interface curing aims at each experiment process individually, so that there are the characteristics of “unique style, simple interface, one-click OK” in the software families.



Main interface of Physics (special) software

Special Software for V8.0 Chemistry/Biology:

General software can support experiments in biology/chemistry conducted with all biology/chemistry sensors. However, the distinctiveness of partial experiments in biology/chemistry is considered. Aimed at the requirements of relatively special display, process and records of a part of experiments in biology/chemistry, it is special designed, while the special software groups of chemistry and biology have been developed, in order to support and promote experiment teaching in biology/chemistry.



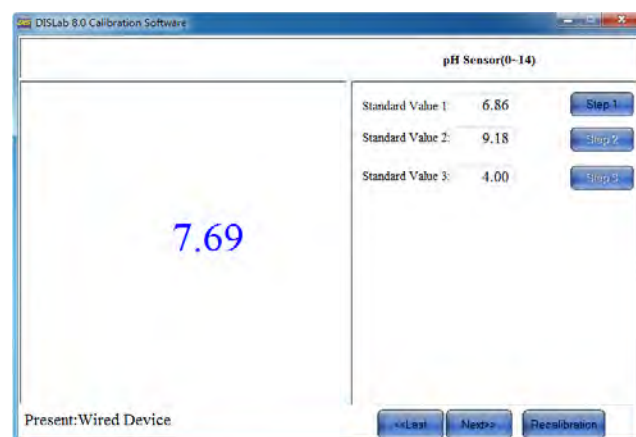
Main interface of Chemistry (specialized) software



Main interface of Biology (specialized) software

V8.0 Calibration Software:

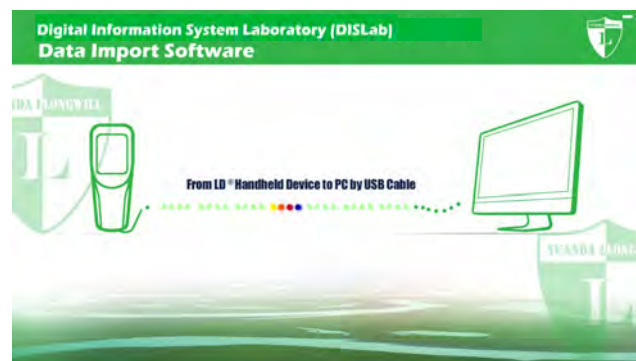
The chemistry sensors & biology sensors are different from physics sensors. The principles of many biology/chemistry sensors are chemical reaction process. Generally speaking, it is electrochemical process. In view of complexity of chemical reaction, calibration software aimed at biology/chemistry sensors has been developed individually, which is used for sensor calibration before experiment.



Calibration software can be used for those items including: pH Sensor, Oxygen Sensor (liquid), Chroma Sensor, Turbidity Sensor, ORP Sensor, Carbon Oxide Sensor, Nitrogen Dioxide Sensor, Ammonia Sensor, Methane Sensor, Hydrogen Sensor, Chlorine Sensor, Ammonium Ion Sensor, Nitrate Ion Sensor, Chloride Ion Sensor, Potassium Ion Sensor. The calibration of these sensors, should work in the standard environment. For instance, three kinds standard buffer solutions of pH value 4.00, 6.86, 9.18 respectively should be prepared in the pH Sensor calibration; The anaerobic water, that is saturated Na_2SO_3 solution should be provided in the oxygen sensor (liquid) calibration;

V8.0 Data loading Software:

V8.0 system equips with independent data display module for sensors. This module has the function of storage data in addition to display real-time data of the sensor. Analyze the data loaded from this module into the computer.



Wireless Centripetal Force Apparatus Software:

LW-S706

Wireless Centripetal Force Apparatus is a new developed intelligent experimental apparatus, aimed at the expanded requirement of centripetal force experiment (details refer to P83). In view that this apparatus is an independent USB equipment which communicates wirelessly with computer directly, there is a certain distinctiveness in structure. Therefore, a relatively independent software is developed for our wireless centripetal force apparatus. The main interface of the software is the same as one in the topic of “study on factors about centripetal force” with DIS in our special software. The main interface of the software is as below:



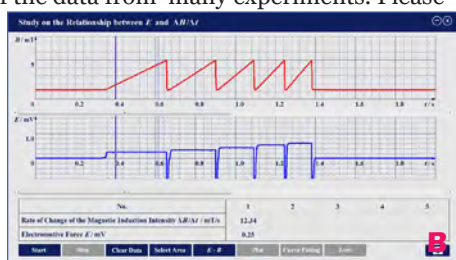
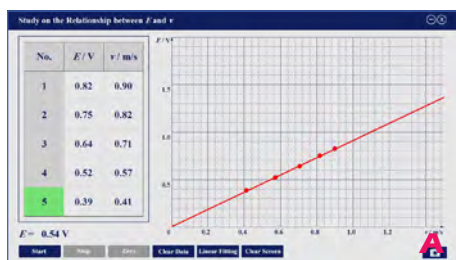
Faraday's Law Apparatus I. II Software:

LW-S707/S708

Faraday's Law apparatus I and II are intelligent apparatus which communicates with computers directly by USB mode (details refer to P88 & P89), and equipped with corresponding bundled software. The experiment

requirements of this series of software are specific. The setting of steps is clear, and

the software can be used in the contrast of the data from many experiments. Please see graph A for the main interface of apparatus I, and graph B for the main interface of apparatus II.



Logical Circuits Apparatus V2.0A Software:

LW-S710

Logical Circuits apparatus V2.0A is the upgraded version of logical circuits apparatus V1.0. After upgraded, the function with signal logger (details refer to P99) is added in the version. By the bundled special software, electric level signal figure curves corresponding to gate circuit can be shown on the computer, which is convenient for students to clearly grasp the logical relations between signals. In the software, there are functions, such as adjustable scanning speed, variable channel modes, and adding marker lines, which can provide strong supporting for logical circuits teaching (graph below).



Robot Modular V2.0 Software:

LW-S809

Robot Modular V2.0 is a support apparatus product used for STEM education (details refer to P95). The designed idea of this apparatus aims at offering an environment for students to learn and to explore by their own, and providing helps for learning the relevant contents of automatic control in the textbooks.

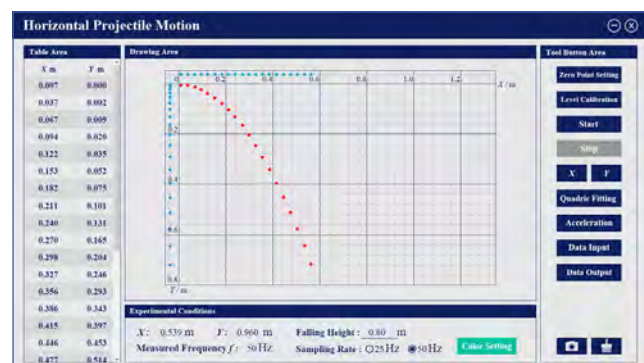
For achieving the teaching goals, the corresponding software and the matched graphical programming-styled software are developed. Once the programme being designed, the programme can be downloaded to the controller for operation by USB cables. The functions of the software include “port setting”, “flowchart drawing”, and “generating code”. Software “Help” menu is detailed.



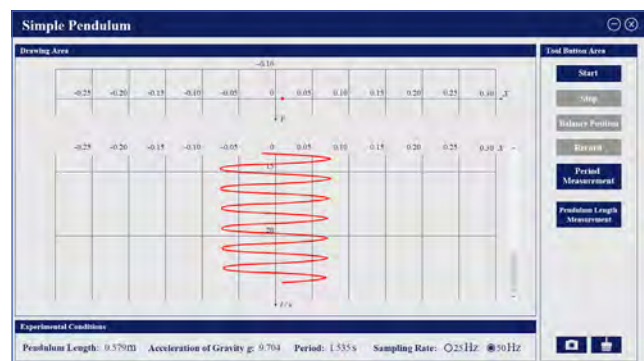
2-D Motion System Special Software Package: LW-S705

2-D Motion System special software package is specially developed for the expended application of 2-D motion sensor system. Since the 2D motion sensor system is an intelligent experimental apparatus which independently communicates with the computer through USB and its special expended application, it is mated with special software. After installing the package, an independent shortcut on the screen is created. In the main interface, supported experiment directories for 2D motion sensor expended applications are listed: projectile motion, composition of motions, uniform circular motion, simple pendulum, damped vibration, robot tracking, centrifugal track and Galileo's experiments.

