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AI _ Internet of Things

# AI IoT SMART PIONEER LIGHT

From the basic theory of AI, you can learn algorithms using TensorFlow that are used for machine learning and deep learning. And it provides the service to control the actuator and the response to information request based on speech recognition using API provided by Google.


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V2.2.1

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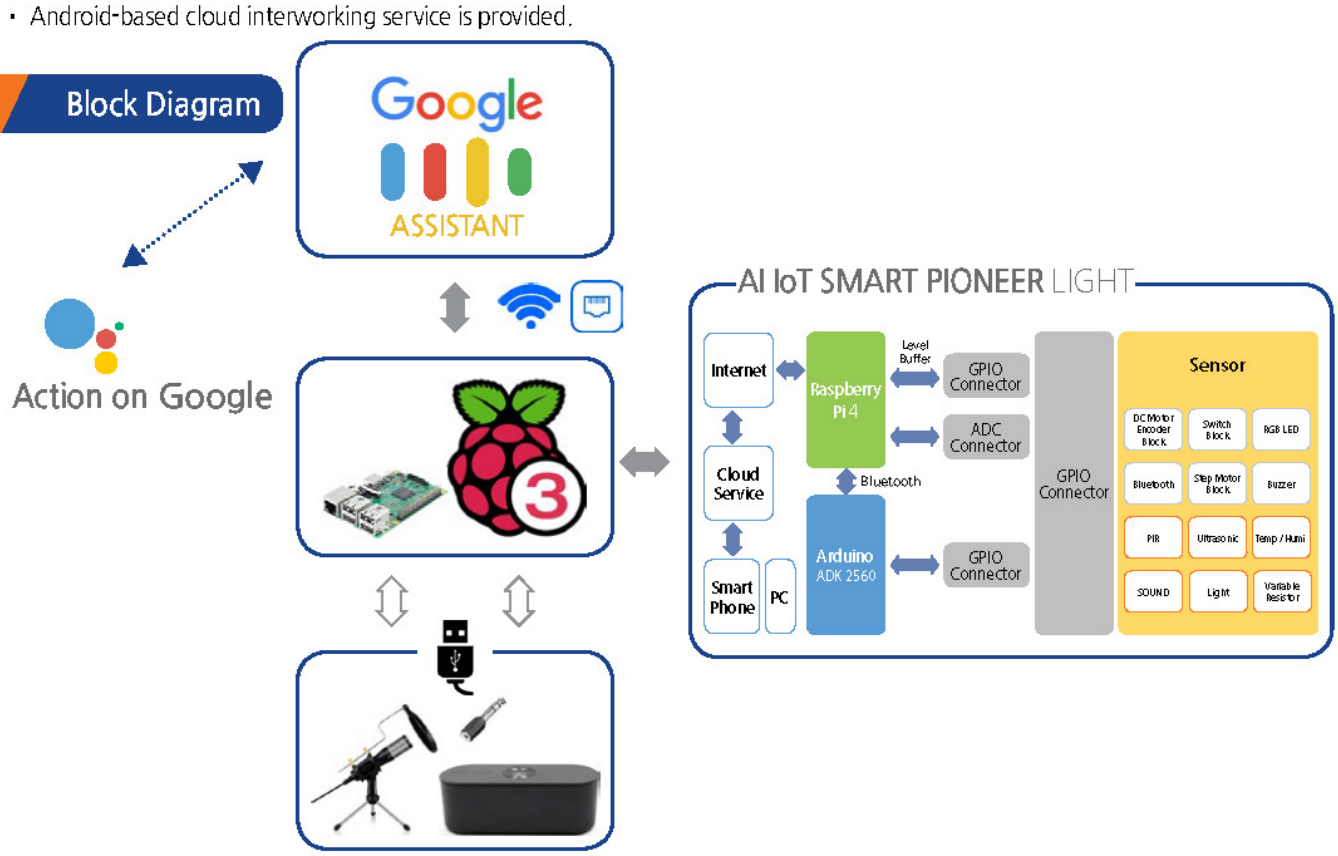
**From the basic theory of AI, you can learn algorithms using TensorFlow that are used for machine learning and deep learning. And it provides the service to control the actuator and the response to information request based on speech recognition using API provided by Google.**

## Product Features

- Sensor data collection is implemented around Open Hardware Platform, so anyone can experience artificial intelligence service.
- You can experience everything from basic theories for machine learning to algorithms for implementation.
- It is possible to teach deep learning which is the basis of machine learning.
- Provides services for machine learning and deepening learning using TensorFlow for high performance numerical calculation.
- Provides voice recognition service using Google's API. In addition, sensors and actuators can be controlled and monitored via speech recognition.
- Provides 10 basic sensor data bases and application examples.
- Provides unit module practice function using firmware to learn sensor information and actuator control exercises for acquiring IoT basic skills for each module.
- By building a gateway, it is possible to carry out various projects through sensor information monitoring and remote access control function.
- Provide AWS-based cloud services.
- Android-based cloud interworking service is provided.

