

Study & Analysing Scope of Sensors used in Android Mobile

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Abstract— Android is an operating system designed based on a modified version of Linux Kernel and other open source software. Android popularity is because of most successful mobile operating system. Android gain popularity in market because its interactive interface, Multi Language Support, App Store for different kinds of Application, Easily available development tools either by using Android SDK or Android Studio by just knowing only basic object oriented java programming language. Hardware including 32 and 64 bit - ARM architecture, *86, *86-64 MIPS and MIPS 64 this enable android to be used in device other than limited mobile phone. Android tablet used Intel processor and Android *86 can run on desktop PC. Android provide list of feature includes - Messaging text messaging, C2DM, GCM part of push messaging service, Auto correction and directory, Web browser, voice based feature, multi touch, multitasking, screen capture, TV recording, Video calling, Accessibility text to speech, Wireless Connectivity, Media, Storage internal and external and etc. Today Android smart phone having different variety of sensor. Android is a different type of sensing devices installed on mobile phone to gather the data for various user purpose often in a mobile application. Basic sensors used in smart phone are - Air humidity sensors, Barometer, Camera, Fingerprint, Accelerometer, Gyroscope, GPS, Infrared, Proximity sensors, Magnetometer, Light, Pedometer, Microphone Sound sensors, Thermometer and etc. Most of the application design for android phone are based on sensors. Sensors also affect the cost of Android smartphone based on used and cost of sensors. Android price chart exponentially increases with increase in number of sensor like with and without fingerprint scanner smartphone cost difference is about one to two thousand Indian rupees.

Key words: Linux Kernel, Android SDK, Object Oriented, MIPS, C2DM, GCM

I. INTRODUCTION

A. Importance of Sensors

At the time of purchasing a new android mobile or device or using android for a particular task, then you should need to ensure that the device support the required sensor. For example, if you are interested in using your mobile for walking and hiking then it have a magnetometer. Not all sensor are supported by all Mobiles. The Mobile sensors framework access many types of sensors. Some of these sensor are hardware based and some are software based. Hardware based sensor are physical components built into a handset or tablet device. Derive data by directly measuring specific properties, such as acceleration, geomagnetic field strength, or angular change. Software based sensors are not physical devices, although hardware based sensor. Software based sensor data from one or more of the hardware based sensor and are sometimes called virtual sensor or synthetic sensor. The linear acceleration sensors and the gravitational sensors are examples of software based sensors. Few Android devices have every type of sensors. For example, Most of the

handset Mobile and tablets have an accelerometers and a magnetometers, but very few device have barometers or thermometers. Also device may have more than one sensors of a given type - example, a device can have two gravity sensor, each one having a different range. A sensors is a device that produces a measurable response to a change in a physical condition, such as temp. Or thermal conductivity, or to a change in chemical concentration. Sensor are an important part to any measurement and automation application. The sensors is responsible for convert some type of physical phenomenon into a quantity measured by a data acquisition system.

II. CLASSIFICATION OF SENSOR

Classification divided in 2 types: Active and Passive. Active sensor are those which require an external excitation signal or a power signal. Passive sensor do not require any external power signal and directly generates output response.

Second classification is based on the mean of detection used in the sensors. Some of the means of detections are on BioChemical, Radioactive, Electric, Biological, Chemical, etc.

Third classification is based on conversion phenomenon. Some of the common conversion phenomena are Photoelectric, Electrochemical, Thermo optic, Electric, Electromagnetic, etc.

Forth classification of the sensor are Analog and Digital sensor. Analog sensor produce an analog output i.e. a continuous output signal with respect to the quantity being measured. Digital sensor work with digital data. The data in digital sensor, which is used for conversion and transmission, Digital Sensors are digital in nature.

III. SENSOR TYPES SUPPORTED BY ANDROID

A. Accelerometer: Hardware

Acceleration force in meter per second square that is applied to a device on all three physical axes (a, b,c), including the force of gravity.

Motion detection (shake, tilt, etc.).

B. Temperature: Hardware

Ambient room temperature in degrees Celsius (°C).

Monitoring air temperatures.

C. Gravity: Software or Hardware

Force of gravity in m/s^2 that is applied to a device on all three physical axes (x, y, z).

Motion detection (shake, tilt, etc.)

D. Gyroscope: Hardware

Device's rate of rotation in rad/s around each of the three physical axes (a, b, and c).

Rotation detection (spin, turn, etc.).

E. Light: Hardware

Ambient light level in lx.
Controlling screen brightness.

F. Linear Acceleration: Software or Hardware

Acceleration force in m/s^2 that is applied to a device on all three physical axes (a, b, and c), excluding the force of gravity
Monitoring acceleration along a single axis.

G. Magnetic Field: Hardware

Ambient geomagnetics field for three axes (a, b, c) in μT .
Creating a compass.

