Android sensors example

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Example code for handling sensor data on Android Context In this Android example we'll try to cover sensor management and all things we believe you need to know to do so properly. Think of opening sensors for reading but also closing them when done. Once opened how to handle the data, like smoothing with moving average, triggering stuff on tresholds and more. And sure we'll have to do some of these tasks in de background so we'll also have to make sure we don't drain the battery too much. I'll try to make it usefull also. This will probably turn into a highly configurable app that can trigger stuff (like wake your device) one certain tresholds. That "wake your device" goal is something I personally need and didn't find a good working alternative for. If possible I'll see if the app can do more than waking up. Fragments Some of the fragments in this example app with information on what they do. ListSensorFragment This fragment gives you a list for all sensors that were found on this device. See code for details on how to retrieve this list. This is where to start, use the sensorManager to get a listing and go from there. SensorDataFragment For a given sensor display data by listening on data changes. This shows how to open a sensor for listening for data changes but also how to close it properly when done. ScheduleServiceFragment and SensorBackgroundService A background service using the command pattern (not the binder) to run in the background checking for sensor values. To safe battery the service reads only one sensor value and then unregisters itself. The Alarmmanager is used for scheduling the sensor reading interval. If the sensor value is below a given treshold it will wake up the screen. To wake up the screen: PowerManager pm = (PowerManager) getApplicationContext().getSystemService(Context.POWER_SERVICE); WakeLock wakeLock = pm.newWakeLock((PowerManager.SCREEN_BRIGHT_WAKE_LOCK | PowerManager.FULL_WAKE_LOCK | PowerManager.ACQUIRE_CAUSES_WAKEUP), "TAG"); wakeLock.acquire(); To release the screen lock: KeyguardManager keyguardManager = (KeyguardManager) getApplicationContext().getSystemService(Context.KEYGUARD_SERVICE); KeyguardLock keyguardLock = keyguardManager.newKeyguardLock("TAG"); keyguardLock.disableKeyguard(); And the manifest needs to contain: < uses-permission android:name="android.permission.WAKE_LOCK" /> < uses-permission android:name="android.permission.DISABLE_KEYGUARD" /> Open Points complete sensor listing and data visualisation add grahps for sensor data view communicate sensor readings from service to configuration fragment Version History 0.1.1 release wake lock directly after acquiring it now check for non triggering values between triggers 0.1.0 first release fixed scrolling implemented basic sensor listing sensor data fetching and background service example Resources The Android platform provides two sensors that let you determine the position of a device: the geomagnetic field sensor and the orientation sensor. The Android platform also provides a sensor that lets you determine how close the face of a device is to an object (known as the proximity sensor). The geomagnetic field sensor and the proximity sensor are hardware-based. Most handset and tablet manufacturers include a geomagnetic field sensor. Likewise, handset manufacturers usually include a proximity sensor to determine when a handset is being held close to a user's face (for example, during a phone call). The orientation sensor is software-based and derives its data from the accelerometer and the geomagnetic field sensor. Note: The orientation sensor was deprecated in Android 2.2 (API Level 8). Position sensors are useful for determining a device's physical position in the world's frame of reference. For example, you can use the geomagnetic field sensor in combination with the accelerometer to determine a device's position relative to the magnetic North Pole. You can also use the orientation sensor (or similar sensor-based orientation methods) to determine a device's position in your application's frame of reference. Position sensors are not typically used to monitor device movement or motion, such as shake, tilt, or thrust (for more information, see Motion Sensors). The geomagnetic field sensor and orientation sensor return multi-dimensional arrays of sensor values for each SensorEvent. For example, the orientation sensor provides geomagnetic field strength values for each of the three coordinate axes during a single sensor event. Likewise, the orientation sensor provides azimuth (yaw), pitch, and roll values during a single sensor event. For more information about the coordinate systems that are used by sensors, see Sensor Coordinate Systems. The proximity sensor provides a single value for each sensor event. Table 1 summarizes the position sensors that are supported on the Android platform. Table 1. Position sensors that are supported on the Android platform. Sensor Sensor event data Description Units of measure TYPE_MAGNETIC_FIELD SensorEvent.values[0] Geomagnetic field strength along the x axis. μT SensorEvent.values[1] Geomagnetic field strength along the y axis. SensorEvent.values[2] Geomagnetic field strength along the z axis. TYPE_ORIENTATION1 SensorEvent.values[0] Azimuth (angle around the z-axis). Degrees SensorEvent.values[1] Pitch (angle around the x-axis). SensorEvent.values[2] Roll (angle around the y-axis). TYPE_PROXIMITY SensorEvent.values[0] Distance from object.2 cm 1 This sensor was deprecated in Android 2.2 (API Level 8). The sensor framework provides alternate methods for acquiring device orientation, which are discussed in Using the Orientation Sensor. 