## Block Diagram

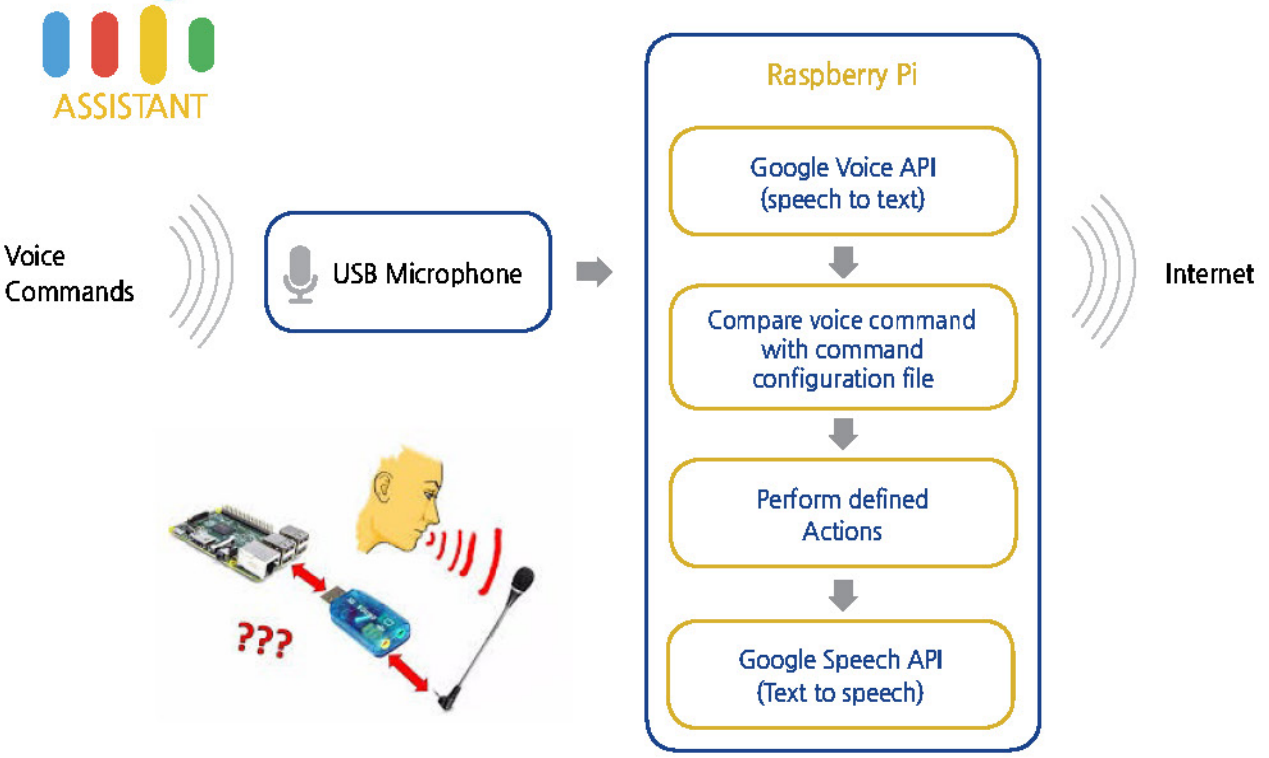


## Software Specifications

| Module | Category | Specifications |
|---|---|---|
| AI | TensorFlow | TensorFlow 1.0.1 |
| Module | Google Assistant | Google Assistant 0.1.1 |
| Gateway | Item | Specification |
| | OS | Raspbian Linux 3.xx |
| | Camera Program | Pi Camera Driver, Camera Streaming Server |
| | Audio | Alsa Driver |
| | Server Program | Sensor Control S/W |
| ADK-2560 | F/W IDE | Arduino 1.6.x |
| | Communication | Bluetooth Communication S/W |
| | Function | Sensor Control S/W |
| Cloud | Minutes Cloud Platform | - Powered by Amazon Web Service(AWS) Cloud infrastructure<br>- Flexible cloud Architecture scalable to the number of IoT Devices and users<br>- Provides virtual sensors /actuators from a variety of external data sources<br>- Web user interface : Provides easy administrator screen through web interface<br>- Device management : Gateway registration<br>- Sensor management : Provides the ability to manage(register/modify/delete) and test the sensor |
| IDE | AndroX Studio | - Launcher : 2.0<br>- ARM Cross Toolchain : GCC 4.6.3 for Windows (Newly build the source code)<br>- Host Toolchain : GCC 4.5.3 (Built-in cygwin)<br>- Cygwin : 1.7.17<br>- Make : GNU Make 3.82.90<br>- Eclipse Platform : Kepler(4.3)<br>- Arduino Platform : 1.0.5<br>- Java SDK : Java SE Runtime Environment (build 1.6.0_26-b03)<br>- Android NDK : Release R8E<br>- Android