

## **KML++**



**Georeferencing tool and  
Google Earth format file  
generation for the Android  
platform mobile devices**

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**May 2015**

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## **KML++ Georeferencing tool and Google Earth file generation**

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## 1 Introduction

The wide range of available mobile phones and equivalent devices combine mobility with high performance computational characteristics. It has long been since this kind of equipment aimed exclusively at ensuring voice communications; today they are also designed to be compatible with such diversified uses as photography, entertainment, personal productivity, etc...

Among the common features to these devices is the ability to receive and interpreter global navigation satellite systems signals (GNSS) such as the American GPS, the Russian GLONASS, or the European Union Galileo (soon to become online).

The georeferencing/geocoding capability associated with these devices enables their use for street navigation (resorting to applications designed for this specific purpose), but it also means that all smartphones represent an extremely mobile and convenient form of collecting geospatial information in a quick and unrestricted manner.

This fact also applies to mobile devices that run on the Android operating system. Based on the signals received by a GNSS chip, the Android operating system is able to perform the positioning calculation necessary to determine the coordinates of the device at any given moment.

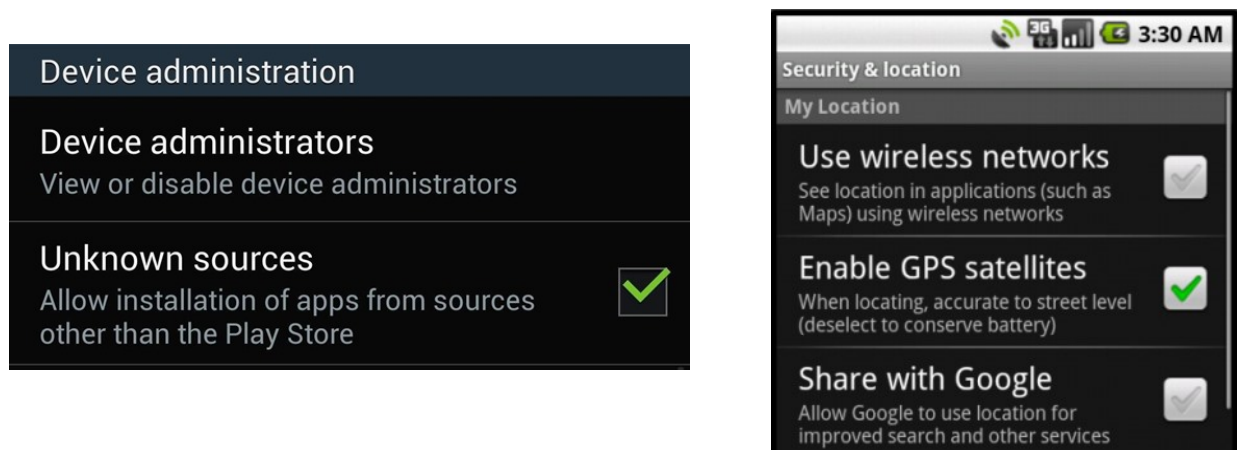
The KML ++ application was developed to exploit this capability and to allow the use of ordinary Android smartphones in either private or professional activities that could benefit from basic field geospatial data collection.

KML++ is a simple and easy to use application that is capable of obtaining the latitude and longitude of any number of locations at the user's command, and of storing this information to a mobile database that is maintained between sessions. The number of points of interest saved in the database is only limited by the internal capacity of the device.

Stored locations can be further interacted with by means of map visualization and/or integration with geographical information systems, via conversion to keyhole markup language (KML) files.

## 2 Setup

KML++ is designed to be compatible with Android operating system version 2.2 (Froyo) and up. The application is not available from the Android distribution service Google Play; the "KML++.apk" file that enables setup can be transferred to the target device via a USB connection or by any other similar form. To perform the setup operation it is first necessary to allow installation from unknown sources in the Settings > Applications menu and in order to use KML++ GPS tracking must be enabled (Figure 1).



**FIGURE 1** Application setup.

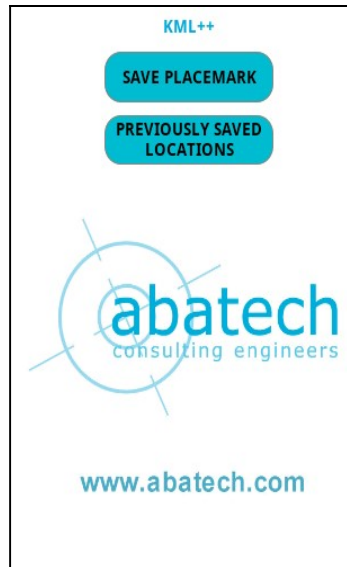
After these steps have been performed, by opening the file explorer and selecting the "KML++.apk" file, the setup process will begin and KML++ will shortly become available. The application is launched by selecting the blue pin icon depicted in Figure 2.



