Attentions

For your safety
- Smartphone might be placed tightly on the vehicle, and don't fly away when a vehicle is running and stopping.
- Please don't operate smartphone when you drive a vehicle.
- Please don't watch smartphone display long time when you drive a vehicle.

For recording accuracy
- Smartphone might be placed tightly on the vehicle.
- It is recommended that it is included 2 km or longer driving distance in one recording.
- It is recommended that it is included two times or more for start, stop, right turn, left turn.
- Smartphone is placed where it can see the sky to receive GPS satellite radio signal.

Available device
- Android Smartphone OS version 2.3 or later. It is recommended 4.4 or later.
- Smartphone has built-in GPS and 3 dimensional accelerometer.
  It is recommended built-in gyroscope and barometer too.
- Accelerometer sampling cycle must be over 50Hz. It is recommended over 100Hz.
  You can check sampling cycle on BumpRecorder [Graph] tab.
Install BumpRecorder on your Smartphone

BumpRecorder is installed from Google Play. It can search **BumpRecorder** or Bump Navi.
Smartphone placement

It can be placed any directions, but it should be placed tightly on the vehicle.

Example: Good placement

Not only fixed at left and right, but also bottom side.

It uses sticky sheet on the bottom side.

Bad placement

Only fixed at left and right side, but not fixed bottom side. It will occurs unexpected vibrations.
App Screen: [Navi] tab

- Map mode tap to change
- North up
- Heading up
- Driving speed
- Driving distance
- Recording time
- Recording button tap to start/stop
- Red mark is indicate recording now.
- Roughness indicator
  - Red: uneven
  - Light blue: even
- Bump mark
- Current position
- Elevation graph
- Acceleration graph
App Screen: [Graph] tab

- Recording time
- Driving speed
- Driving distance
- Elevation graph
- Acceleration graph
- Estimated vehicle specifications

Recording button: tap to start/stop

Red mark indicates recording now.
App Screen: [List] tab - data list of your smartphone -

- Selecting checkbox
- Recording date time
- Driving distance
- User comment tap to input
- Tap to display on the map
- Data delete
- Data upload
**App Screen: [Web] tab - data list on the server side -**

<table>
<thead>
<tr>
<th>Date Time</th>
<th>Distance</th>
<th>City</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015/05/18 10:03:56</td>
<td>1.1km</td>
<td>茨城県つくば市</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 36.09</td>
<td>Lon 140.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/18 08:32:57</td>
<td>2.6km</td>
<td>北海道十勝支庁中川郡池田町</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 42.93</td>
<td>Lon 143.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/18 08:26:53</td>
<td>1.5km</td>
<td>北海道十勝支庁中川郡池田町</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 42.93</td>
<td>Lon 143.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/17 11:48:48</td>
<td>31.3km</td>
<td>北海道石狩支庁札幌市北区</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 43.13</td>
<td>Lon 141.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/17 09:17:46</td>
<td>199.2km</td>
<td>栃木県日光市</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 36.72</td>
<td>Lon 139.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/17 07:28:08</td>
<td>415.0km</td>
<td>栃木県宇都宮市</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 36.69</td>
<td>Lon 139.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/16 16:10:01</td>
<td>31.8km</td>
<td>秋田県秋田市</td>
<td>Japan</td>
</tr>
<tr>
<td>Lat 39.70</td>
<td>Lon 140.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015/05/16 14:55:54</td>
<td>203.7km</td>
<td>秋田県秋田市</td>
<td>Japan</td>
</tr>
</tbody>
</table>
App Screen: [Setting] tab

Get free ID from http://map.bumprecorder.com/Users/registerFree

When you use paid service, please contact us from http://www.bumprecorder.com/contact
Data File Format of BumpRecorder

Data file will record on /data/BumpRecorder/ folder for recording date and time.

Data file will record for each recording and each sensors.

Acceleration, gyro, magnetic field, air pressure, light will record when smartphone has these sensors.

Data sample

<table>
<thead>
<tr>
<th>DeviceTime</th>
<th>HardTime</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1416963906970</td>
<td>11791534033000</td>
<td>-119</td>
<td>1002</td>
<td>7</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>-166</td>
<td>972</td>
<td>-2</td>
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<tr>
<td>3</td>
<td>84</td>
<td>-112</td>
<td>1007</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>146</td>
<td>-104</td>
<td>951</td>
<td>-86</td>
</tr>
<tr>
<td>5</td>
<td>273</td>
<td>-98</td>
<td>1021</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>348</td>
<td>-113</td>
<td>945</td>
<td>-15</td>
</tr>
</tbody>
</table>

Header line

Basis lines: It has 1 line for each 10 sec.

Data lines: It has 1 line for each records.

Data line

DeviceTime, HardTime, X, Y, Z

Unit for each sensors

- Acceleration: [m/s²]
- Gyroscope: [rad/s]
- Magnetic: [μT]
- Pressure: [hP]
- Light: [lux]

Quantization rate for each sensors

- Acceleration: 1024 / 9.8
- Gyroscope: 1024
- Magnetic: 10
- Pressure: 100
- Light: 1

Attentions: Pressure and light has only X value.