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| **Pillow Android SDK Description** |
| **V1.0** |
|  |
| **Author: 闭周健** |
| **2017/07/10** |

# Change log

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| **内部文档 严禁外传** |

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# Android SDK Intro

## Function and Purpose

Pillow SDK,launched by Sleepace, is a software development kit for fast Internet APP development on android platform.

The SDK encapsulates the communication process between APP and hardware, and provides functions such as device configuration, device control and data query. Using the SDK, users do not need to care about complex communication protocols and the underlying implementation, only need to focus on the APP interaction and business level.

# Integration

## 1 .SDK framework

|  |  |
| --- | --- |
| **Framework** | **Description** |
| SdkCore.jar | SDK base core |
| HeartBreathDeviceCore.jar | Realtime data core |
| PillowSdk.jar | Pillow SDK |
| SdkAlgorithm.jar | Algorithm call library |
| libalgorithm.so | Algorithm library |

## 2 .Integration

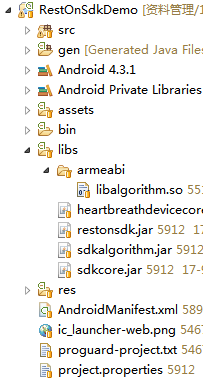
There are many Android development tools, and here we introduce the engineering configuration method of Sleepace SDK with Eclipse.

## Eclipse Config

**Step 1**：

In the project to create a "libs" folder, copy SdkCore.jar, HeartBreathDeviceCore.jar, PillowSdk.jar, SdkAlgorithm.jar to "libs" folder, copy libalgorithm.so to "libs \ armeabi" folder.

Like this:



**Setp 2:**

Config the “AndroidManifest.xml”

<uses-permission android:name=*"android.permission.BLUETOOTH"*/>

<uses-permission android:name=*"android.permission.BLUETOOTH\_ADMIN"*/>

<uses-feature android:name=*"android.hardware.bluetooth\_le"* android:required=*"true"*/>

<uses-permission android:name=*"android.permission.MOUNT\_UNMOUNT\_FILESYSTEMS"*/> <uses-permission android:name=*"android.permission.WRITE\_EXTERNAL\_STORAGE"*/>

# API

## 1.API initialization

PillowHelper.getInstance(Context mContext);

### Description

PillowHelper Initialization

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| mContext | Context | Conetxt |

## Connnect Device

**public** **void** login(String deviceName, String address, String deviceCode, **int** userId, **int** timeout, IDataCallback<LoginBean> cb)

### Description

Connect Pillow and setting userId

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| deviceName | String | deviceName |
| address | String | Bluetooth address |
| deviceCode | String | [DeviceCode](#_DeviceCode) |
| userId | int | userId does not belong to Sleepace.  userId belong to partner  **Why need it：**  Pillow separates the data according to userId.  It mean user A connects to device, generates and gets the data which only belong to user A. User A can’t get the data of user B |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<[LoginBean](#_LoginBean)> | Callback function, if success,return [LoginBean](#_LoginBean) Obj |

## Get Battery

**public** **void** getBattery(**int** timeout, IDataCallback<BatteryBean> cb)

### Description

Get battery

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<[BatteryBean](#_BatteryBean)> | Callback function, if success,return [BatteryBean](#_BatteryBean) Object |

## Get Device Version

**public** **void** getDeviceVersion(**int** timeout, IDataCallback<String> cb)

### Description

Get current version of device

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<String> | Callback function, if success,return the version of device |

## Set up automatic Collection

**public** **void** setAutoCollection(**boolean** enable, **int** hour, **int** minute, **int** repeat, **int** timeout, IDataCallback<Void> cb)

### Description

Set up automatic collection

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| enable | boolean | The automatic monitoring work or not |
| hour | int | The hour of work time (0 - 23) |
| minute | int | The minute of work time (0 - 59) |
| repeat | int | repeat mode，For example: 00000111, from right to left, represents Monday, Tuesday, Wednesday respectively, if the bit is 1, that means it will repeat at the same day, otherwise, it will not repeat. 127(decimalism) = 1111111(Binary), it means repeating from Monday to Sunday. 16 = 0010000, it means just repeating on Friday |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallbac](#_IDataCallback<T>)k<Void> | Callback function |

## Start Monitoring/Collecting

**public** **void** startCollection(**int** timeout, IDataCallback<Void> cb)

### Description

Start monitoring/collecting

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<Void> | Callback function |

