Calibrate magnetic sensor android

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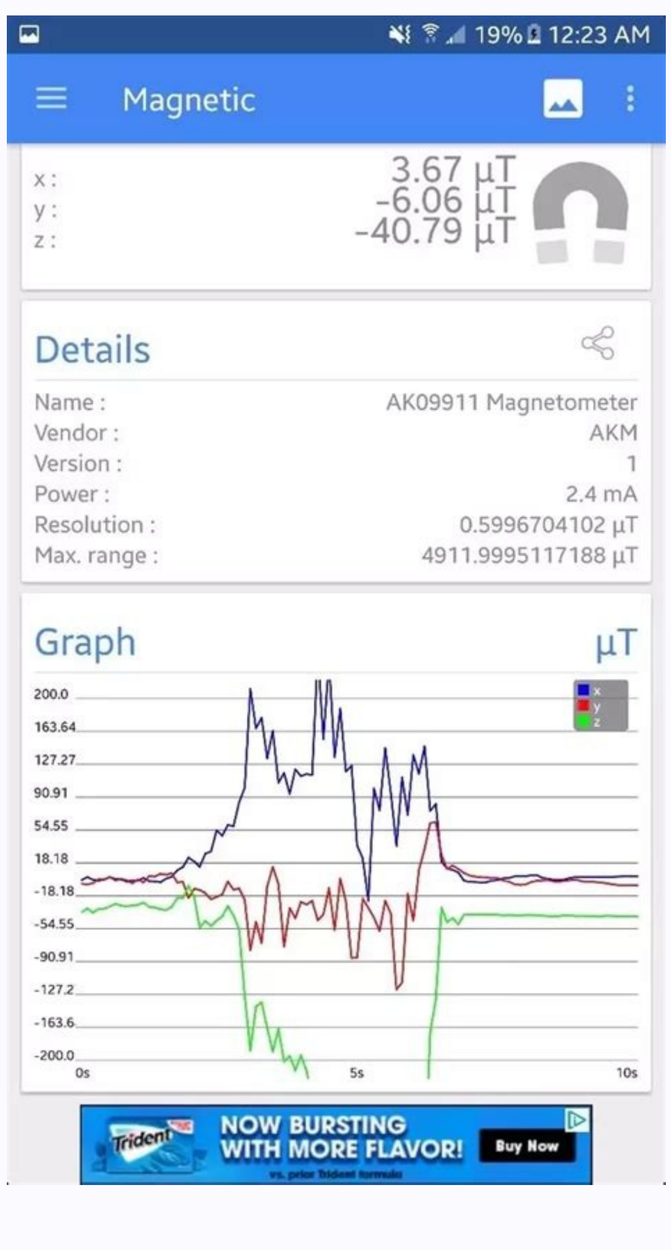
8


19% 12:23 AM
Magnetic
x :
y :
z :
3.67 µT
-6.06 µT
-40.79 µT
Details
Name :
AK09911 Magnetometer
Vendor :
AKM
Version :
1
Power :
2.4 mA
Resolution :
0.5996704102 µT
Max. range :
4911.9995117188 µT
Graph
µT
200.0
163.64
127.27
90.91
54.55
18.18
-18.18
-54.55
-90.91
-127.2
-163.6
-200.0
0s
5s
10s
x
y
z
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After harvest, a penetrometer was placed in the corn field to measure soil hardness. If the handheld sensor was unable to assess yield, the penetrometer was useful in identifying areas of low yield. Photo: Rintaro Kinoshita If you are a gardener, you know that planting seeds in the ground does not always mean a good harvest at the end of the growing season. On a personal level, this can be frustrating. Farmers are responsible for growing food on tens and thousands of hectares. They face the same variability as gardeners in planting, growing and harvesting. Agronomists and soil scientists are studying best practices for farmers to help them make informed decisions about managing their fields and crops. Rintaro Kinoshita and a team of researchers have found that this tool, an "apparent electrical conductivity (ECa) sensor," can provide important information about managing agricultural fields. Kinoshita is an assistant professor at the Obihiro University of Agriculture and Veterinary Medicine in Japan, but did this research at Cornell University in the US. The study was published in the journal Agronomy. “On large farms, there are factors that limit yields or cause yield fluctuations within the field,” says Kinoshita. “Understanding these factors is critical to optimizing resource investment and financial returns. It also helps to avoid adverse environmental impacts.” Undoubtedly, the soil and its properties are one of the most important factors in agriculture. Spatial variation in yields is highly dependent on three factors: topography, soil, and pest/disease. The soil factor is important and can be regulated by farmers. Soil cores collected from fields on the same farm. The research team compared ground test results with results from various sensor technologies to determine which were the most accurate. Photo: Rintaro Kinoshita Farmers often rely on soil tests to understand properties, but they are time consuming and costly. Kinoshita andused sensor technologies that can collect various information about crops and soil without digging the soil. These sensors are carried by agricultural machinery such as tractors and provide important information. To calibrate the information, they compared data from their sensors with data from soil samples. Although the study was conducted while Kinoshita was at Cornell University, the study was conducted in Maryland and Delaware, the Coastal Plain, and the Piedmont. The team studied 26 maize fields in two contrasting geographic and thematic areas. The apparent electrical conductivity (ECa) sensor has proven to be the most successful in evaluating soil properties compared to soil samples. These sensors could predict soil texture, especially at different depths, and available water content. Because water is the only conducting phase, measurements of soil properties that affect water availability can be predicted using ESA. The measurements relate to soil moisture and corn yield, which is valuable information for farmers. The team also tested other technologies, but the results were not as conclusive as the apparent conductivity sensor. The advantage of collecting readings from a sensor is that it is timely, typically taking 1-2 hours per fifty acres. Soil core testing, on the other hand, can take anywhere from a few weeks to a few months, depending on soil characteristics. "I decided to use the ECa sensor because it can measure soil properties in deeper layers (subsoil), where it is usually overlooked in soil management, but is a very important reservoir of water available to plants," says Kinoshita. "This can be very important in changing weather conditions, especially in drought conditions, to stabilize crops and maintain high yields." Kinoshita explains that it is important to start paying more attention to deeper soils in order to better manage crops, which is why the ECa sensor can be very useful in detecting soil conditions that would otherwise be very difficult to see. More information:Kinoshita et al., Soil sensing and machine learning reveal factors influencing corn yields, Midâtlantic USA, Agronomy Journal (2022). DOI: 10.1002/agj2.21223 