SDK : Android 4.2(API 17)<br>- ADT : 22.0.1<br>- Android SDK Tools : 22.0.1<br>- Remote Explorer : 5.1.1<br>- Remote Shell : 0.62<br>- Remote Viewer : 2.7.1<br>- Serial Packet Monitor : 1.2<br>- Application Package : 1.2<br>- Installer : 1.4 |

## Architecture with Mobile

Google ASSISTANT

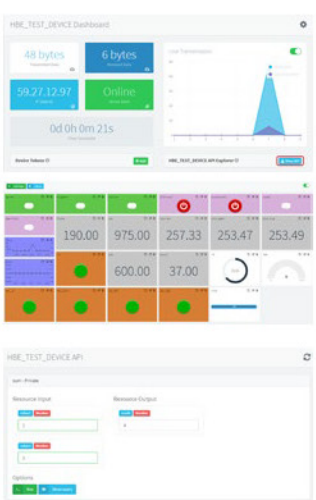


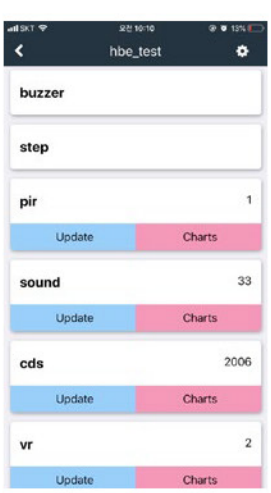

## Hardware Specifications

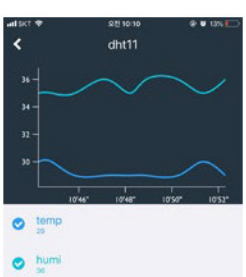
| Module | Category | Specifications |
|---|---|---|
| Gateway (Raspberry Pi 4) | Processor | Broadcom BCM2711 1.5Ghz Cortex-A72 quad-core |
| | RAM | 2GB |
| | Storage | MicroSD |
| | USB | USB 2.0 2ports, USB 3.0 2ports |
| | Power | USB-C socket 5V, 2A |
| | Audio | 3.5mm A/V JACK |
| | Digital Video | HDMI 2 * micro HDMI |
| | Ethernet | 10/100 BaseT |
| | Wireless Network | 802.11n , Bluetooth 5.0 |
| | Expansion I/O | 40EA GPIO (2x20 2.54mm pitch Header) |
| | Size | 116x56mm |
| HBE-ADK-2560 | Micro Controller | ATmega2560 16MHz |
| | Flash Memory | 256kByte(8KB USED BY BOOTLOADER) |
| | Clock Speed | 16MHz |
| | USB Controller | ATmega8U2 16MHz |
| | USB Host Controller | MAX3421E USB 2.0 |
| | GPIO Socket | 2x18 Socket(1EA), 1x10 Socket(1EA), 1x8 Socket(5EA) |
| | Operating Voltage | 7~12V |
| | Dimension | 122 x 76(mm) |
| Sensor Module | PIR | Sensor : RE200B<br>Sensing Range : 110 degree<br>Operating Voltage : 3.3V<br>I/O Interface : 1pin Digital Output |