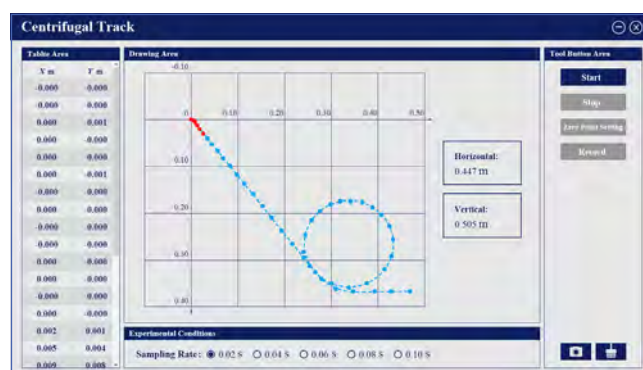
Here below shows the main interface of the software:



Experiment interface of 2-D projectile motion



Experiment interface of 2-D pendulum



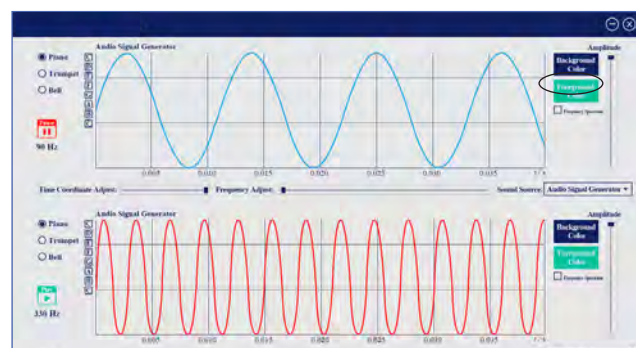
Experiment interface of 2-D Centrifugal Track



Experiment interface of 2-D Motion Composition

Acoustics Software: LW-S702

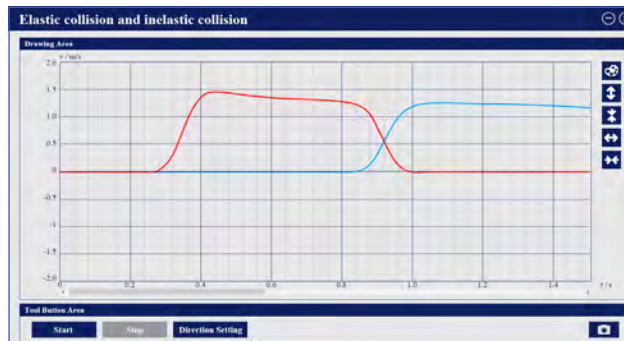
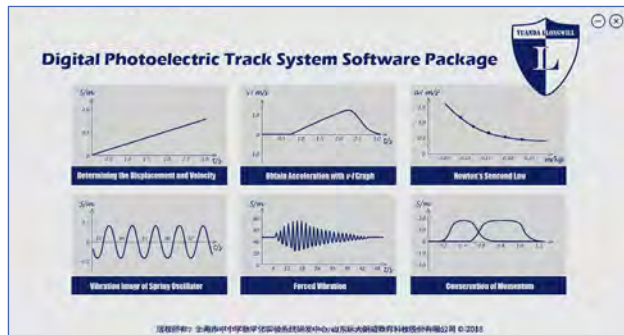
Acoustic Software's built-in audio generator and self-extending sound gallery own the three essential elements—"loudness, tone, timbre", indicating that "the essence of loudness is amplitude" and "the essence of tone is frequency", especially with the powerful "spectrum" function (inside the red circle of image below), which shows that "the essence of tone is the overlay of multiple frequency sound waves". It is a powerful support for teaching and has obvious superiority compared with traditional experiments.



Experiment interface of relation between frequency and tone

Digital Photoelectric Track System Software Package: LW-S820

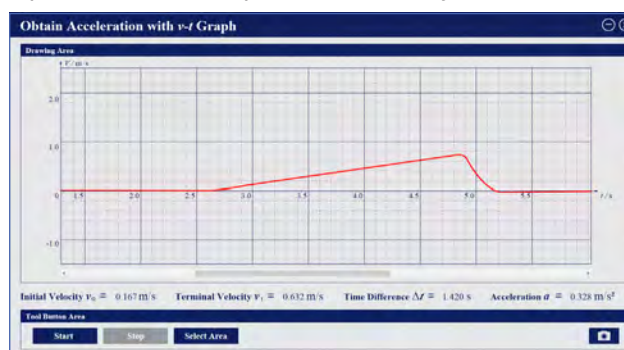
Since the Digital Photoelectric Track System is an intelligent device which independently communicates with the computer in wireless and its special expended applications, it is mated with dedicated software. After installing the package, an independent shortcut is created, the opened main interface is shown as graph below:



Experiment interface of elastic collision and inelastic collision



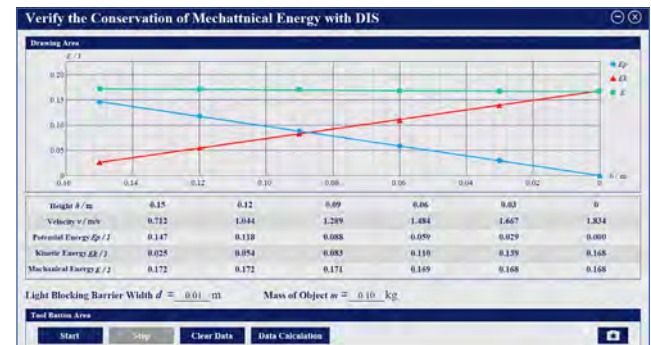
Experiment interface of displacement and velocity measurement



Experiment interface of acceleration calculation from $v-t$ figure

Conservation Law of Mechanical Energy Apparatus II Software: LW-S822

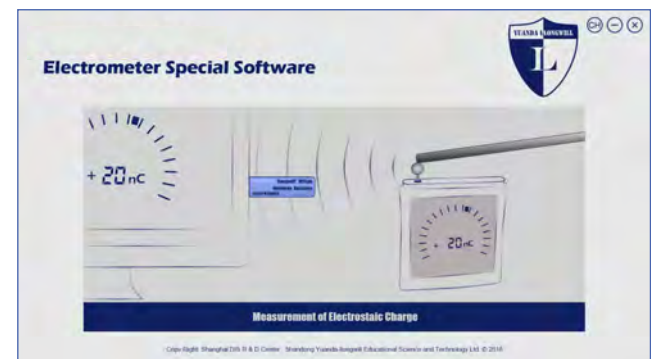
Conservation Law of Mechanical Energy Apparatus II is an intelligent experiment apparatus (details refer to P84). Since the experiment apparatus is a special intelligent device which independently communicates with the computer via USB, it is mated with the dedicated software.



Electrostatic Measurement Software:

LW-S823

Electrostatic Measurement software is dedicated for the electrostatic sensor and the electrometer (details refer to P22). Since they are intelligent devices which independently communicate with the computer through wire or wireless, it is mated with the dedicated software.



Interface of electrostatic measurement special software

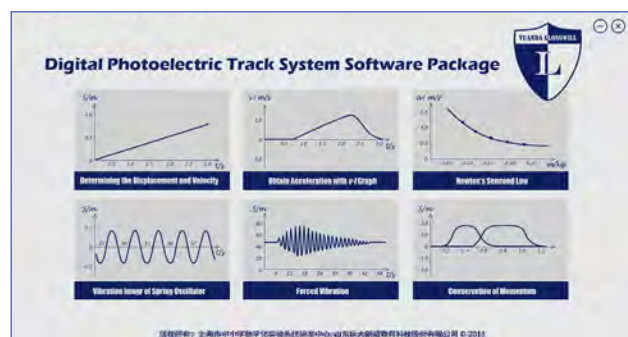


Experiment interface of charged glass rod after rubbing by silk

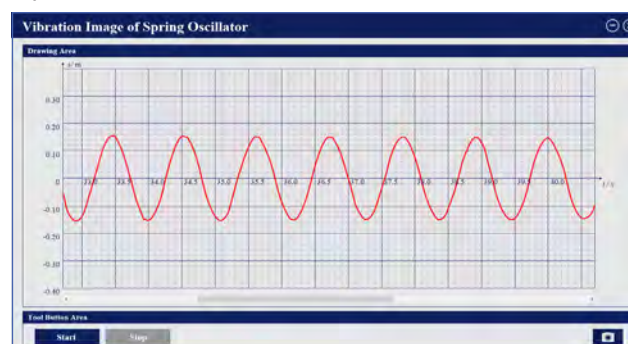
Photoelectric Range Finder System Software Package LW-S825



The cart in this system is an intelligent equipment which communicates independently with computer by wireless, and its extended application has its particularity, so the special software package is chosen to form a complete set. The main interface of the software is as follows:



Experiment interface of elastic collision and inelastic collision



Experiment interface of vibration image of spring oscillator

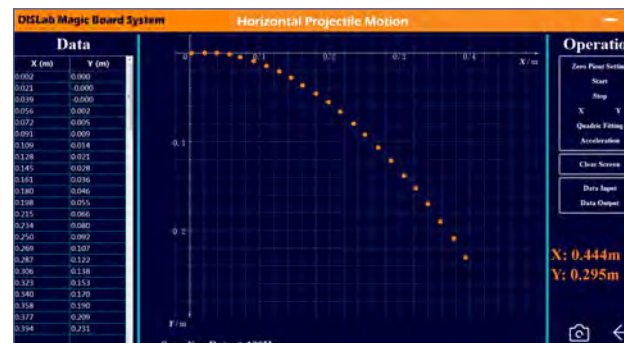


Experiment interface of Newton's second law

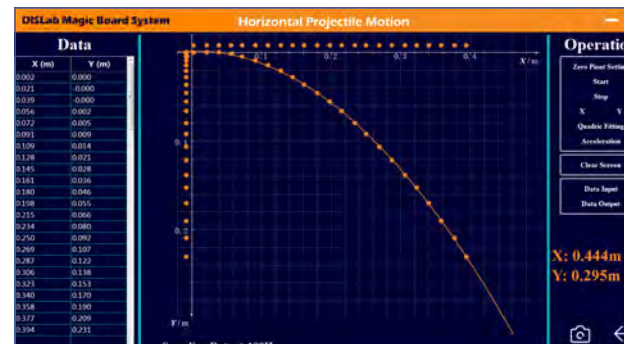
Magic Board System Software Package LW-S826