**FIGURE 2** KML ++ icon.

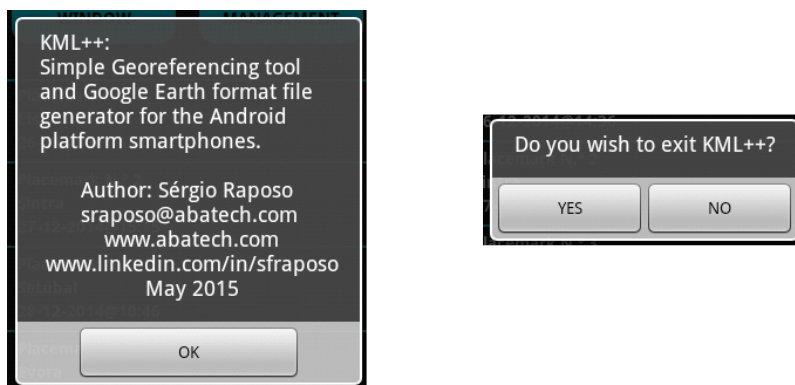
### 3 KML++ operations

When launched, KML++ will display its main screen (Figure 3), thus immediately offering the options of saving the user's current location or of accessing and interacting with previously stored coordinates.



**FIGURE 3** KML++ main screen.

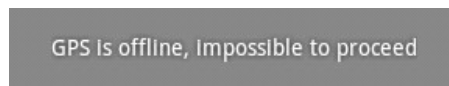
By pressing the dedicated menu button (physical or virtual button depending on device model and operating system version), it will be possible to view some basic KML++ information or to exit the application (Figure 4).



**FIGURE 4** About box and exit dialogues.

### 3.1 Collecting geospatial data

Pressing the "SAVE PLACEMARK" button will prompt KML++ to save the current location to the database. In order to perform the positioning calculation necessary to determine the device coordinates, it is required that the GNSS chip is receiving a minimum of four different valid satellite transmissions simultaneously. Therefore KML++ will only save locations if a suitable signal has been established, otherwise the user will be notified that it is impossible to proceed due to that fact (Figure 5).

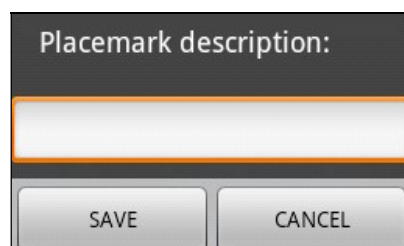


**FIGURE 5** Inadequate GNSS signal message.

Should there be an adequate signal available the KML++ app will automatically obtain the following parameters:

- Longitude
- Latitude
- Date
- Time

Along with this information it is also possible to add an optional user defined description of each specific location (Figure 6). This custom description is limited to two hundred characters.



**FIGURE 6** Custom description dialogue.

If the user decides not to add any custom description, KML++ will automatically label that specific location's description as being the date and time at which it was collected.

### 3.2 - Google Maps interaction

If the option of consulting previously saved locations is selected, the main screen will give way to the chronological order display of stored locations and their corresponding descriptions, as well as to the date and time at which they were collected. When KML++ is initially installed five different example locations will already be predefined (Figure 7), but the user can add or delete any number of locations from this point forward.

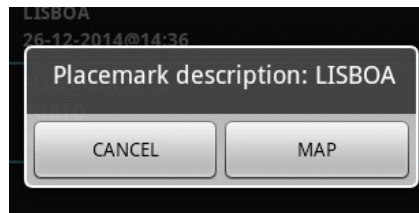


The screenshot shows the KML++ application interface. At the top, the title 'KML++' is displayed. Below the title are two buttons: 'BACK TO MAIN WINDOW' and 'DATABASE MANAGEMENT'. Below these buttons is a list of four predefined locations, each with a title, a location name, and a timestamp.

Placemark N.º	Location	Timestamp
1	Lisboa	26-12-2014@14:36
2	Sintra	27-12-2014@15:15
3	Setúbal	28-12-2014@10:46
4	Évora	29-12-2014@17:06

**FIGURE 7** List of available locations for map visualization.

Selecting any row from the displayed list of locations will present a pop-up window (Figure 8) in order to ascertain if the corresponding coordinates are to be viewed in a map. Should the user reply positively, KML++ will launch the Google Maps application directly to that specific location without the need to define either address or coordinates. The map visualization feature will only be accessible if there is an active Internet connection available and if the Google Maps app is already installed in the device. If this application is not installed, the user will be asked to install it and a web browser leading to the Google Maps download page will be launched.



**FIGURE 8** Map visualization dialogue.

Within Google Maps, it is possible to share the coordinates of the selected location (by e-mail, text message, etc...), or to initiate an assisted navigation to that particular point, as well as performing any other action made available by the Google Maps application.

### 3.3 Database Management and KML file generation

The third and final screen is related to the KML++ database management (Figure 9). In order to interact with the data the user must select at least one location from the list that is presented at this point.