H. Orientation: Software

Degrees of rotation that a device makes around all three physical axes (a, b, c). As of API level 3 you can obtain the inclination matrix and rotation matrix for a device by using the gravity sensors and the geomagnetic field sensors in conjunction with the `getRotationMatrix()` method.
Determining device position.

I. Pressure: Hardware

Ambient air pressure in hPa or mbar
Monitoring air pressure changes.

J. Proximity: Hardware

Proximity of an object in centimetres relative to the view screen of a device. This sensors is typically used to determine whether a handset is being held up to a person ear.
Phone position during a call.

K. Humidity: Hardware

Relative ambient humidity in percent (%).
Monitoring dewpoint, absolute, and relative humidity.

L. Rotation Vector: Software or Hardware

Orientation of a device by providing the 3 elements of the mobile rotation vector.
Motion detection and rotation detection.

IV. SENSOR FRAMEWORK

You can access these sensor and acquire raw sensors data by using the Android sensors framework. The sensors framework is part of the android. Hardware package and includes the following classes and interfaces:

A. Sensors Manager

You can use this class to create an instance of the sensors service. Class provide several sensor constant that are used to report sensors accuracy and set data acquisition rate, and calibrate sensor.

B. Sensors

Class used to create an instance of a specific sensors. This class provides various methods that let you determine a sensors capability.

C. SensorsEvent

The system uses this class to create a sensors event object, which provides information about a sensors event. A sensors object includes information of: the raw sensors data, the type

of sensors that generated the event, the accuracy of the data, and the timestamp for the event.

V. COMMUNICATION OPTION

A. Bluetooth

Data link protocol wants to use your Mobile in connection with a smart watches. See understanding Bluetooth and how smart watches work with tablets.

B. Wi-Fi

A Data link protocol. Used for connecting you tablet/phone to the Internet. Standard on all tablets/phones but not on smart watches.

C. NFC (Near Field Communication)

A Data link protocol which requires devices to almost touch each other's, and is used in application like Google pay.

D. Infra Red

Used for remote control (TV –infraredblaster.). Becoming popular again on Mobile.

VI. CURRENT APPLICATIONS IN MARKET USED SENSOR

A. Androsensors

Androsensors supports all the sensor an Android Mobile tells you which of them are not supported by your hardware. View in a single screen the data from all devices sensor in real time. Graphical and text output available for each sensors.

B. Star Chart (GPS)

Android app that let you see the projection representation of sky object in your droid.

C. Heart Rate Monitor System

Specially designed for health. It allows you to monitor your heart rates with your Android; it uses an Android camera and its flashlight to detect your pulse rate.

D. WiFi Analyzer

Finding best WiFi channel and the best location to use that WiFi on your Android device.

E. IR Universal Remote

Android app that works perfectly with your Android and your smart devices around you which can be controlled by this cool app using IR, it turns your phone into a real universal remote controller.

F. WalkLogger pedometer

Android app that works with your Android sensor that can count your daily activity within your steps and you can also calculate the calories that you burn with that steps count.

G. Metal Detector

This app measures magnetic field value using a magnetic sensors that is built into your device.

H. Gravity Screen

Automatically turns the screen off when you put your phone into your pocket or onto a table. And turns the screen on when you take it out or up. No need to touch any button and you are

ready to go. It's especially helpful if your lock key is hard to reach or the power button is broken.

I. *Thermometer app*

Tempretuer app uses the internal temperature sensors, GPS and an Internet-based weather service to provide both inside and outside temperatures in C.

J. *Wave to Unlock & Lock*

wave Lock is the app use proximity sensors to lock and unlock the screen by way wave your hand over the proximity sensors. Protect power button on your phone.

K. *Holo Droid*

It shows you several pieces of information about your mobile device and gives the phone's screen a futuristic look. In its latest version, Four sensors combinations in order to enable the gyro compass.

L. *Spirit Level Plus*

Have you in the situation where you need to find out whether the surface is level enough to meet your needs. Spirit Level Plus will help you to find out the surface is level.

M. *Light Meter*

App requires devices with a light sensors. It uses native light sensors data acquisition that gives accurate and instant light intensity reading.

N. *Clinometer Bubble Level*

A clinometer is an instrument for measuring angles of slope elevation or depression of an object with respect to gravity. It is also known as a tilt meter, tilt indicator, slope alert, slope gauge, gradient meter, gradiometer, level gauge, level meter, declinometer, and pitch & roll indicator.

VII. CONCLUSION

The Android Mobile sensors framework Access many types of sensors. Some of sensor are hardware based and some are on the bases of software. Integration of different embedded devices and android is possible with using this sensor. Easy integration possible with android. While studying used sensors in android conclude that different application already available in market and having very large future scope for integrating with hardware developed under embedded application development.

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