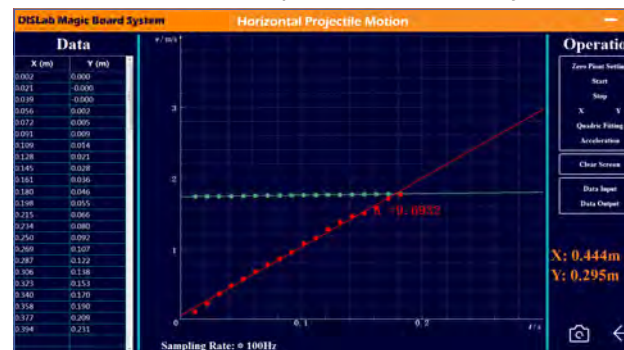
The Magic Board is an intelligent apparatus that communicates independently with the computer via USB, and its extended application has its particularity, so an independent special software is developed. The main interface of the software is as follows:



Experiment result of the projectile motion trajectory



Projection and fitting curve of projectile motion trajectory



Experiment result of the acceleration in vertical direction of projectile motion

Primary School Science Software

LW-XS801

Primary school is the critical stage for developing one's interest on science. The scientific spirit and literacy is grown together with the study of science knowledge at this stage. The teaching feature is focused on practice and taking interest as priority based on the physiological and psychological conditions. Therefore, experimental teaching plays an irreplaceable role in the primary school science teaching activities.

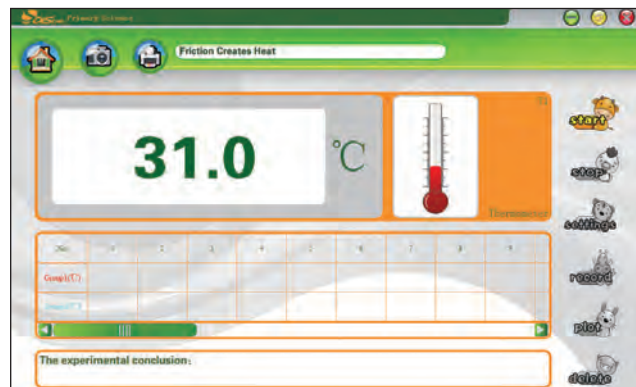
In the design of our primary school science software, the cognitive psychological feature of primary school students is fully considered. The software consists of two systems: special software and general software. The initial interface, is shown in the image above the whole set of software is developed in a graphical design idea and a large amount of cartoon images used to easily motive students' learning interests.



Our primary school science special software is structured in menu-style and based on the primary science curriculum. The experiments which can be conducted with DIS system in the textbook is divided into 8 categories, 30 topics in total, which are respectively corresponding to the eight learning packages of primary science. (details refer to P45~P49). Indeed, the categories divided may be different from that of the primary school science textbooks, but it's generally corresponding to those textbooks.



Currently, the main functions of experimental interface of our dedicated primary school science software are displayed in the style of image and text, so that experiment topics, experiment data, window of data sheet and function button can be clearly shown, and the curving description based on experimental data, can be supported by the software.



Primary school science general software is designed as the same structure of general software as secondary schools. The main interface consists of data display area, channel overlay display area, sheet area, video area and button tools. The accessed sensor can automatically be identified, and sensor name and real-time data can be presented.

Functions description:

- "data display" supports 4-channel parallel display and the data in each channel can be displayed by number (default) or oscillography. The data of each channel can be displayed in the "channel overlay display area" by clicking the "+" icon, and be recalled by clicking "-" icon.
- "channel overlay display" is analogous to the "combination curve" in secondary school general software, and the data from multi-channel can be parallelly displayed in mode of oscillography at the unified time coordinate.
- In "sheet" area we can select "automatic record" or "manual record". Under "automatic record", record interval can be set according to the experimental requirement.
- "video" enables the function of recording the experimental process with the support of video recording device. Students can review the operation and the relationship between object variation and data variation based on the video recorded after the experiment, linking the phenomena observed with science principles, and deepening the knowledge of scientific laws. It is no doubt that it is more helpful in a great perfection and improvement for the primary school science teaching.

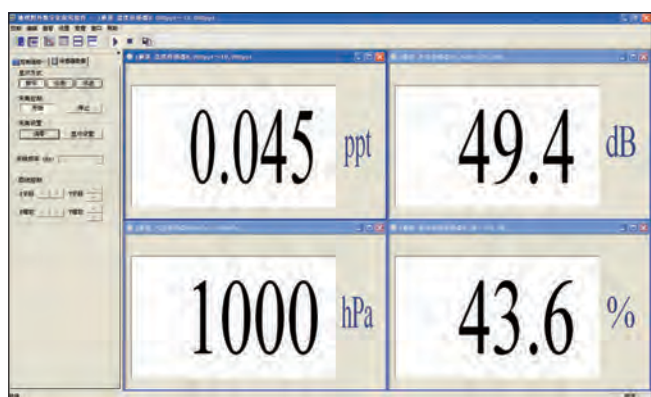
Digital Geographic Field Kit Software Package

LW-WS812

Digital Geographic Field Kit software package is the dedicated analysis software. By clicking the software, the activities of data testing, collection and analysis can be conducted after connecting to hardware. The main interface is shown as below:

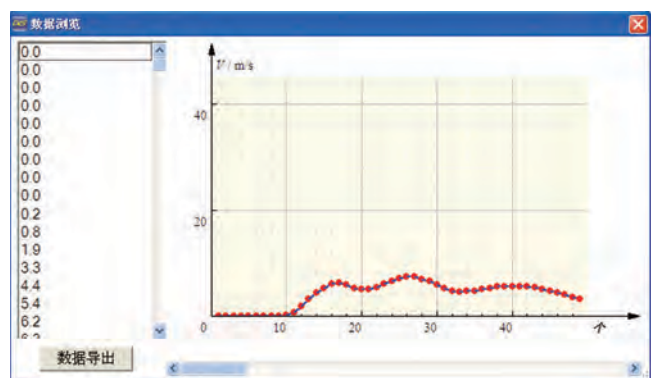


Working interface mainly consists of menu bar, toolbar, control panel and display area, functions of data display, data sheet, curve combination, data storage, etc



Data import software:

Data display module with data storage function, can be connected with the computer via the MiniUSB cable for data uploading and processing.



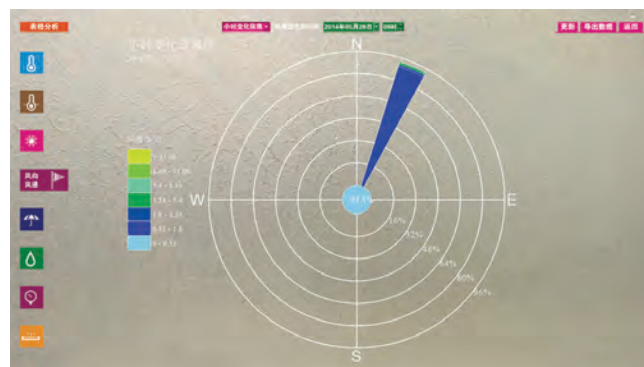
Digital Weather Station Software

LW-WS301

Digital Weather Station software is the subsystem of digital weather station for data display and storage, with functions of real-time data display, huge data storage and diverse data analysis. The weather station can be unattended and automatic operated for a long time. The main interface is shown as below:



The main interface is divided into two parts: the basic information display area and the display area of nine weather elements. The basic information includes current time, station location, station name, serial number, etc. The display area of nine weather elements is arranged from A~I: temperature A, evaporation B, soil temperature C, wind direction D, wind speed E, atmospheric pressure F, humidity G, solar radiation H and rainfall I. In addition, the software also has the data analysis function. The interface is shown as below:



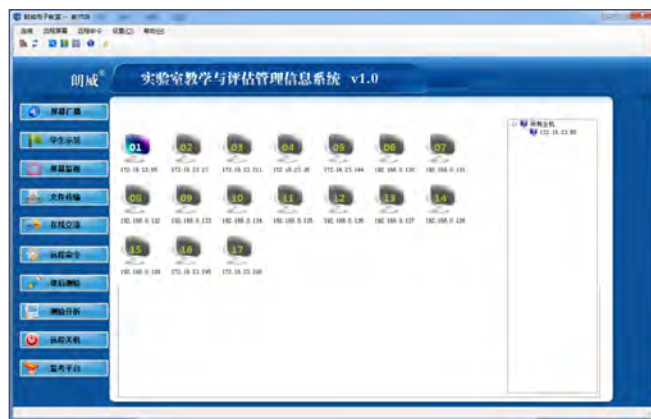
In consideration of the particularity of wind power and wind direction, click "wind power/wind direction" icon in data analysis interface, and then the "wind power/wind direction rose diagram" can be opened.