2 Some proximity sensors provide only binary values representing near and far. Using the Orientation Sensor The orientation sensor lets you monitor the position of a device relative to the earth's frame of reference (specifically, magnetic north). The following code shows you how to get an instance of the default orientation sensor : private SensorManager mSensorManager; private Sensor mSensor; ... mSensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE); mSensor = mSensorManager.getDefaultSensor(Sensor.TYPE_ORIENTATION); The orientation sensor derives its data by using a device's geomagnetic field sensor in combination with a device's accelerometer. Using these two hardware sensors, an orientation sensor provides data for the following three dimensions: Azimuth (degrees of rotation around the z axis). This is the angle between magnetic north and the device's y axis. For example, if the device's y axis is aligned with magnetic north this value is 0, and if the device's y axis is pointing south this value is 180. Likewise, when the y axis is pointing east this value is 90 and when it is pointing west this value is 270. Pitch (degrees of rotation around the x axis). This value is positive when the positive z axis rotates toward the positive y axis, and it is negative when the positive z axis rotates toward the negative y axis. The range of values is 180 degrees to -180 degrees. Roll (degrees of rotation around the y axis). This value is positive when the positive z axis rotates toward the positive x axis, and it is negative when the positive z axis rotates toward the negative x axis. The range of values is 90 degrees to -90 degrees. This definition is different from yaw, pitch, and roll used in aviation, where the X axis is along the long side of the plane (tail to nose). Also, for historical reasons the roll angle is positive in the clockwise direction (mathematically speaking, it should be positive in the counter-clockwise direction). The orientation sensor derives its data by processing the raw sensor data from the accelerometer and the geomagnetic field sensor. Because of the heavy processing that is involved, the accuracy and precision of the orientation sensor is diminished (specifically, this sensor is only reliable when the roll component is 0). As a result, the orientation sensor was deprecated in Android 2.2 (API level 8). Instead of using raw data from the orientation sensor, we recommend that you use the getRotationMatrix() method in conjunction with the getOrientation() method to compute orientation values. You can also use the remapCoordinateSystem() method to translate the orientation values to your application's frame of reference. The following code sample shows how to acquire orientation data directly from the orientation sensor. We recommend that you do this only if a device has negligible roll. public class SensorActivity extends Activity implements SensorEventListener { private SensorManager mSensorManager; private Sensor mOrientation; @Override public void onCreate(Bundle savedInstanceState) { super.onCreate(savedInstanceState); setContentView(R.layout.main); mSensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE); mOrientation = mSensorManager.getDefaultSensor(Sensor.TYPE_ORIENTATION); } @Override public void onAccuracyChanged(Sensor sensor, int accuracy) { // Do something here if sensor accuracy changes. // You must implement this callback in your code. } @Override protected void onResume() { super.onResume(); mSensorManager.registerListener(this, mOrientation, SensorManager.SENSOR_DELAY_NORMAL); } @Override protected void onPause() { super.onPause(); mSensorManager.unregisterListener(this); } @Override public void onSensorChanged(SensorEvent event) { float azimuth_angle = event.values[0]; float pitch_angle = event.values[1]; float roll_angle = event.values[2]; // Do something with these orientation angles. } } You do not usually need to perform any data processing or filtering of the raw data that you obtain from an orientation sensor, other than translating the sensor's coordinate system to your application's frame of reference. The Accelerometer Play sample shows you how to translate acceleration sensor data into another frame of reference; the technique is similar to the one you might use with the orientation sensor. Using the Geomagnetic Field Sensor The geomagnetic field sensor lets you monitor changes in the earth's magnetic field. The following code shows you how to get an instance of the default geomagnetic field sensor: private SensorManager mSensorManager; private Sensor mSensor; ... mSensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE); mSensor = mSensorManager.getDefaultSensor(Sensor.TYPE_MAGNETIC_FIELD); This sensor provides raw field strength data (in μT) for each of the three coordinate axes. Usually, you do not need to use this sensor directly. Instead, you can use the rotation vector sensor to determine raw rotational movement or you can use the accelerometer and geomagnetic field sensor in conjunction with the getRotationMatrix() method to obtain the rotation matrix and the inclination matrix. You can then use these matrices with the getOrientation() and getInclination() methods to obtain azimuth and geomagnetic inclination data. Using the Proximity Sensor The proximity sensor lets you determine how far away an object is from a device. The following code shows you how to get an instance of the default proximity sensor: private SensorManager mSensorManager; private Sensor mSensor; ... mSensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE); mSensor = mSensorManager.getDefaultSensor(Sensor.TYPE_PROXIMITY); The proximity sensor is usually used to determine how far away a person's head is from the face of a handset device (for example, when a user is making or receiving a phone call). Most proximity sensors return the absolute distance, in cm, but some return only near and far values. The following code shows you how to use the proximity sensor: public class SensorActivity extends Activity implements SensorEventListener { private SensorManager mSensorManager; private Sensor mProximity; @Override public final void onCreate(Bundle savedInstanceState) { super.onCreate(savedInstanceState); setContentView(R.layout.main); // Get an instance of the sensor service, and use that to get an instance of // a particular sensor. mSensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE); mProximity = mSensorManager.getDefaultSensor(Sensor.TYPE_PROXIMITY); } @Override public final void onAccuracyChanged(Sensor sensor, int accuracy) { // Do something here if sensor accuracy changes. } @Override public final void onSensorChanged(SensorEvent event) { float distance = event.values[0]; // Do something with this sensor data. } @Override protected void onResume() { // Register a listener for the sensor. super.onResume(); mSensorManager.registerListener(this, mProximity, SensorManager.SENSOR_DELAY_NORMAL); } @Override protected void onPause() { // Be sure to unregister the sensor when the activity pauses. super.onPause(); mSensorManager.unregisterListener(this); } } Note: Some proximity sensors return binary values that represent "near" or "far." In this case, the sensor usually reports its maximum range value in the far state and a lesser value in the near state. Typically, the far value is a value > 5 cm, but this can vary from sensor to sensor. You can determine a sensor's maximum range by using the getMaximumRange() method.

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