Internet of Things

IoT Smart Health LAB

Medical Care, Health Care and IoT

This is a healthcare practice equipment with IoT technology. It is capable of analyzing up to 13 types (11 basic types) of biomedical signals and transmitting or receiving the data through Wi-Fi or Bluetooth. It also can be remotely monitored from PC and Smart Phone through Hybrid Web.

Medical Care, Health Care and IoT

IoT Smart Health LAB

- Application of Raspberry Pi based IoT Gateway

- Arduino-based sensor transmission and reception

- Up to 13 bio signal measurements

- Acquiring bio signal knowledge

- 10.1 inch touch monitor application

- Monitoring measured values on GUI (Graphical User Interface) via App and Web

- Provides Minutes Cloud-based service

Product Overview

This is a healthcare practice equipment with IoT technology. It is capable of analyzing up to 13 types (11 basic types) of biomedical signals and transmitting or receiving the data through Wi-Fi or Bluetooth. It also can be remotely monitored from PC and Smart Phone through Hybrid Web.

Product Features

- It is possible to learn about implementation and analysis of measurement algorithm based on principle of bio-signal.
- Measurement of up to 13 sensors is available including 2 options of GSR and DUST in addition to the basic 11 sensors such as ECG, EEG, EMG+HHI, EOG, PCG, Respiration, NIBP, BT, SpO2, HR and Bio-impedance.
- It is convenient to monitor measurement data using 10.1 inch electrostatic touch LCD.
- Each sensor module has a rechargeable battery and can be linked with Wi-Fi and Bluetooth.
- AVR MCU with Arduino is applied to the sensor module and the receiving module for more various exercises.
- Measured sensor values can be monitored on PC and Smart Phone through Hybrid Web.
- Provides SMS and e-mail service for specific sensor values by using alarm process and IFTTT.
- Supports interface linked with Android and Arduino for comprehensive application practice.
- Supports both on-board type and module type at the same time.

Block Diagram

Module	Category	Specifications
10.1inch Touch LCD	DISPLAY	HDMI 1280x800 IPS Touchscreen
Raspberry Pi	CPU	Broadcom BCM2711 1.5Ghz Cortex-A72 quad-core
	Bluetooth	Ver 5.0
	Ethernet	10/100 BaseT
	Wi-Fi	802.11n
	Storage	Micro-SD
	USB	USB 2.0 2ports, USB 3.0 2ports
	HDMI	HDMI 2 * micro HDMI
Software	Raspberry pi	- Raspbian : Nov 2018 - Kernal : 4.14.98-v7+ - GCC : 6.3.0
	Server	- Lighttpd : 1.4.45 - PHP : 7.0.33-0+deb9u3

Data Collecting Part

Module	Category	Specifications
DAQ	MCU	ATMEGA2560
	Memory	256KB Flash
	Bootloader	Arduino
	Clock Speed	Up to 16MHz
	Debug	SWD & USB
	External ADC	4ch
BLUETOOTH	MCU	ATMEGA2560
	Memory	256KB Flash
	Bootloader	Arduino
	Clock Speed	Up to 16MHz
	Debug	SWD & USB
	Bluetooth	V2.0 UART 9600bps
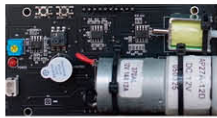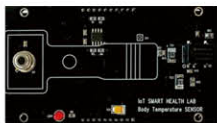
ECG Signal Generating Part

Module	Category	Specifications
Biological Signal Generator	Display	LCD
	Button	5EA
	Electrode	3EA
	ECG Rate	80BPM
	Amplitude	1mV
	Accuracy	+-5%