Option setting of data analysis interface: time curve option—click pull-down menu to check variation curves by hours, days, months and years; add new curve—set start time in option setting, then click "add new curve". Click "export data" to export the historical data stored in database as Excel document.

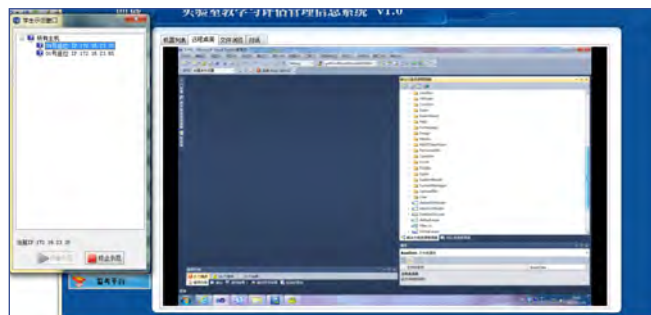
Experimental Teaching and Evaluation System

LW-WS831

The system further combines the multimedia teaching with the laboratory teaching, mainly aimed at the experiment teaching, so that teachers can complete the teaching and evaluation tasks very conveniently. It also facilitates students' class learning, after class test and evaluation. This system includes ten functions, which are screen broadcast, student demonstration, screen monitoring, file transmission, online communication, remote command, after class test, test analysis, remote shutdown, and monitor platform. The evaluation subsystem includes user management, test library management, examination management, performance management, basic data management, system management.:



Control Interface (figure above) and remote monitoring (figure below)



Educational Equipment Information Management System

LW-WS833

Teacher information management system mainly includes the management of teachers' basic information, education background information, work experience information, professional skill qualification information, training information, reward and penalties information, award-winning information, volunteer teaching information and salary information, as well as the retired teachers

information management and the substitute teachers information management; the system also provides a powerful statistical function, which allows the users to combine statistical conditions freely with all basic attributes of teachers:

Statistics Report of the Ministry of Education

Teacher Information Management System

LW-WS832

The Educational Equipment Information Management System has realized the network management platform with various functions, such as school basic information management, team construction, teaching activities management, educational technology and equipment management, statistic analysis, equipment requisition, school-running evaluation, and the Ministry of Education report. The system can implement the management and statistics of teaching instrument, basic equipment and teaching space for various disciplines such as physics, chemistry, biology, and science under different level of schools including primary school, middle school, high school, secondary school and nine-year persistent system school.

The system also provides various management functions for school's basic information, teaching space, buildings, school buses and equipment personnel:

Dynamic Statistics

Mobile Science Exploration System for Primary School

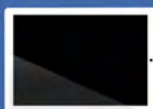
Multi-platform compatibility
Support multi-system and cross-platform application



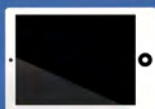
Android



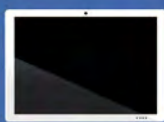
iphone



Android



ipad



Windows Pad



Mac/Chrome



Windows

**Support Windows/Mac OS/Android/iOS/Chrome OS,
mobile/pad/computer and other platforms**



Mobile Science Exploration System for Primary School

I. System Overview

Mobile Science Exploration System for Primary School consists of sensors, data display module, wireless transmitter, mobile terminals and App software.

(i) Sensors

A part of sensors are shown in Fig. 1-1.



Fig. 1-1 Part of sensors

Item NO.	Sensors Descriptions	Measurement Range
1	Force Sensor	Range: -20N~+20N
2	Displacement Sensor (Separated)	Ranges: 0 cm~200cm
3	Photo Gate Sensor	Graduation: 0.1ms
4	Temperature Sensor	Ranges: -20~+130°C
5	High Temperature Sensor	Ranges: 0°C~1200°C
6	IR Temperature Sensor	Ranges: -20°C~+200°C
7	Pressure Sensor	Ranges: 0Kpa~300 KPa
8	Sound Sensor	Ranges: 20 Hz ~20000Hz
9	Sound Level Sensor	Ranges: 20 dB~120 dB

Item NO.	Sensors Descriptions	Measurement Range
10	Illumination Sensor	Ranges: 0 Lux ~10000 Lux
11	Current Sensor	Ranges: -2A~+2A
12	Current Sensor (Multi-range)	Three measurement ranges available for switching A: -2A~+2A; B: -200 mA~+200 mA; C: -20 mA~+20 mA
13	Micro Current Sensor	Ranges: -1 μ A~+1 μ A
14	Voltage Sensor	Ranges: -20Volt~+20Volt
15	Voltage Sensor (Multi-range)	Three measurement ranges available for switching A: -20 Volt ~+20 Volt; B: -2 Volt ~+2 Volt; C: -0.2 Volt ~+0.2 Volt
16	Magnetic Induction Sensor	Ranges: -15 mTesla~+15 mTesla
17	pH Sensor	Ranges: 0~14
18	Conductivity Sensor	Ranges: 0 mSiemen/cm ~20 mSiemens/ cm
19	Chroma Sensor	Ranges: Absorbance 0~2
20	Turbidity Sensor	Ranges: 0 NTU~400 NTU
21	Oxygen Sensor	Ranges: 0~100%
22	Carbon Dioxide Sensor	Ranges: oppm~50000ppm
23	Relative Humidity Sensor	Ranges: 0~100%
24	Oxygen Sensor (Dissolved)	Ranges: 0mg/L~20mg/L
25	Heart Rate Sensor	Ranges: 0~200

Table 1 Sensor Specification

The quantity of the sensors is being expanded according to the teaching requirements.

(ii) Data Display Module

The data display module (Fig. 1-2) is a key device that can be plugged into sensors directly as a mini data logger. As well as, it can identify the type of sensor, display and record the real-time data of sensor automatically. We can upload the sensor data to the mobile terminal for further analysis.

(iii) Wireless Transmitter Module

The wireless transmitter module (Fig. 1-3) also can be plugged into sensors directly so as to establish the communication between the sensor and the mobile terminal by Bluetooth.

(iv) Mobile Terminals

The system can be run on all kinds of mobile terminals, such as Android /iOS Pad, Phone and Chromebook, as shown in Fig. 1-4.



Fig. 1-2 Data display module



Fig. 1-3 Wireless transmitter module



Fig. 1-4 Mobile terminal

(v) App Software

System	The Version being supported	Unloading paths
Android	Android 4.4 & above	
iOS	iOS 8.0 & above	
Chrome OS	Chrome OS 37& above	

1. Android Version

For Android App, it can be searched in Google Play using the keywords of "LD LAB Primary", as shown in Fig. 1-5. Click "INSTALL" button, the App software can be installed on the mobile terminal.

2. iOS Version

For iOS App, it can be searched in the Apple App Store using the keywords of "LD LAB Primary", as shown in Fig. 1-6. Click "INSTALL" button, the App software can be installed on the mobile terminal.



Fig. 1-5 Installation of App software based on Android

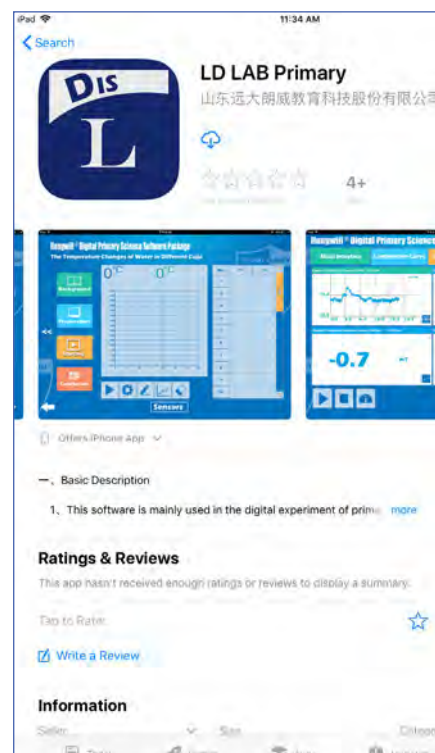


Fig. 1-6 Installation of App software based on iOS

3. Chrome OS Version

For Chrome App, it can be searched in the Chrome Web Store using the keywords of "LD Chrome LAB", as shown in Fig. 1-7. Click "ADD TO CHROME" button, the App software can be installed on the mobile terminal.