## Stop Monitoring/Collecting

**public** **void** stopCollection(**int** timeout, IDataCallback<Void> cb)

### Description

Stop Monitoring/Collecting

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | IDataCallback<Void> | Callback function |

## Get Collection Status

**public** **void** getCollectionStatus(**int** timeout, IDataCallback<Byte> cb)

### Description

Get collection status, monitoring or not

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<Byte> | Callback function,  Collection status 1:Collecting,0：not |

## Get Sleep Data (Real-time)

**public** **void** startRealTimeData(**int** timeout, IDataCallback<RealTimeData> cb)

### Description

Get Real-time Data

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<[RealTimeData](#_RealTimeData)> | Callback function |

## Stop Getting Sleep Data

**public** **void** stopRealTimeData(**int** timeout, IDataCallback<Void> cb)

### Description

Stop getting real-time data

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<Void> | Callback function |

## Get The Signal Strength (Real-time)

**public** **void** startOriginalData(**int** timeout, IDataCallback<OriginalData> cb)

### Description

Get the signal strength

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<[OriginalData](#_OriginalData)> | Callback function |

## Stop Getting The Signal Strength

**public** **void** stopOriginalData(**int** timeout, IDataCallback<Void> cb)

### Description

Stop Getting The Signal Strength

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback<Void>](#_IDataCallback<T>) | Callback function |

## Get Sleep Report

**public** **void** historyDownload(**int** startTime, **int** endTime, **int** sex, IDataCallback<List<HistoryData>> cb)

### Description

Get sleep report

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| starTime | int | Start time(timestamp), Unit(second) |
| endTime | int | End time(timestamp), Unit(second) |
| sex | int | Gender,1:male 0:female |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<List<[HistoryData](#_HistoryData)>> | Callback function |

## Firmware Update 1

**public** **void** upgradeDevice(**final** **long** crcDes, **final** **long** crcBin, **final** File file, **final** IDataCallback<Integer> cb)

### Description

Firmware Update

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| crcDes | long | Get it from Sleepace |
| crcBin | long | Get it from Sleepace |
| file | File | Firmware object |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<Integer> | Callback function, Return upgrade progress |

## Firmware Update 2

**public** **void** upgradeDevice(**final** **long** crcDes, **final** **long** crcBin, **final** InputStream is, **final** IDataCallback<Integer> cb)

### Description

Firmware Update

### Parameters

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| crcDes | long | Get it from Sleepace |
| crcBin | long | Get it from Sleepace |
| is | InputStream | Get it from Sleepace |
| timeout | int | Timeout, Unit(Millisecond) |
| cb | [IDataCallback](#_IDataCallback<T>)<Integer> | Callback function, Return upgrade progress |

# Object Description

## StatusCode

### Description

Status of execution

### Fields

|  |  |
| --- | --- |
| **Field** | **Description** |
| STATUS\_SUCCESS | success |
| STATUS\_FAILED | failed |
| STATUS\_TIMEOUT | timeout |
| STATUS\_DISCONNECT | Bluetooth is disconnected |
| STATUS\_BLUETOOTH\_NOT\_OPEN | Bluetooth is not open |
| STATUS\_PARAMETER\_ERROR | Parameter error |

## DeviceCode

### Description

Device code

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **value** | **Description** |
| PILLOW\_3\_1 | 3-1 | Smart Pillow(BLE)\_Smart Pillow（Bilateral Piezoelectric Film Fiber Pillow） |
| PILLOW\_3\_2 | 3-2 | Smart Pillow(BLE)\_ Piezoelectric Cable Memory Foam Pillow |
| PILLOW\_3\_3 | 3-3 | Smart Pillow(BLE)\_Smart Pillow（Unilateral Piezoelectric Film Fiber Pillow） |
| PILLOW\_3\_4 | 3-4 | Smart Pillow(BLE)\_ Smart Pillow（Aroma Piezoelectric Film Fiber Pillow） |
| PILLOW\_3\_5 | 3-5 | Smart Pillow(BLE)\_Smart Pillow（Dismountable Polyester Fiber Pillow） |
| PILLOW\_3\_6 | 3-6 | Smart Pillow(BLE)\_Smart Pillow（Dismountable Memory Foam Pillow） |

## IDataCallback<T>

### Description

Callback interface

### Function

**void** onDataCallback(CallbackData<T> cd)

callback function

## CallbackData<T>

### Description

Callback object

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| status | Int | [Status](#_StatusCode) of execution |
| type | int | Interface Type, used to distinguish between operating interface |
| result | T | The result of execution |

## LoginBean

### Description

The result of Connnect Device.

