OSMaps Library

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Abstract

The OSMaps library is designed for using as built-in library in the applications that need to interact to the world map. At the moment our library implements a cached access to tile maps server openstreetmaps.com, which uses the Mercator's projection.

Mercator's projection is an Earth projection as a sphere onto a cylinder. This projection is used by such servers as openstreetmaps.com and maps.google.com.[1,2] These servers contain maps made in several zooms as a set of tiles. Each tile is pixmap 256x256 px. On the 0 zoom there is 1 tile. On each next zooms tiles' number on one dimension increases in two times. In this case the coordinates' translations are circumscribed by expressions:

$$x = i / 128 / 2^{zoom} \cdot \pi - \pi$$

$$y = \arctan\left(\sinh\left(\pi \cdot \left(1 - j / 128 / 2^{zoom}\right)\right)\right)$$

$$i = \left(x + \pi\right)\big/ \pi \cdot 2^{zoom} \cdot 128$$

$$j = \left(1 - \log\left(\tan\left(y\right) + \frac{1.0}{\cos\left(y\right) \cdot \pi}\right)\right) \cdot 2^{zoom} \cdot 128$$

where x, y – real geo coordinates; i, j – pixel coordinates, counted from the top left corner of the map [3].

In the purposes of optimization of the library there is made two-level cache – the disk cache and the memory cache. In this way, tiles that were already used not so far ago need not to be loaded from the disk cache.

The library architecture allows quickly link up other maps servers, so end user has alternative variants. At the moment it's possible to link up only the servers that use sphere projection onto the cylinder. For example, when we tried to use Yandex® maps we got an error in the coordinates mathematics, because Yandex® use an ellipsoid projection onto the cylinder.

Library's programming interface allows tracing user movement on the map, zooming changes, marks' addition and deletion. Marks' databases for different applications are separated, so this library can be used by several working applications at the same time.

It's possible to add different marks on the map and to compare with any mark some text data or image. In the next version there will be an ability to add other types of the data, defined by programmers that will use this library.

Index Terms: Maps, Mercator's projection, Mobile services, LBS.

REFERENCES

[1] Mercator projection http://en.wikipedia.org/wiki/Mercator projection

[2] libkml, Google's library for to parsing, generating and operating on KML http://code.google.com/p/libkml/

[3] J.P. Snyder,"Map Projections - A Working Manual", U.S. Geological Survey Professional Paper 1395, United States Government Printing Ofce, Washington, D.C., 1987