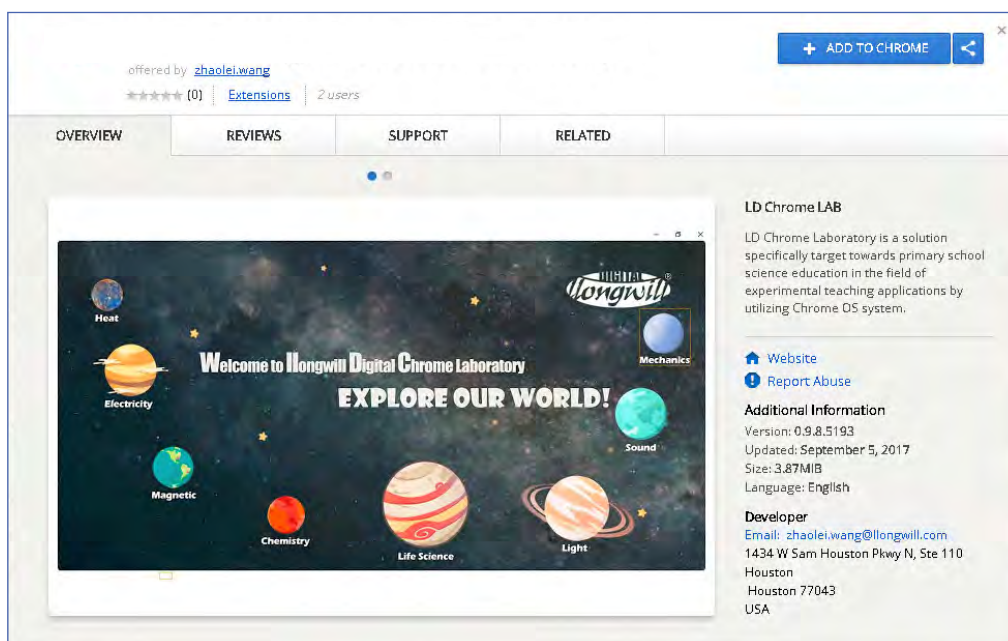


Fig. 1-7 Installation of App software based on Chrome OS

II. Application

We have two modes of application: one is DDM, which means "Sensor" + "Data Display Module"; and the other is WMT, which means "Sensor" + "Wireless Transmitter Module" + "Mobile Terminal".

(i) The Use of Digital Display Mode--DDM

When we just only need data collecting and recording in the science experiment or inquiry, we can select the DDM, and get rid of the burden of PC.

1. Data Measuring

Plug the data display module into the sensor (Fig. 2-1) and switch on it; the type of sensor, the real-time data, and the measurement unit can be observed on the module screen (Fig.2-2). All sensor data can be stored in the module after we switch on it.



Fig. 2-1 Connecting the data display module with the sensors



Fig. 2-2 The display mode

2. Data Upload

The data stored in the module can be uploaded to the mobile terminal by the data upload software.

(1) Open the App software on the mobile terminal and enter "Data Upload"(Fig.2-3), click the button of " " to enter the scanning interface and scan the QR code on the back of the module, as shown in Fig.2-4.

(2) After scanning, the module data can be uploaded automatically, as shown in Fig. 2-5.

(3) After uploading, data can be shown in table and displayed as curve (Fig.2-6).

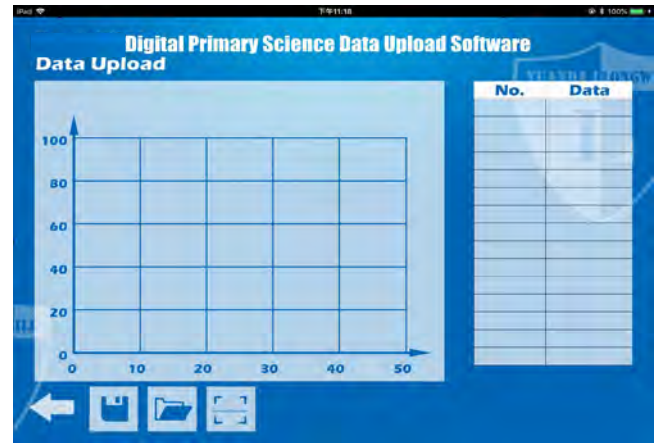


Fig. 2-3 Data upload main interface



Fig. 2-4 Scanning QR code

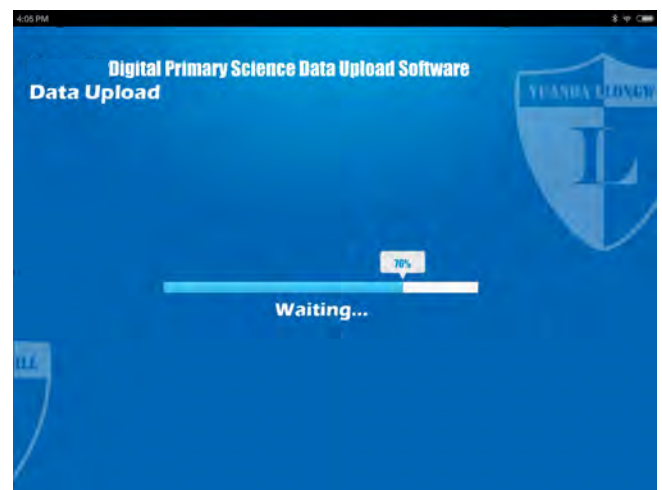


Fig. 2-5 Data uploading

3. Open the Date

Push the button of " " on the interface of Fig.2-6, open the file list(Fig.2-7), click the file name, the data can be shown as Fig. 2-6.

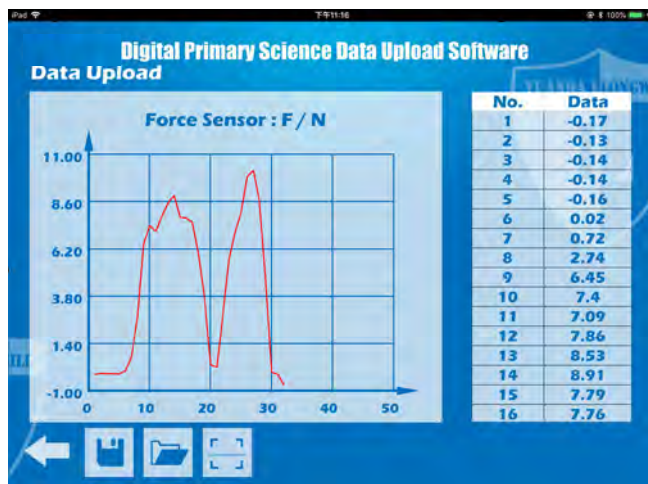


Fig. 2-6 Data Upload Main Interface



Fig. 2-7 File list

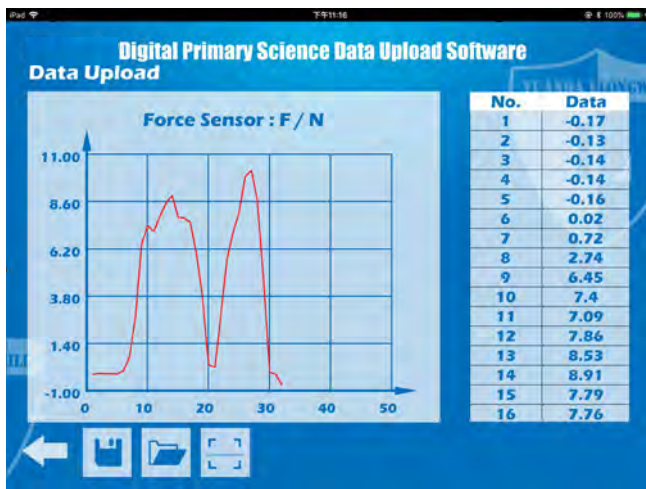


Fig. 2-6 Data Upload Main Interface



Fig. 2-7 File list

(ii) The Use of Terminal Mode---WMT

1. The Application on the Android/iOS terminal

There are three kinds of software in Android/iOS App: General Software, Special Software, and Data Upload Software(Fig. 2-8).

(1) General Software

• The general software has a "one-to-many" function, which supports up to four sensors (same kind or different kinds), and sensor's data logging, recording, calculating and graph analysis.

• Add Sensor

In general software main interface as shown in Fig. 2-9, click the "Add Sensor" to enter the interface as shown in Fig. 2-10.

Plug the wireless transmitter into the sensor and switch on it. Scan the QR code on the back of the wireless transmitter (Fig. 2-11). The App will give a prompt automatically after scanning successfully (Fig. 2-12). Repeat the above steps, more sensors can be added. Push the button of "NO", the App will return to the main interface of general software(Fig. 2-9).