Protocol details: Agronomy Journal Citation: Soil sensor provides farmers with useful information (November 14, 2022) Retrieved November 30, 2022, from Productions-Beneficial-Farmers.html This document is protected by copyright. Except for permitted use for private study or research, no part may be reproduced without written permission. The content is provided for informational purposes only. © 1996-2014, Amazon.com, Inc. or its affiliates Most Android devices have built-in sensors that measure movement, orientation, and various environmental conditions. Capable of providing raw data with high precision and accuracy, these sensors are useful if you want to monitor the three-dimensional movement or location of a device, or if you want to monitor changes in the environment near the device. For example, a game can track data from a device's gravity sensor to infer complex user gestures and movements such as tilting, shaking, turning, or swaying. Similarly, a weather app can use your device's temperature sensor and humidity sensor to calculate and report dew point, and a travel app can use your geomagnetic field sensor and accelerometer to report compass bearing. The Android platform supports three broad categories of sensors: Motion sensors These sensors measure acceleration forces and rotational forces in three axes. This category includes accelerometers, gravity sensors, gyroscopes, and rotation vector sensors. Environmental sensors These sensors measure various environmental parameters, such as ambient air temperature and pressure, light and humidity. This category includes barometers, photometers and thermometers. Location sensors These sensors measure the physical location of the device. of this categoryOrientation sensors and magnetometers. You can access the sensors available on your device and get raw sensor data using the Android sensor framework. The sensor framework provides a set of classes and interfaces that help perform various sensor-related tasks. For example, you can use the sensor system to: Find out which sensors are available on a device. Determine the capabilities of a single sensor, eg B. maximum range, manufacturer, power requirements and resolution. Receive raw sensor data and define the minimum rate at which you receive sensor data. Register and unregister sensor event listeners that monitor sensor changes. This topic provides an overview of the sensors available on the Android platform. It also provides an introduction to the sensor system. Introduction to Sensors The Android sensor system provides access to many types of sensors. Some of these sensors are hardware based and some are software based. Hardware sensors are physical components built into a handset or tablet. They obtain data by directly measuring certain properties of the environment, such as acceleration, the strength of the Earth's magnetic field, or changes in angle. Software sensors are not physical devices, although they mimic hardware sensors. Software sensors receive data from one or more hardware sensors and are sometimes referred to as virtual sensors or synthetic sensors. Examples of software sensors are a linear acceleration sensor and a gravity sensor. Table 1 summarizes the sensors supported by the Android platform. Some Android devices have both types of sensors. For example, most phones and tablets have accelerometers and magnetometers, while smaller devices have barometers or thermometers. A device can also have more than one sensor of a given type. For example, a device may have two gravity sensors, each with a different range. Table 1. Sensorsupported Android platform. Sensor Type Description General Applications TYPE_ACCELEROMETER The M/s2 hardware measures the accelerating force applied to the device in all three physical axes (x, y and z), including gravity. Motion detection (shake, tilt, etc.). TYPE_AMBIENT_TEMPERATURE Hardware Measures the ambient temperature in degrees Celsius (°C). See note below. Air temperature monitoring. TYPE_GRAVITY Software or hardware Measures the gravitational force acting on the device in m/s2 along all three physical axes (x, y, z). Motion detection (shake, tilt, etc.). TYPE_GYROSCOPE Hardware Measures the rotational speed of the device in rad/s around each of the three physical axes (x, y, and z). Rotation detection (rotation, rotation, etc.). Hardware TYPE_LIGHT Measures the ambient light level (illuminance) lux. Screen brightness control. TYPE_LINEAR_ACCELERATION Software or hardware M/s2 measures the acceleration force applied to the device in all three physical axes (x, y and z), excluding the gravitational force. Acceleration