• Bio-Signal Measuring Part

Module	Category	Specifications
Controller	MCU	ATMEGA2560
	Memory	256KB Flash
	Bootloader	Arduino
	Clock Speed	Up to 16MHz
	Debug	SWD & USB
	Bluetooth	V2.0 UART 9600bps
	Supply Voltage	3.7v 500mAh Li-Poly Battery
1. EOG	Measurement Contents	Eye Conduction
	Number of Electrodes	3 Points
	Measurement Range	10mV ~ 30mV
	Filter	Low-pass : 4.5Hz High-pass : 0.5Hz
	Supply Voltage	+-5V
2. PCG	Measurement Contents	Phonocardiogram
	Measurement Sensor	Condenser Mic
	Listening Method	Head-Phone
	Filter	Low-pass : 100Hz High-pass : 0.5Hz
	Supply Voltage	+-5V
3. EMG	Measurement Contents	Electromyogram
	Number of Electrodes	3 Points
	Gain	10,350x
	Differential Input Voltage	2~5mV
	Supply Voltage	+-5V
4. HHI	Measurement Contents	Human Interface
	Number of Electrodes	2 Points
	Output Voltage	220V, 15mA
	Supply Voltage	Li-Poly 3.6V Battery
5. ECG	Measurement Contents	Electrocardiography
	Measure Point	3 Points
	ADC Resolution	24Bits
	Sample rate (Max)	8kSPS
	Input type	Differential, Single-Ended
	Supply Voltage	3.3V

Bio-Signal Measuring Part

Module	Category	Specifications
6. NIBP	Measurement Contents	Blood Pressure
	Measurement Method	Cuff wearing
	Measurement Range	Pulse Rate : 40~200bpm Systolic Pressure : 60~250mmHg Diastolic Pressure : 40~200mmHg
	Supply Voltage	5V, 12V
7. BT	Measurement Contents	Body Temperature
	Measure	Infra Red Thermometer
	Measurement resolution	0.02℃
	Measure range	-40℃ ~ +125℃
	Power supply	3.3V
8. SpO2	Measurement Contents	Pulse oximeter
	Measure	Optical biosensing
	ADC Resolution	22bit
	Heart rate monitor	
	Power supply	1.8V, 3.3V
9. Respiration	Measurement Contents	Respiration
	Measurement Point	3Points
	ADC Resolution	24Bits
	Sample rate (Max)	8kSPS
	Input type	Differential, Single-Ended
	Power supply	5V
10. Bio-Impedance	Weight-scale measurement	
	Body composition measurement	
	Measure Point	2Points
	Measurement Range	100Ohm ~ 1KOhm
	Accuracy	±1%
	Frequency	Single Frequency(>60hz)
11. EEG	Measurement Contents	Electroencephalogram
	Number of Electrodes	3 Points
	Band width	0.1~50Hz
	Filter	Hi-pass (0.1Hz), Low-pass (50Hz), Notch (60Hz)
	Measurement Range	0.1~3.3V
	Supply Voltage	5V

Oscilloscope (Option)

Module	Category	Specifications
	Channel	2ch
	Band width	60MHz Up to $60MH_2$(1ch)
	Sampling Rate	60M sampling/sec Up to $30MH_2$(2ch)
	Voltage Division	0.02V ~ 5V
	Interface	USB

Training Contents

| 기본 과정	교육 내용
	Study 1. Bio Signal Theory
	Study 2. IoT Smart Health LAB
	Study 3. ECG Theory & Measurement
	Study 4. PCG Theory & Measurement
	Study 5. EOG Theory & Measurement
	Study 6. BT Theory & Measurement
	Study 7. Respiration Theory & Measurement
	Study 8. SpO2 Theory & Measurement
	Study 9. NIBP Theory & Measurement
	Study 10. Bio Impedance Theory & Measurement
IoT SMART HEALTH LAB	Study 11. EEG Theory & Measurement
	Study 12. EMG Theory & Measurement
	Study 13. HHI Theory & Measurement
	Study 14. Arduino Development Environment
	Study 15. Sensor Board Source Code
	Study 16. Data Collection Using Raspberry Pi
	Study 17. Remote Notification Using IFTTT
	Study 18. Building Web Server with Lighttpd
	Study 19. External Internet Connection
	Study 20. Sensor Monitoring Source Code
	Study 21. Recovery of Raspberry Pi Environment

1. ECG (Electro CardioGram)

When the heart is beating, the minute action potential difference in the myocardium is measured by the electrode attached to the body surface, and the change curve over time is expressed in mV.