Fig. 2-8 the App software on Android/iOS



Fig. 2-9 General software main interface

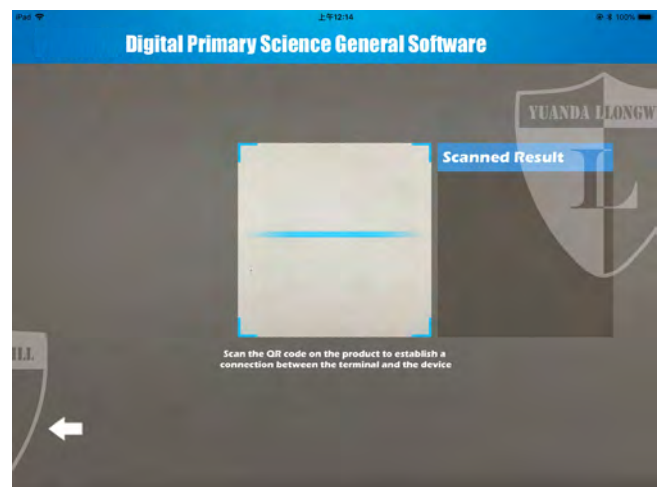


Fig. 2-10:Scan QR Code

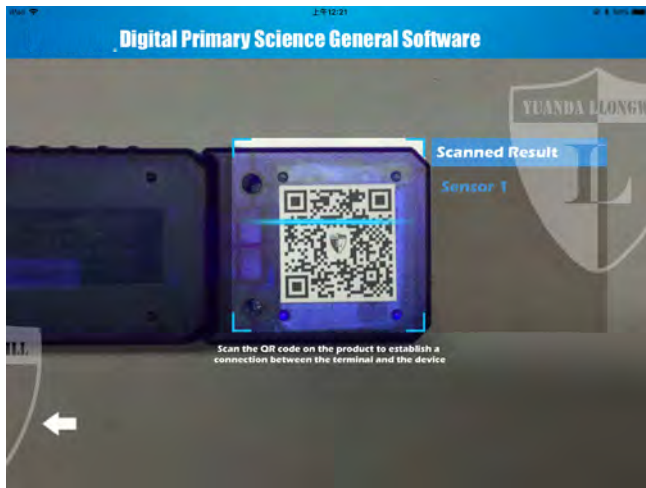


Fig. 2-11 Scanning

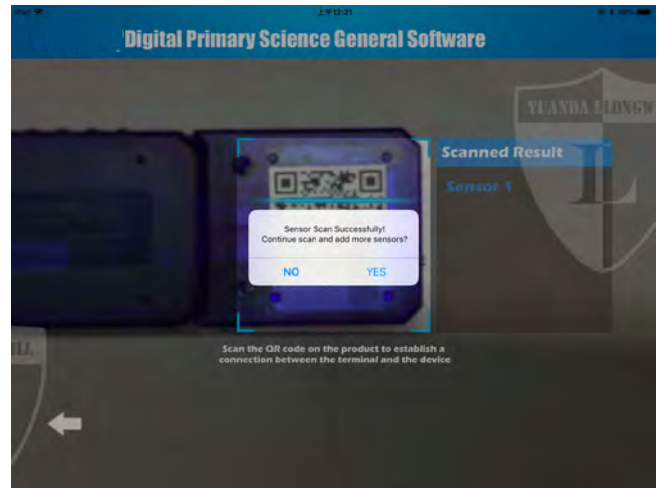


Fig. 2-12 Scan successfully

• General Software Main Interface

The main interface of General Software can support up to four sensors data parallel display. Each sensor owns a data windows, which show the sensor' type, measurement range and series number in the title bar. If there are more than one data windows, the title bar, number and unit of the selected windows will change to green, while the others keep blue (Fig. 2-13).

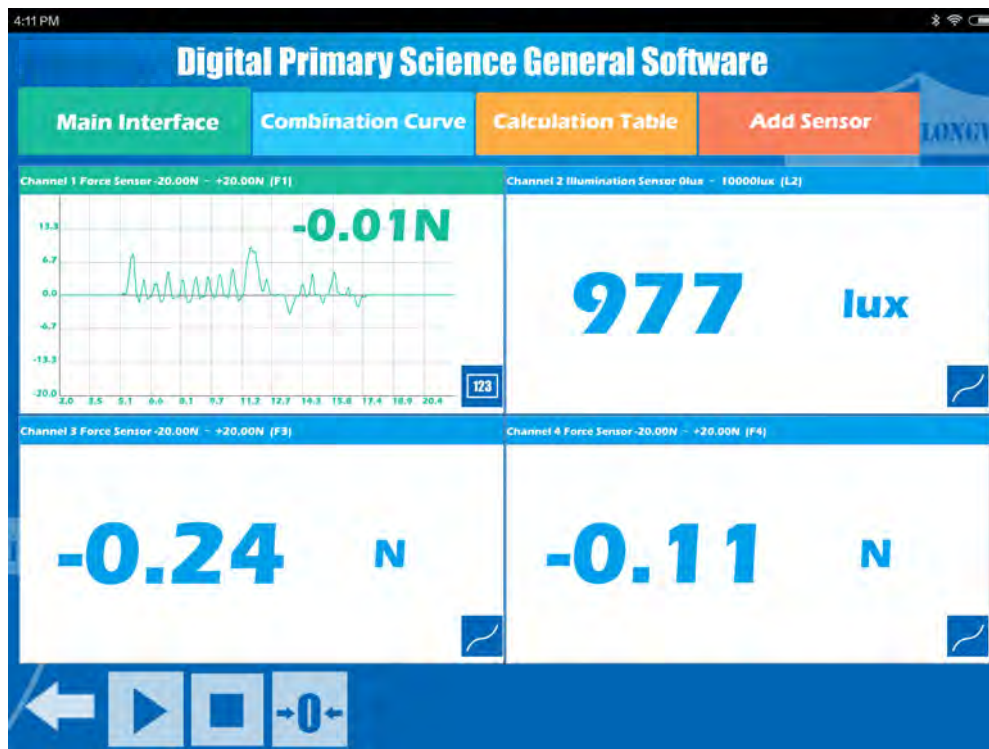


Fig. 2-13 General software main interface

Icon interpretation



——Switch the display mode to curve



——Start the data record



——Switch the display mode to digit



—— Stop the data record



——Sensor zero adjustment (Attention: Only part of the sensor has this function. Sensors that measure environmental information can't be zeroed.)

• Combination Curve

Clicking the "Combination Curve" can put multiple sensor data curves in the same coordinate system, which is convenient for comparative study (Fig. 2-14).

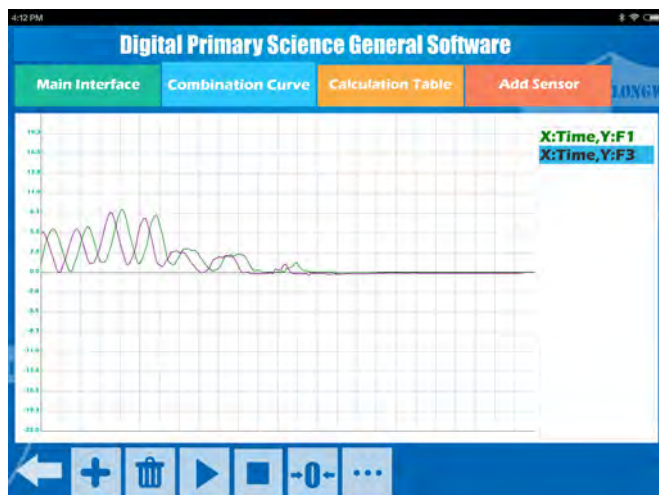


Fig. 2-14 Combination Curve

Icon interpretation

-  —Add a new curve
-  —Start the data record
-  —Delete curve (Firstly, need to choose the name of the curve in the right list area of the window)
-  — Stop the data record
-  — Sensor zero adjustment (Attention: Only part of the sensor has this function. Sensors that measure environmental information can't be zeroed.)
-  — Data calculation (including average, maximum and minimum)

• Data Table

Icon interpretations in the data table (Fig.2-15)

No.	F1	L2	U3	L4	t
1	-0.17	9	-0.01	51	0.0
2	-0.17	0	0.03	51	1.0
3	-0.18	9	0.01	51	2.0
4	-0.17	9	0.01	51	3.0
5	-0.17	9	0.00	51	4.0
6	-1.43	9	0.00	51	5.0
7	8.34	9	0.01	51	6.0
8	13.22	9	0.01	51	7.0

Fig. 2-15 Data table

Icon interpretation

-  —Add a new table
-  —Start the data record
-  —Open the saved data file
-  —Stop the data record
-  —Save file
-  —Set the time interval of recording
-  —Average
-  —Drawing curve based on the data in table

Application case "Thermal Expansion and Contraction" by using the general software

Apparatus: wireless transmitter, force sensor, mobile terminal, thermal expansion and contraction apparatus, alcohol burner, as shown in Fig. 2-16.

Operations: Plug the wireless transmitter into the force sensor; scan the QR code; start the general software and select "curve" display mode, heat the middle of the wire on thermal expansion and contraction apparatus by the alcohol burner, the curve of force will continuously drop down; Stop heating, it will rise up, as shown in Fig. 2-17.