control along the axis. TYPE_MAGNETIC_FIELD Hardware Measures the Earth's ambient magnetic field along all three physical axes (x, y, z) Ï¼T. Create compass. Software TYPE_ORIENTATION Measures the degree of rotation of the device around all three physical axes (x, y, z). Starting with API level 3, the tilt matrix and rotation matrix of a device can be obtained using the gravity sensor and the geomagnetic field sensor along with the getRotationMatrix() method. Locating the device. Hardware TYPE_PRESSURE Measures ambient air pressure in hPa or mbar. Monitor changes in barometric pressure. TYPE_PROXIMITY Hardware Measures the object's distance in cm from the device's display screen. This sensor is commonly used to detect when a phone is brought up to a person's ear. The position of the phone during a call. TYPE_RELATIVE_HUMIDITY Hardware Measures the relative humidity of the environment.(%). Control of dew point, absolute and relative humidity. TYPE_ROTATION_VECTOR Software or Hardware Measures the device's orientation by providing three elements of the device's rotation vector. Motion detection and rotation detection. TYPE_TEMPERATURE Hardware Measures the temperature of the device in degrees Celsius (°C). The implementation of this sensor depends on the device and it has been replaced by the TYPE_AMBIENT_TEMPERATURE sensor in API level 14 temperature monitoring. Sensor Framework You can access these sensors and get raw sensor data using the Android Sensor Framework. The sensor framework is part of the android.hardware package and contains the following classes and interfaces: SensorManager. This class can be used to instantiate a sensor service. This class provides various methods for accessing and enumerating sensors, registering and unregistering sensor event listeners, and obtaining orientation information. This class also contains several sensor constants that are used to report sensor accuracy, set the acquisition rate, and calibrate the sensors. Sensor With this class you can create an instance of a specific sensor. This class provides various methods that allow you to determine the capabilities of the sensor. SensorEvent The system uses this class to create a sensor event object that provides information about a sensor event. The sensor event object contains the following information: raw sensor data, the type of sensor that generated the event, the accuracy of the data, and the timestamp of the event. SensorEventListener You can use this interface to create two callback methods that receive notifications (sensor events) when sensor values change or when sensor accuracy changes. In a typical application, the sensor APIs are used to perform two main tasks: Identifying sensors and their capabilities Identifying sensors and their capabilities at runtime is useful if your application hassensor types or their options. For example, you might want to identify all sensors on your device and disable any app features that depend on sensors that aren't there. In addition, you can identify all sensors of a given type and select the sensor implementation that provides optimal performance for your application. Monitoring sensory events. Monitoring sensor events is a way to get raw sensor data. A sensor event occurs every time a sensor detects a change in the parameters it is measuring. A sensor event provides four pieces of information: the name of the sensor that raised the event, the timestamp of the event, the accuracy of the event, and the raw data of the sensor that raised the event. Sensor Availability Sensor availability varies by device, but may also vary between Android versions. This is because Android sensors have been introduced in several versions of the platform. For example, many sensors were introduced in Android 1.5 (API level 3), but some were not implemented and available for use before Android 2.3 (API level 9). In addition, Android 2.3 (API level 9) and Android 4.0 (API level 14) introduced several sensors. Two of the sensors are obsolete and have been replaced by newer, better sensors. Table 2 lists the availability of each sensor for each platform. Only four platforms are listed because sensor changes were made on those platforms. Sensors marked as deprecated will continue to be available on future platforms (if the sensor is installed on the device) that meet the Android compatibility policy. Table 2. Availability of sensors by platform. 1 This sensor type was added in Android 1.5 (API level 3), but was not available for use until Android 2.3 (API level 9). 