Location of Electrodes

Used Module

Waveform (mV)
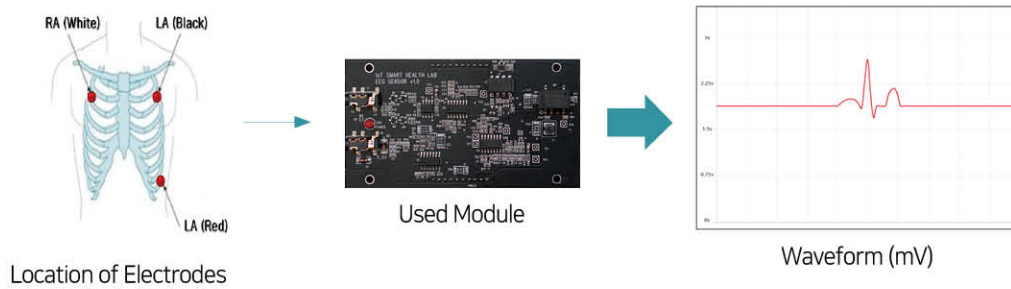
2. Respiration

The change in impedance due to changes in volume inside the chest is measured.

Location of Electrodes

Used Module

Waveform (BPM)
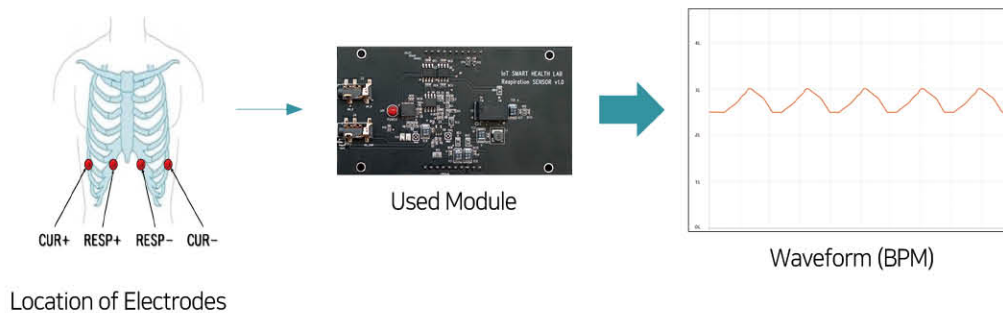
3. SpO2 (Pulse Oximeter)

The percentage of hemoglobin concentration that contains oxygen to the concentration of total hemoglobin in the blood stream is measured by optical method.



Measurement Method

Used Module

Waveform (%)
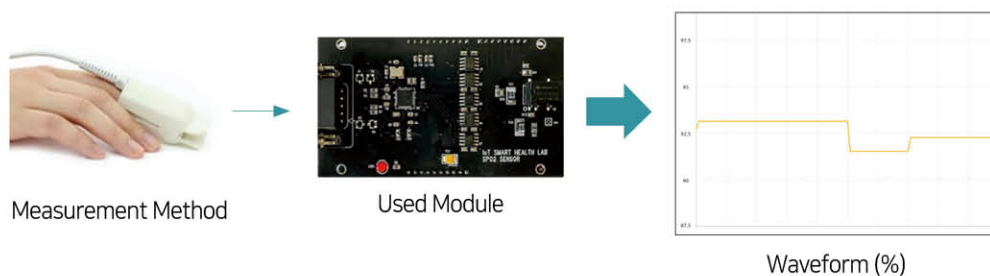
4. NIBP (Non-Invasive Blood Pressure)

NIBP is the way to measure blood pressure that we see easily around ourselves. If you put a cuff on your forearm and use an air pump to put air into the cuff, the cuff swells and blocks the artery. Systolic blood pressure and diastolic blood pressure are determined while listening to the vortex sounds that occur when the blood flows as the cuff is decompressed step by step.