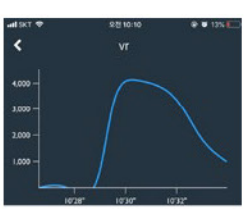
| Module | Category | Specifications |
|---|---|---|
| Sensor Module | Sound Sensor | Sensor : Microphone<br>Feature : Ambient sound detection, sound level detection<br>Operatiing Voltage : 5V<br>I/O Interface : 1pin Analog Output |
| | Humidity / Temperature Sensor | Sensor : DHT11<br>Feature : Temperature and humidity sensor, ambient temperature and humidity detection<br>Operation Voltage : 5V<br>I/O Interface : 1pin Digital Output |
| | Ultrasonic Sensor | Sensor : HC-SR04<br>Feature : 2~500cm distance measuring range, 40kHz Frequency<br>Operating Voltage : 5V<br>I/O Interface : 1pin Digital Input, 1pin Digital Output |
| | Light Sensor | Sensor : CdS<br>Operation Voltage : 5V<br>I/O Interface : 1pin Analog Output |
| | Variable Resistor Module | Sensor : 1kΩ Variable Resistor<br>Feature : 0 ~ 5V DC Variable Voltage out<br>I/O Interface : 1pin Analog Output |
| BASE | Raspberry Pi 4 block | Raspberry Pi 4 Connector, Power Switch, I/O Port |
| | ADK2560 Block | ADK2560 Connector, I/O Port |
| | Sensor Module Block | Sensor Module 6 Connector, I/O Port |
| | Step Motor Block | Feature : Step Motor, 32 Step, 1/16 Gear Motor<br>Motor Driver : ULN2003<br>Operation Voltage : 5V<br>I/O Interface : 4pin Digital Input |
| | LED Block | Feature : RED, GREEN, BLUE COLOR LED<br>Current Consumption : 20mA<br>Luminous Intensity : 6000~7000mcd at 20mA<br>Viewing Angle : 30 degree<br>I/O Interface : 3pin Digital Input |
| | Switch Block | Feature : Button 4EA<br>I/O Interface : 4pin Digital Output |
| Jumper Cable | - | - |

## APPS

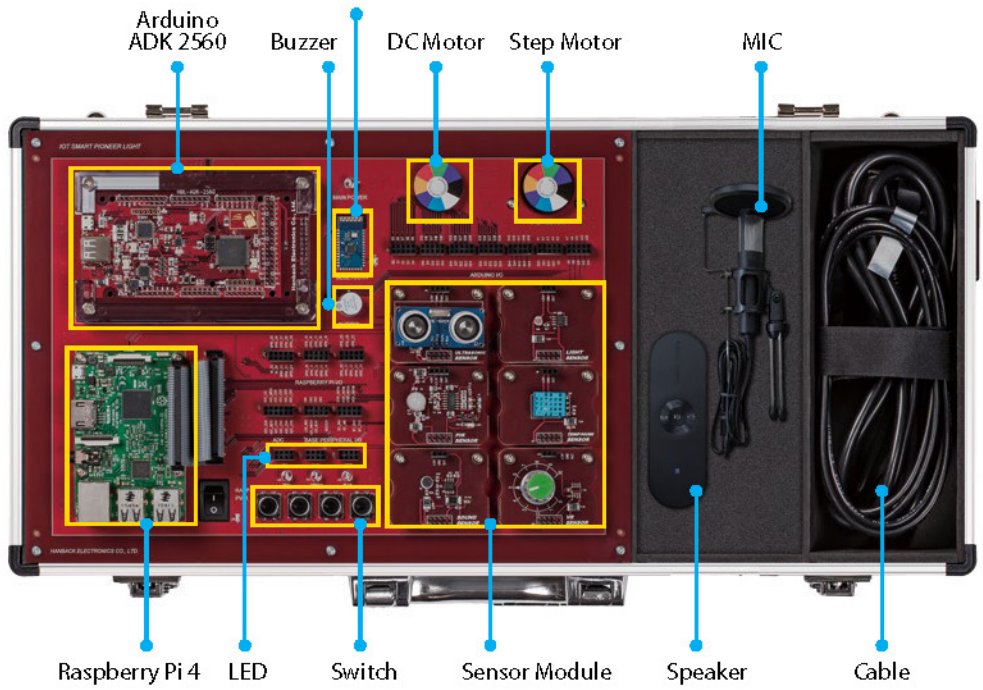


## Layout




## Textbook Chapter for AI

**1. Machine Learning**
- What is machine learning?
- Types of machine learning
- Machine learning algorithm

**2. Practice Equipment Introduction**

**3. Raspberry Pi**
- Introduction and development environment setting

**4. TensorFlow**
- Introduction to TensorFlow
- Development environment to use TensorFlow
- Using TensorFlow function
- Implement algorithm using TensorFlow

**5. Google Assistant**
- Introduction to G.A
- G.A development environment setup and account setup
- First conversation with G.A
- Device control using speech recognition

## Textbook Chapter for IoT

**1. Overview of IoT (Internet of Things)**

**2. Equipment Configuration and Practice Environment Configuration**

**3. Practice of Smart Sensor Control using Arduino**

**4. Raspberry Pi**

**5. Practice Smart Sensor Control using Raspberry Pi**

**6. Smart Sensor and Cloud Integration**