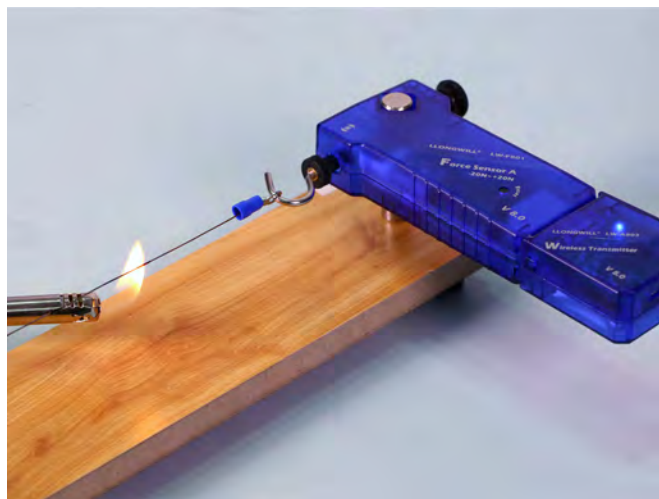


Fig. 2-16 Experimental Installation for Thermal Expansion and Contraction

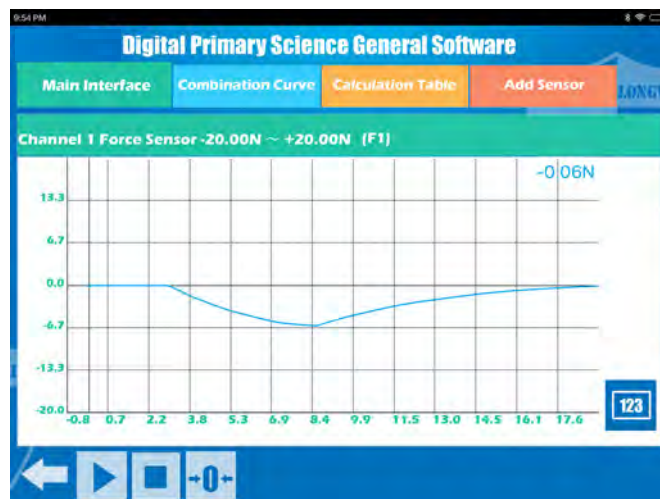


Fig. 2-17 General software experiment curve on thermal expansion and contraction

(2) The special software

The special software is a software package composed of multiple independent software interfaces. Each independent software interface corresponds to a scientific experiment or inquiry project. According to project requirements, special software presets the corresponding operation steps and sequence. The current list of specific items for specific software is as follows:

Subjects	Heat	Mechanics	Life Science	Electricity
Descriptions	Measuring changes in water temperature	Study on buoyancy	Comparison of air and exhaled gases	Study on the conductivity with different materials
	Friction heat	Study on friction	Study on photosynthesis	Fruit battery
	Study on heat conducting	Study on slope	Heart rate effected by physical activities	Conducting by glass
	Study on heat absorption capacity	Study on lever		Thermoelectric power generation
	Study on heat transferring	Study on pulley		
	Water evaporation	Study fast and slow		
	Water boiling	The secret of the pendulum		
		Study magnetic force		

Subjects	Magnetism	Chemistry	Optics	Sound
Descriptions	Study on magnets	Study on pH of water	Study on light	Visible sound
				Study on sound intensity

Special software is developed in accordance with the common requirements of science experiment and inquiry. Therefore, the quantity of the special software is in continuously expanded. After entering the special software, select the subject firstly, and then select the specific project entry, as shown in Fig. 2-18.

After clicking the specific project and enter the background as shown in Fig. 2-19.

Click “Preparation” and enter preparation interface, understanding the equipment and operation steps required by the project (Fig.2-20)

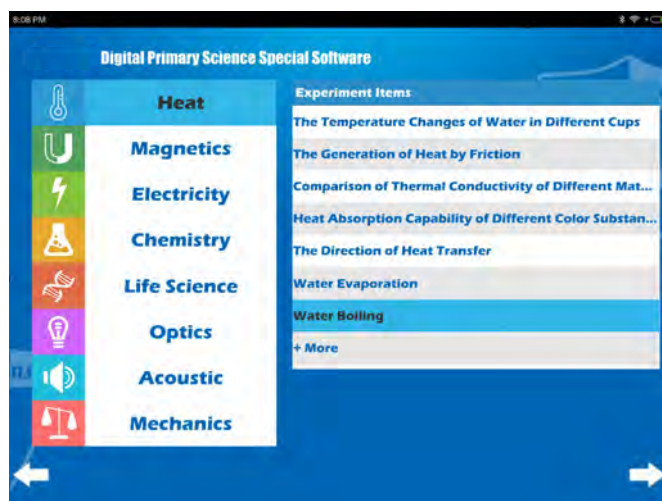


Fig. 2-18 Project items

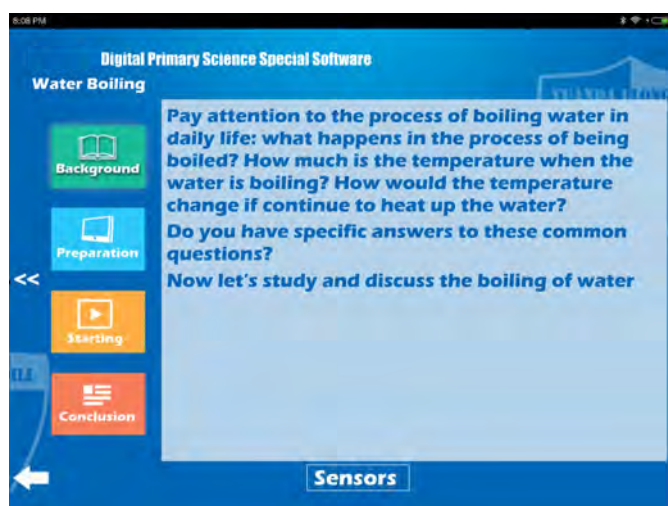


Fig. 2-19 Background

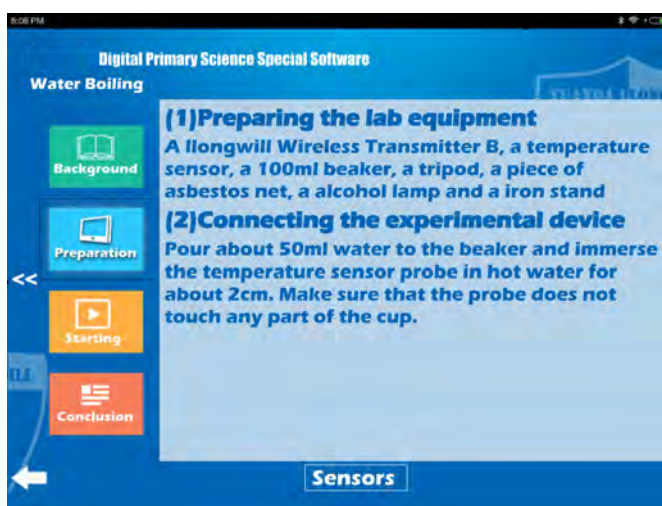


Fig. 2-20 Preparation

Click "Starting" and enter experiment interface (Fig. 2-21)

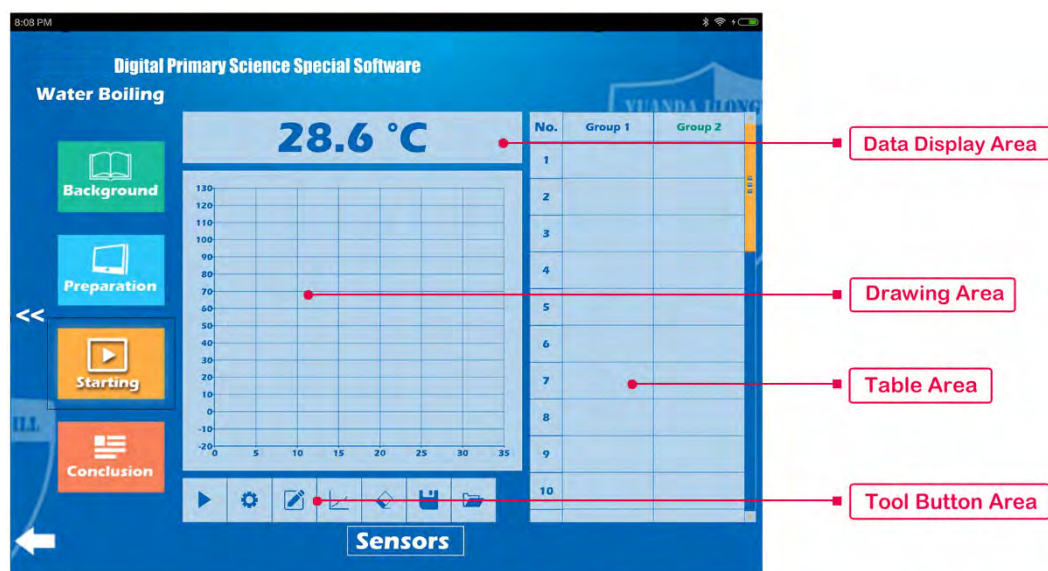


Fig. 2-21 Starting

Click "Sensors" and enter adding sensor interface (Fig.2-22).

Plug the wireless transmitter module into the sensor and switch on it. Scan the QR code on the back of the wireless transmitter module, then display the result on the left side of the interface after scanning successfully (Fig.2-23).

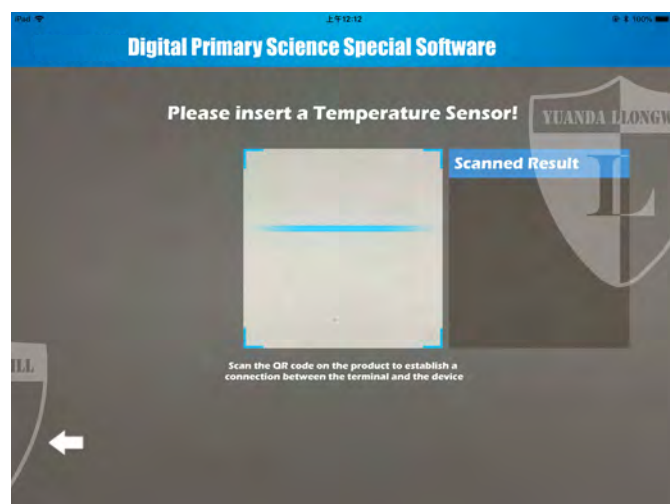


Fig. 2-22 Scan QR Code



Fig. 2-23 Scanning QR Code

Click "←" icon return into the experiment interface of specific software (Fig.2-21). At this point, the temperature real-time data is displayed in the data display area.