Measurement Method   Used Module

Waveform (mmHg)
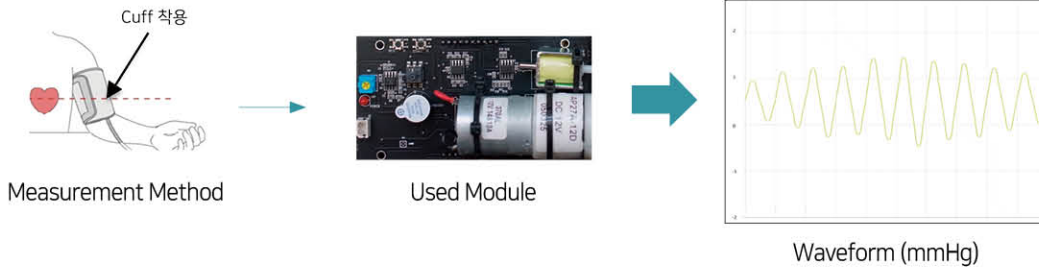
5. Bio Impedance

Of the constituents of the human body, the substances measurable by impedance are water and fat. Body fat and body water content are measured by bio-impedance.

Measurement Method   Used Module

Measured Value Display
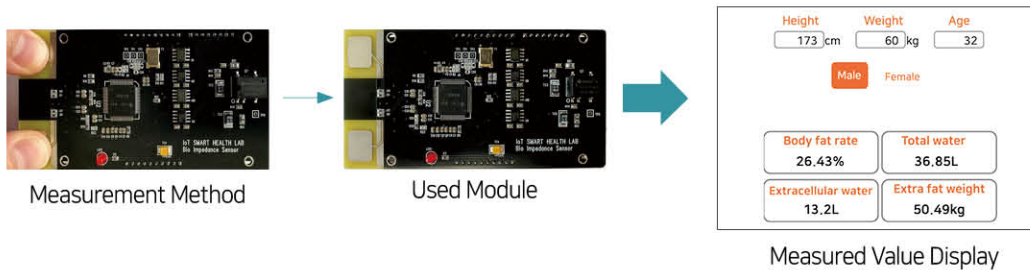
6. EEG (Electro EncephaloGram)

Using an electrode attached to the surface of the head, electrical signals from the brain's electrical activity are measured non-invasively.

Measurement Method   Used Module

Waveform (Hz)
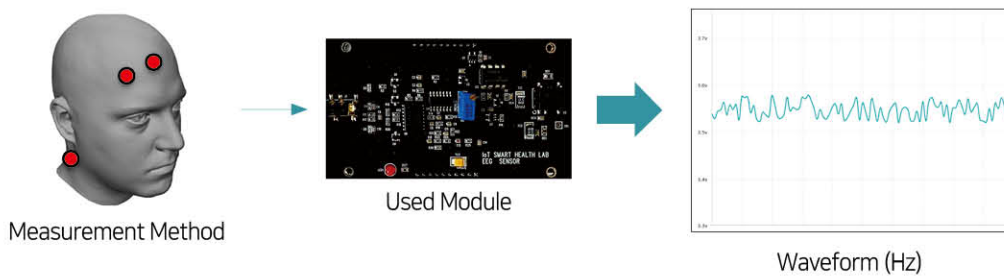
7. EMG (Electro MyoGraphy)

Attaches an electrode to the surface of the skin and measures the electrical signal generated when the muscle cells are activated electrically and neurologically.