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| hardwareVersion | String | Device version |
| deviceId | String | Device id |

## BatteryBean

### Description

The result of getting battery

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| chargingState | int | Charging or not，  0：not  1: charging |
| quantity | int | Percentage of battery, It’s disable when charging |

## RealTimeData

### Description

The result of getting sleep data (Real-time)

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| heartRate | short | Heart rate |
| breathRate | short | Breath rate |
| status | byte | [SleepStatusType](#_SleepStatusType) |
| statusValue | int | The value of status. Unit(Millisecond) |
| sleepFlag | int | Asleep or not  1: asleep  0: not |
| wakeFlag | int | Awake or not  1: awake  0: not |
| eTemp | float | Ambient temperature (required equipment support) |
| eWet | int | Ambient humidity (required equipment support) |
| eLight | int | Ambient light intensity (required equipment support) |
| eCo2 | int | Environmental carbon dioxide content (required equipment support) |
| eNoise | short | Ambient noise (required equipment support) |

## OriginalData

### Description

The result of getting signal strength

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| heartRate | float[] | Heart rate |
| breathRate | Float[] | Breath rate |

## HistoryData

### Description

The result of getting sleep report

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| summary | Summary | History data [Summary](#_Summary) |
| detail | Detail | History data [Detail](#_Detail) |
| analy | Analysis | [Analysis](#_Analysis) |

## Summary

### Description

Summary of sleep report

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| recordCount | int | The length of Collecting.  Unit(minute)  Eg:  300. It means you collect for 300 minutes |
| startTime | int | Start time(timestamp). Unit(second) |
| stopMode | int | How to stop collecting：  0: Call the method “Stop Collecting”  1: stop automatically if you leave the bed for an hour  2: Error(a、Collect more than 24 hours，b、Pillow shutdown c、upgrade)  3: restart |
| timeStep | int | Record interval (default 60s, ie: 1 minute a time a point) |
| timezone | int | Timezone |

## Detail

### Description

Detail of sleep report

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| breathRate | int[] | Breath rate |
| heartRate | int[] | Heart rate |
| status | int[] | Status |
| statusValue | int[] | The value of status |
| eHumidity | int[] | Humidity(required equipment support) |
| eTemp | int[] | Temperature(required equipment support) |