2 This sensor is available but out of date. Sensor identification and sensor capabilities The Android touch system providesa method to easily determine at runtime what sensors are on the device. The API also provides methods to determine the capabilities of each sensor, such as B. its maximum range, resolution and performance requirements. In order to identify the sensors on your device, you must first request a sensor service reference number. To do this, create an instance of the SensorManager class by calling the getSystemService() method and passing in the SENSOR_SERVICE argument. Example: private latinit var sensorManager: SensorManager ... sensorManager = getSystemService(Context.SENSOR_SERVICE) as SensorManager private SensorManager sensorManager; ... sensorManager = (SensorManager) getSystemService (Context.SENSOR_SERVICE); You can then get a list of all device sensors by calling the getSensorList() method and using the TYPE_ALL constant. Example: val deviceSensors: List = sensorManager.getSensorList(Sensor.TYPE_ALL) List deviceSensors = sensorManager.getSensorList(Sensor.TYPE_ALL); If you want to list all sensors of a certain type, you can use another constant like TYPE_GYROSCOPE, TYPE_LINEAR_ACCELERATION or TYPE_GRAVITY instead of TYPE_ALL. You can also determine if a specific sensor type is present on the device by using the getDefaultSensor() method and passing in a type constant for the specific sensor. If a device has more than one sensor of a certain type, one of the sensors must be set as the default sensor. If there is no default sensor for a given sensor type, the method call returns null, meaning the device does not have a sensor of that type. For example, the following code checks if the device has a magnetometer: private latinit var sensorManager: SensorManager ... sensorManager = getSystemService(Context.SENSOR_SERVICE) as SensorManager if (sensorManager.getDefaultSensor(Sensor.TYPE_MAGNETIC_FIELD) {! / Good luck! Not a magnetometer } else { // error!magnetometers. } SensorManager closed; ... SensorManager = (SensorManager) getSystemService (Context.SENSOR_SERVICE); if (sensorManager.getDefaultSensor(Sensor.TYPE_MAGNETIC_FIELD) != null){ // Good luck! There is a magnetometer. } else { // error! There is no magnetometer. } Note. Android does not require device manufacturers to embed a specific type of sensor in their Android devices, so devices can have different sensor configurations. In addition to enumerating a device's sensors, you can use the public methods of the Sensor class to define the capabilities and attributes of individual sensors. This is useful if you want your application to behave differently depending on the sensors or sensor capabilities available on the device. For example, you can use the getResolution() and getMaximumRange() methods to get the sensor's resolution and maximum range. You can also use the getPower() method to get the sensor's power consumption. Both public methods are particularly useful if you want to optimize your application for sensors from different manufacturers or for different sensor versions. For example, if your application needs to track user gestures such as tilt and shake, you can create a single set of data filtering rules and optimizations for new devices with a specific vendor's set of gravity sensors and other data filtering rulesets and optimizations for devices. which have no gravity sensor and only an accelerometer. The following code example shows how the getVendor() and getVersion() methods can be used for this purpose. In this example, we're looking for the gravity sensor provided by Google LLC, version number 3. If that sensor isn't present on the device, we'll try using the accelerometer. private latinit var sensorManager: SensorManager private var mSensor: Sensor? = null ... SensorManager = getSystemService(Context.SENSOR_SERVICE) as SensorManager(sensorManager.getDefaultSensor(Sensor.TYPE_GRAVITY) != null) { val gravSensors: List = sensorManager.getSensorList(Sensor.TYPE_GRAVITY) // Use gravity sensor version 3. mSensor = gravSensors.firstOrNull { it.vendor.contains ("Google LLC") && it.version == 3 } } if (mSensor == null) { // Use accelerometer. mSensor = if (sensorManager.getDefaultSensor(Sensor.TYPE_ACCELEROMETER) != null) { sensorManager.getDefaultSensor(Sensor.TYPE_ACCELEROMETER) } else { // Sorry, your device doesn't have accelerometers. // You cannot play this game. null } } private SensorManager SensorManager; own mSensor; ... sensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE); mSensor = zero; if (sensorManager.getDefaultSensor(Sensor.TYPE_GRAVITY) != null){List gravSensors = sensorManager.getSensorList(Sensor.TYPE_GRAVITY); for(int i=0; i