Measurement Method   Used Module
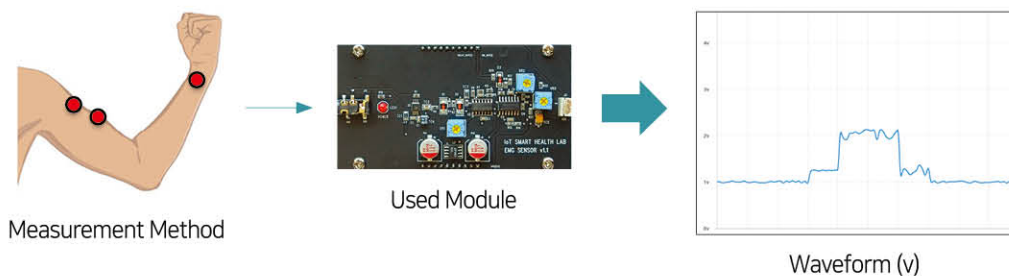
Waveform (v)

8. EOG (Electro OculoGraphy)

Measures minute voltage between retina and cornea caused by eye movement.

Measurement Method
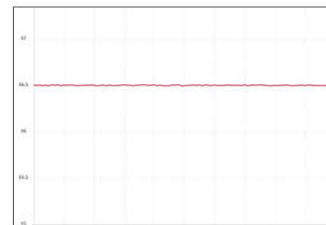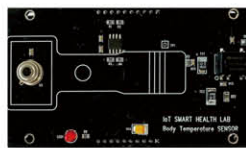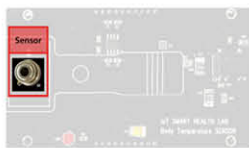
Used Module
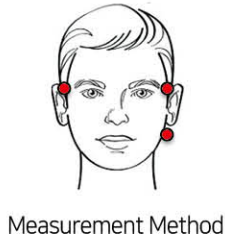
Waveform (V)

9. PCG (Phono CardioGram)

The condenser microphone is used to amplify the heart sound and the value is measured with its waveform and sound.

Measurement Method

Used Module

Waveform (BPM: Beat Per Minutes)
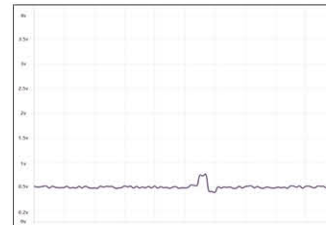
10. BT (Body Temperature)

Measures the temperature of the human body.

Measurement Method

Used Module

Waveform (℃)

11. HHI (Human-Human Interface)

Experiment of interlocking between two persons. When an electrical signal is detected in the movement of one person's arm, an electrical signal is generated in the other person's arm.

Measurement Method

Used Module

Waveform (V)
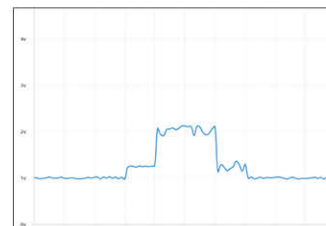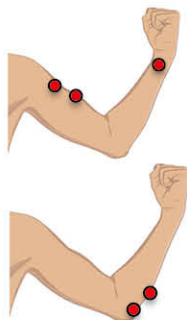
Option
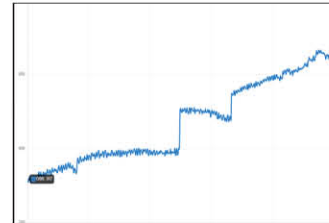### 12. GSR (Galvanic Skin Response)

Attach electrodes to both fingers to stimulate the sympathetic nervous system when feeling strong emotion. Measure the conductivity of the skin, where sweat gland produces a lot of sweat.

Measurement Method   Used Module   Waveform (μSimens)
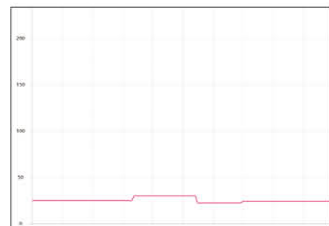
Option
13. DUST

Measure fine dust in the air.

Dust

Sensor

Measurement Method   Used Module   Waveform (μg/m³)

Product Configuration

IoT Smart Health LAB	Cables for Signal Measurement	Cuff for NIBP Measurement	Electronode	Hedaphone	COTS (for GSR)
Electronic Stethoscope	Oscilloscope Probe	Power Cable	User Guide Book 1EA	Platform USB 1EA	

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Homepage