**FIGURE 9** Database management screen.



After selecting the desired location(s), three distinct options are possible:

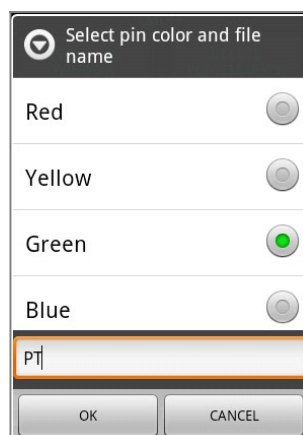
- Delete the corresponding entries from the database
- Write the selected placemarks to an equal number of KML files (1 per file)
- Write the of selected placemarks to only one KML file (batch data file)

KML files are native to the widely known map and geographical information program Google Earth, and can be equally used with several other geographic information systems. KML files use an "xml" type data structure in order to save and list information in a completely ordered and easily accessible form (Figure 10).

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
  <Placemark>
    <name>#SLB</name>
    <description>KML File Data Structure</description>
    <Point>
      <coordinates>-9.184799641370773,38.75268391909695,0</coordinates>
    </Point>
  </Placemark>
</kml>
```

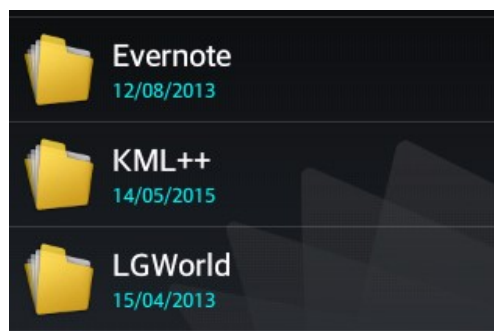
**FIGURE 10** KML file data structure example.

The name of the file or files to be produced as well as the color of the markers used by Google Earth to identify the position of each of the locations (Figure 11) can be customized by the user.



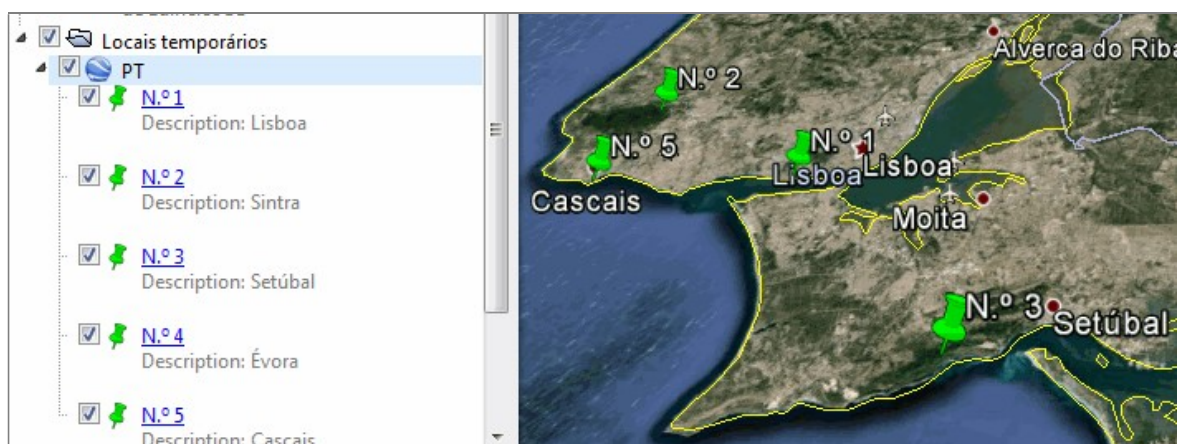
**FIGURE 11** File name and pin color definition dialogue.

If this particular information is not defined, KML++ assumes that the standard marker color is yellow, and that the file name(s) will abide by the designation **file\_dd-mm-yyyy@hh-mm.kml**, in which dd-mm-yyyy and hh-mm are the date and time of file creation respectively. Regardless of the user defined file name, should the option of writing one individual placemark per file be selected, a sequential suffix of the type filename\_1.kml, filename\_2.kml,..., filename\_n.kml, will be added to each of the generated files. The files created by the KML++ application will be stored on the internal storage unit of the Android device in a folder with the exact same designation as the app (Figure 12). The files contained in this folder can then be transferred to a computer or to any other compatible equipment.



**FIGURE 12** KML++ application folder.

Opening the KML++ generated files with Google Earth will display the geospatial information that was previously collected and selected by the user (Figure 13).



**FIGURE 13** Google Earth visualization of KML++ collected geospatial data.

## **6 DISCLAIMER**

The information contained in this document, as well as the data resulting from the KML++ application is provided "as-is" without any express or implied warranty. In no event shall the author be held liable for any damages arising from the use of this software.

Lisbon, May 2015

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