Capabilities of Fitbit for measuring exercise effectiveness

Developer Insights:

* Operating System: Fitbit OS (latest v5.2)
* Developer SDK: Fitbit OS SDK 6.0
* IDE: Fitbit Studio – includes simulator
* Apps developed using SVG, JS & CSS

Types of sensors that might be relevant to us:

**Diagram

Description automatically generated with medium confidenceAccelerometer**: measures a device’s acceleration along 3 orthogonal axes

* The x axis is parallel with the device’s screen, aligned with the top and bottom edges, in the left-to-right direction
* The y axis is parallel with the device’s screen, aligned with the left and right edges, in the bottom-to-top direction
* The z axis is perpendicular to the device’s screen, pointing up
* Acceleration reading include the acceleration of gravity. For example: if the device is at rest, lying flat on a table on the surface of the earth, the acceleration along the z axis should equal the acceleration of gravity (~9.8m/s ^2) and the acceleration along the x and y axis should be 0.
* Default sample rate is 100hz (100 times per second)

**Barometer**: provides access to the atmospheric pressure data measured by the hardware sensor

* Returns a reading of Atmospheric pressure, in Pascal Units (Pa)
* Can also be used as a basic altimeter since they both work on the notion that atmospheric pressure varies with elevation
* Only supports a specific set of sampling rates between 1Hz and 40Hz, the API will automatically adjust your requested frequency to match the closest supported rate

**Body-presence:** Used to determine whether the device is on the user’s wrist or not

* Returns a Boolean value indicating if the device is on a user’s body or not

**Geolocation:** obtain the location of the device. Requires explicit permissions from the user to obtain this information. (access\_location, run\_background)

* Geographic position information is provided in terms of World Geodetic System coordinates [WGS84](https://en.wikipedia.org/wiki/World_Geodetic_System)
* Locations can be set to be high accuracy or low accuracy
* Each location contains a coordinate and a timestamp of the entry
* Accuracy: accuracy level of the latitude and longitude coordinates in meters
* Altitude: height of the position, specified in meters above the [WGS84](https://en.wikipedia.org/wiki/World_Geodetic_System) ellipsoid
* Altitude accuracy: Accuracy of the altitude attribute in meters
* Heading: Direction of travel of the device, in degrees, between 0 and 360 degrees, counting clockwise relative to true north
* Latitude: Latitude, in degrees
* Longitude: Longitude, in degrees
* Speed: Magnitude of the horizontal component of the device’s current velocity, in m/s

**Gyroscope:** measures a device’s angular velocity along 3 orthogonal axes

NOTE: Only the Fitbit Ionic, Fitbit Versa, and Fitbit Sense contain a gyroscope sensor.

* The x axis is parallel to the device’s screen, aligned with the top and bottom edges, in the left-to-right direction
* The y axis is parallel to the device’s screen, aligned with the left and right edges, in the bottom-to-top direction
* The z axis is perpendicular to the device’s screen, pointing up
* The sign of angular velocities follows the [right-hand rule](https://en.wikipedia.org/wiki/Right-hand_rule). A positive angular velocity along an axis corresponds to the curling direction of the fingers of a right hand, with the thumb pointing in the direction of the axis
* X: Angular velocity around the x axis in rad/s
* Y: Angular velocity around the y axis in rad/s
* Z: Angular velocity around the z axis in rad/s

**Heart Rate Sensor**: measures a person’s heart rate in ‘Beats per minute’. Requires the access\_heart\_rate permission to access this sensor

**Orientation Sensor**: measures the orientation of a device relative to an orthogonal coordinate frame

* The x and y axes are perpendicular to each other, but do not point in a particular direction relative to the earth. The orientation of x and y relative to the earth can drift over time
* The z axis is perpendicular to the ground and points towards the sky
* Quaternion: a 4-element array containing the components of the unit quaternion (a.k.a versor) representing the device’s orientation. The first element if the array is the scalar part of the quaternion, and the last 3 elements form the i, j and k factors of the vector part.

User-activity API:

* Appears to be the API which revolves tracking users’ goals and progress to said goals over certain timeframes
* A lot of the data available here will require the access\_activity permission from the user to get access to it

Looking at the API is appearing we can get the following useful information:

* Today: retrieve data and events relating to a user’s physical activity levels
* ActiveZoneMinutes: counts minutes spent in each hear rate zones, counting all activities that get the user’s heart pumping. (Fat Burn, Cardio and Peak)
* Calories: Number of calories burned, in Calories (kcal)
* Distance: Distance traveled, in meters
* ElevationGain: Elevation gain, in the number of floors climbed
* Steps: Number of steps taken

Web API:

* Fitbit offers a way to extract all the data collected on the device into a format like excel or csv. It can be accessed by signing into your account, choosing which data you’d like to export then Fitbit will let you know via e-mail when its available to download

Graphical user interface, text, application, email

Description automatically generated

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Suitable Devices:

* Fitbit Sense
* Fitbit Versa 3

Sources:

* <https://dev.fitbit.com/build/reference/device-api/>
* <https://dev.fitbit.com/build/reference/web-api/>
* <https://help.fitbit.com/articles/en_US/Help_article/1133.htm>