Data Display Area ——Display the data measured with sensors

Table Area ——Record and display data on the table

Drawing Area ——Draw curves based on the data in the table

Tool Button Area ——Provide data processing tools



——Start the data record



——Drawing curve based on the data in table



——Record the data in table



——Activities or project setting



——Clear the data recorded in table



——Open the saved data file

Application case "The Study of Boiling Water" by using special software

Apparatus: wireless transmitter, temperature sensor, mobile terminal, tripod, asbestos mesh, 100 ml beaker, alcohol burner, water, as shown in Fig. 2-25.

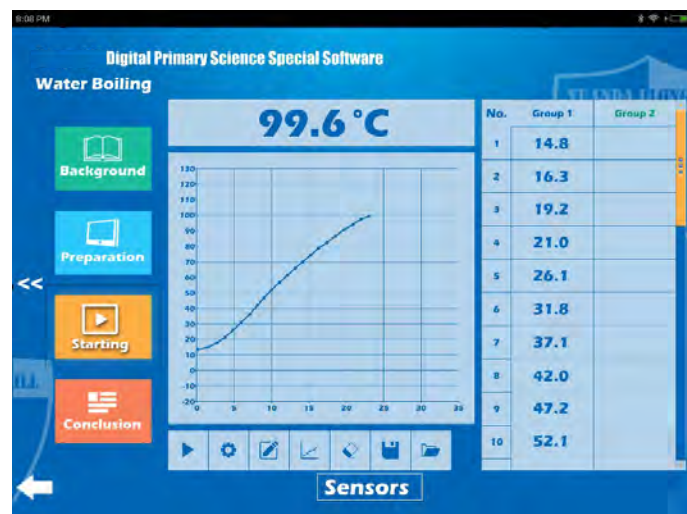


Fig. 2-26 The experiment on water boiling



Fig. 2-25 Experimental Installation for The Study of Boiling Water

Operations: Plug the wireless transmitter into the temperature sensor, scan the QR code, start the special software of Water Boiling, click "Set" and select "Automatic Recording", set the time interval (such as 15 seconds); light alcohol burner, heat the water in the beaker, insert the temperature sensor probe into the water, click "Record", the water temperature will be recorded automatically as 15 seconds interval; Click "Draw", we will get the water temperature curve (Fig. 2-26).

2. The Application on Chromebook

(1) Operation preparation

Open the App software and select the appropriate function. Click in icon to start the software, as shown

•Enter the main interface, we will find different science experiments or inquiry topics divided into 8 categories: Heat, Electricity, Magnetic, Chemistry, Life Science, Light, Sound, and Mechanics, as shown in Fig. 2-28.

• Connecting and identifying sensors

Click "☰" to open the sensor connection window, as shown in Fig. 2-29; scan the QR code on the rear of the wireless transmitter, establish a connection between sensor and the mobile terminal. If there is no built-in camera in the mobile terminal, we also can click the "Connect" button and type MAC address manually.

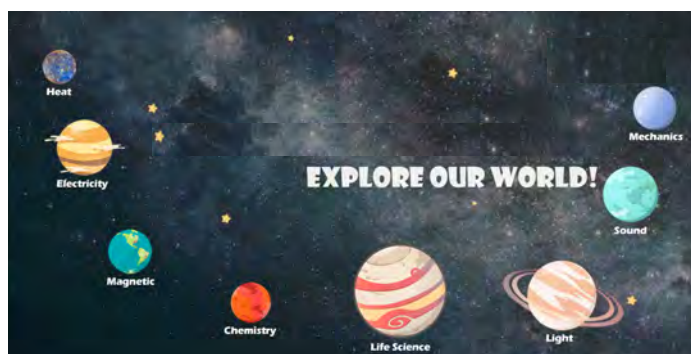


Fig. 2-27 Interface of app software on Chrome OS

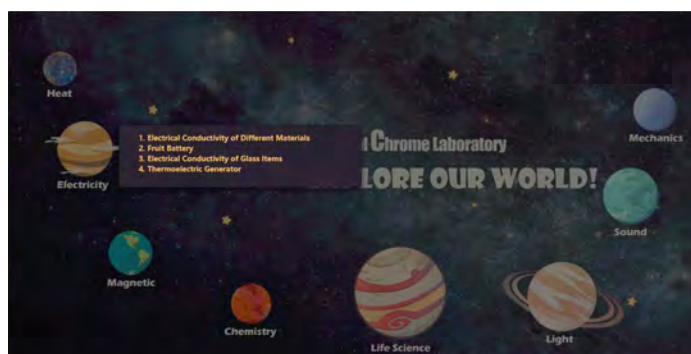


Fig. 2-28 Interface on experiment entry

(2) Application case

Click on a project software, you can enter the operation interface as shown in Fig. 2-30. The interface is divided into four parts: data display area, curve display area, data recording area, and operation button area.

Data display area: Instantly display the data measured with the sensors.
“” is the icon of code scanning and click to connect the sensor in the display area.

Curve display area: Multiple curves can be displayed at the same time , and supports the playback , zoom-in, zoom-out, and restore operations of the curve.



Fig. 2-29 Window on sensor connecting

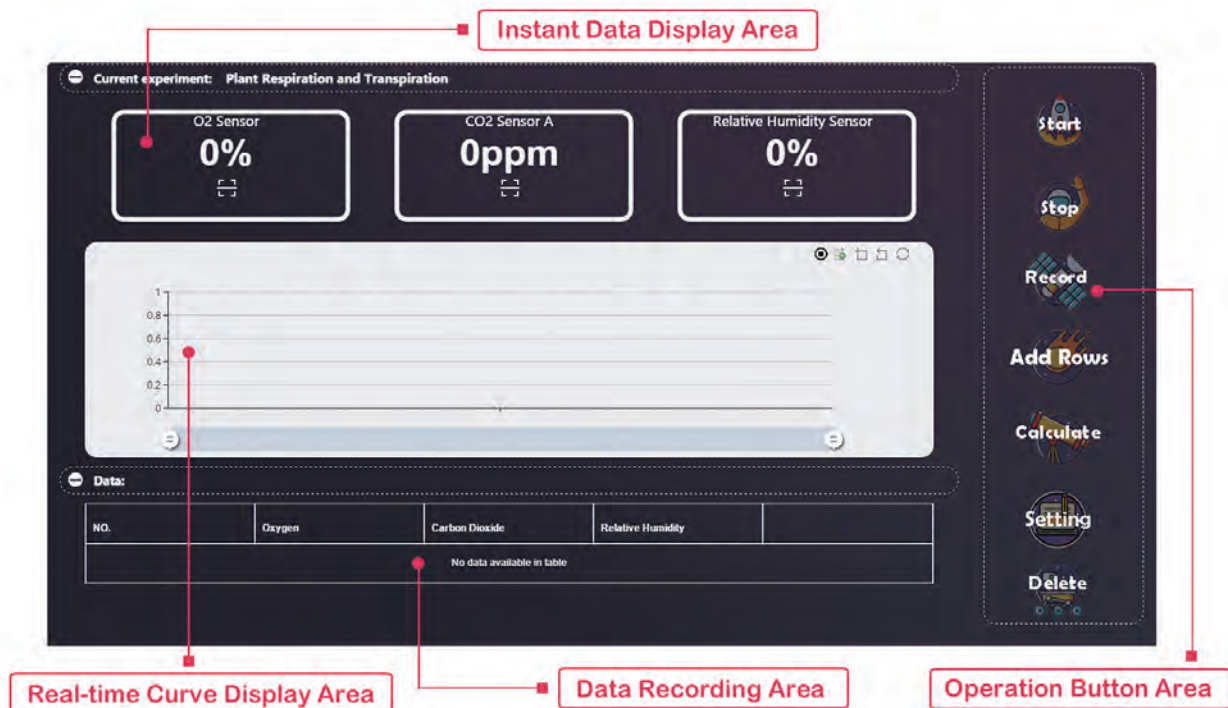


Fig. 2-30 Software interface

Operation button area: Operate the item.



— Start, record data in the table.



— Setting, configure basic parameters.



— Stop, stop recording data automatically.



— Delete, delete the selected row in the table area.



— Add rows, add blank rows in the table area.

Data recording area: Stores recorded data, column headers can be customized, and data tables can be paged.

Application case "Visible Sound"

Apparatus: wireless transmitter, sound sensor, mobile terminal, 125Hz tuning fork, as shown in Fig. 2-31.



Fig. 2-31 Experimental Installation for Visible Sound

Operations: Select the sound topic of "Visible Sound", plug the wireless transmitter module into the sound sensor, establish the connection between the mobile terminal and sensor by scanning the QR code. Tap the tuning fork and observe the sound curve, as shown in Fig. 2-32.



Fig. 2-32 Experimental curve on sound