## Analysis

### Description

Analysis of sleep report

### Fields

|  |  |  |
| --- | --- | --- |
| **Field** | **Type** | **Description** |
| averageBreathRate | int | Average breath rate(n counts per min) |
| averageHeartBeatRate | int | Average heart rate(n counts per min) |
| fallAlseepAllTime | int | Fall asleep time(Unit:min) |
| wakeAndLeaveBedBeforeAllTime | int | Duration of awake before getting up(Unit:min) |
| leaveBedTimes | int | Counts of leaving bed |
| trunOverTimes | int | Counts of turning over |
| bodyMovementTimes | int | Counts of body movement |
| heartBeatPauseTimes | int | Counts of Heat beat Pause |
| breathPauseTimes | int | Counts of apnea |
| deepSleepPerc | int | Deep sleep percentage |
| inSleepPerc | int | Mid sleep percentage |
| lightSleepPerc | int | Light sleep percentage |
| wakeSleepPerc | int | Awake percentage |
| duration | int | Sleep duration(Unit:min) |
| wakeTimes | int | Awake times |
| lightSleepAllTime | int | Duration of Light sleep(Unit:min) |
| inSleepAllTime | int | Duration of Mid sleep(Unit:min) |
| deepSleepAllTime | int | Duration of Deep sleep)(Unit:min) |
| wakeAllTime | int | Duration of Awake)(Unit:min) |
| breathPauseAllTime | int | Duration of Apnea(Unit:seconds) |
| heartBeatPauseAllTime | int | Duration of heart beat pause)(Unit:seconds) |
| leaveBedAllTime | int | Duration of leaving bed(Unit:min) |
| maxHeartBeatRate | int | Maximum heart rate(n counts per min) |
| maxBreathRate | int | Maximum breath rate(n counts per min) |
| minHeartBeatRate | int | Minimum heart rate)(n counts per min) |
| minBreathRate | int | Minimum breath rate(n counts per min) |
| heartBeatRateFastAllTime | int | Duration of tachycardia(Unit:seconds) |
| heartBeatRateSlowAllTime | int | Duration of bradycardia(Unit:seconds) |
| breathRateFastAllTime | int | Duration of tachypnea(Unit:seconds |
| breathRateSlowAllTime | int | Duration of bradypnea(Unit:seconds) |
| sleepScore | int | Score  90>=score<=100 Bravo!  80>=score<90 Good!  60>=score<80, average!  score <60 Bad |
| sleepCurveArray | float[] | Example:  [0.212,1.231,2.111,0.212,1.231,2.111,....]  0: awake 0 ~ 1: light sleep 1 ~ 2: moderate sleep 2 ~ 3: deep sleep  Drawing sleep curve (Unit:min) |
| ~~sleepCurveStatusArray~~ | ~~short[]~~ | ~~Sleep Event Flag (Unit:min)~~ |
| breathRateStatusAry | int[] | Apnea, It used to draw the graph  Example:  [0,0,1,0,2]  0: nothing  Other: Duration of Apnea in this minute(Unit:seconds) |
| heartRateStatusAry | int[] | Heart beat pause, It used to draw the graph  Example:  [0,0,1,0,2]  0: nothing  Other: Duration of Heat beat Pause in this minute(Unit:seconds) |
| leftBedStatusAry | int[] | Leave bed, It used to draw the graph  Example:  [0,0,1,0,2]  0: nothing  Other: Duration of leaving bed in this minute(Unit:seconds) |
| turnOverStatusAry | int[] | Turn over, It used to draw the graph  Example:  [0,0,1,0,2]  0: nothing  Other: the times of turning over |
| algorithmVer | String | Algorithm version |
| fallsleepTimeStamp | int | The time you fall asleep(timestamp) |
| wakeupTimeStamp | int | The time you wake up(timestamp) |
| reportFlag | int | 1. Long report(>3h) 2. Short report(>10m && <3h) |
| md\_body\_move\_decrease\_scale | short | Score Deduction:Score Deduction due to body movement |
| md\_leave\_bed\_decrease\_scale |  | Score Deduction:Score Deduction due to the times of leaving bed |
| md\_wake\_cnt\_decrease\_scale | short | Score Deduction:Score Deduction due to the wake count |
| md\_start\_time\_decrease\_scale | short | Score Deduction:Score Deduction due to sleeping time (too late) |
| md\_fall\_asleep\_time\_decrease\_scale | short | Score Deduction:Score Deduction due to long falling sleep time |
| md\_perc\_deep\_decrease\_scale | short | Score Deduction:Score Deduction due to the deep sleep |
| md\_sleep\_time\_decrease\_scale | short | Score Deduction due to sleeping time too short |
| md\_sleep\_time\_increase\_scale | short | Score Deduction due to sleeping time too long |
| md\_breath\_stop\_decrease\_scale | short | Score Deduction:Score Deduction due to breathing stop |
| md\_heart\_stop\_decrease\_scale | short | Score Deduction:Score Deduction due to Heart beat stop |
| md\_heart\_low\_decrease\_scale | short | Score Deduction:Score Deduction due to slow heart beat |
| md\_heart\_high\_decrease\_scale | short | Score Deduction:Score Deduction due to Rapid heart beat |
| md\_breath\_low\_decrease\_scale | short | Score Deduction:Score Deduction due to slow breathing |
| md\_breath\_high\_decrease\_scale | short | Score Deduction:Score Deduction due to rapid breathing |
| md\_perc\_effective\_sleep\_decrease\_scale | short | Score Deduction:Score Ded**uction due to good sleeping (ratio of mi**ddle sleep/deep sleep) |

## SleepStatusType

### Description

Status value of monitoring

### Fields

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | **Type** | **Value** | **Description** |
| SLEEP\_OK | byte | 0x00 | normal |
| SLEEP\_INIT | byte | 0x01 | init |
| SLEEP\_B\_STOP | byte | 0x02 | apnea |
| SLEEP\_H\_STOP | byte | 0x03 | Heartbeat pause |
| SLEEP\_BODYMOVE | byte | 0x04 | Body movement |
| SLEEP\_LEAVE | byte | 0x05 | Leaving bed |
| SLEEP\_TURN\_OVER | byte | 0x06 | Turning over |
| SLEEP\_BODYMOVE\_TEMP | byte | 0x07 | Amplitude of body motion |
| SLEEP\_INVALID | byte | -1 | invalid |