A Field Report on the Role of Free and Open Source Geospatial Software at the University of Applied Sciences

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Summary

Universities of Applied Sciences in Switzerland serve a fourfold prupose. In addition to education, they work in the field of applied research and projects. During the last few years, free and open source geospatial software (FOSGS) has proved to be a catalyst not only in the implementation of projects but also in their acquisition process. Further, it has built a bridge from researcher to students and supported a better integration of students' work into research work and vice versa. This paper presents a field report based on a few projects which were implemented at the Institute of Geomatics Engineering at the University of Applied Sciences and Arts Northwestern Switzerland FHNW.

Introduction

At the Institute of Geomatics Engineering (IGE) at the University of Applied Sciences and Arts Northwestern Switzerland FHNW, free and open source geospatial software (FOSGS) has been used since 2005. Starting with UMN MapServer, PostgreSQL/PostGIS, PHP and JavaScript for web-based applications [1], the number of FOSGS has grown over the years. One major project which has its roots at IGE is OpenAddresses.org [2], which was originally developed as a Google Maps mash up but was later migrated in 2010 to MapFish [3], which is

a framework for building rich web-mapping applications [4]. Due to these public web-based applications which were realised at IGE, public interest in FOSGS grew in the community and networks which are linked to IGE. This led to the situation where IGE was specifically contacted with the focus to realise research projects and applications with FOSGS. As a result, IGE was able to set up two large projects with the Bau- und Umweltdirektion Baselland [5], [6].A service to evaluate the conformity of OpenGeoSpatial webservices was conceptionally designed with the 'Coordination, Geo-Information and Services (COGIS)' department of swisstopo, the federal geo-information center of Switzerland and is currently in the process of being implemented. With all these projects, fundamental skills for using Django and Python as the programming languages were developed. Additionally, GeoExt and OpenLayers were two of the main frameworks which were used.

Bridging gaps with free and open source geospatial software

Our know-how of Django, Python and GeoExt was the basis on which the public web-based application 'See You' was built. See You is a project designed for secondary school children [7] and is a further development of the Map Your World project [8]. Secondary school pupils carry a GPS logger for a week or two, upload their data into the project's central database from where different geospatial information is provided: a heat map that shows colour-coded accumulated GPS tracks, hot spots which indicate locations with either high frequency or where people meet and finally indoor locations which indicate potential indoor leisure or residential places are computed. The GPS tracks can be filtered by age, gender, time of day and days of the week.

Many aspects concerning different technologies within this project are covered both for those who use the application but also for the project supplier. Using low-cost GPS devices leads to the problem of how to pre-process this data to improve its quality for further analysis in the See You project. This task was transferred into students' projects with the support of research assistants at IGE. Not only [9] did students in the bachelor and master programmes work conceptionally on the issue but they were also able to use Python to test their concept. Their Python code can now be revised and easily integrated into the

project's architecture which is based on Python. Other issues that were dealt with similarly were the creation of the heat or density maps based on intensive literature research ([10],[11],[12],[13]) and the extraction of indoor locations. Thanks to the practice of sharing code and samples which is one of the main pillars in open source software, the creation of the heat maps did not have to be started from scratch but used a script provided by Seth Golub [14].

Python is one of the languages which can be easily learned and thus helped, especially in the See You project, to bridge the gap between research and the bachelor and master programmes at IGE. For students it is very motivating to see their work is not an artificial task but is integrated into real-life projects and that their effort is a contribution to a larger context. Free and open source geospatial software strongly supports this approach because both institutions like universities and students are able to access software licenses and evaluate them at no external cost. The software and quite often also samples are available and members of newsgroups or mailing lists are helpful and quick to reply when there are questions and obstacles. The project See You also shows that applying FOSGS had an even further positive impact on education in secondary school. If the mentioned application had needed to be set up with proprietary software, it might have failed due to the incurred cost.

Conclusion

In the author's experience, FOSGS has proved to be a catalyst in successfully implementing projects in an academic environment. This is due not only to the free software licenses but also thanks to the availability, the openness and willingness to support of communities doing open source software projects. Academic research and teaching experience have shown FOSGS to be a fruitful and productive environment to work in.

In addition, the Institute of Geomatics Engineering receives generous support from proprietary software vendors. Thus the future is not going to be 'only FOSGS' but rather a 'both FOSGS and proprietary GIS software' approach. Most of IGE's students will face proprietary software in their future careers, especially in the area of surveying. Nevertheless, the FOSGS which they came into contact with during their studies have opened their minds to another,

mostly complementary and occasionally even better alternative to the still very famous and proprietary software programmes which partly dominates the market. For the future, we are confident we will integrate FOSGS more and more into the teaching at IGE and balance the supply of different geospatial software.

[1] STARK, HJ, TIEFENBACH, P. Navigationssystem für mobilitätsbeeinträchtigte Menschen (NafmoM), in: STROBL, J. et al. (Eds.), *Angewandte Geoninformatik 2006. Beiträge zum 18. AGIT-Symposium Salzburg* (Heidelberg, 2006) pp. 597-602.

[2] STARK, HJ. OpenAddresses.ch, in: Tagungsband *Konferenz für Freie und Open Source Software für Geoinformationssysteme* (Freiburg i.Brsg., 2008) pp. 55-60.

[3] STARK, HJ. OpenAddresses - reloaded. *Geomatik Schweiz* (05/2010).

[4] www.mapfish.org [accessed June, 15 2012]

[5] STARK, HJ. , KARRIE, C., BÄHLER, L. Schwachstellenanalyse im Langsamverkehr. in: STROBL, J. et al. (Eds.), *Angewandte Geoninformatik 2011. Beiträge zum 18. AGIT-Symposium Salzburg* (Heidelberg, 2011) pp. 421-427.

[6] STARK, HJ. , KARRIE, C. Anwendung im Bereich Bauzonenstatistik in der Schweiz, in: Tagungsband *Konferenz für Freie und Open Source Software für Geoinformationssysteme* (Dessau, 2012) pp. 46-50.

[7] STARK, HJ. Spatial Pattern Analysis of Secondary School Students' Leisure Behaviour. in: CAR, A. et al. (Eds.), *Geospatial Crossroads @ GI_Forum '12*. Proceedings of the Geoinformatics Forum Salzburg. (Heidelberg, 2012) [currently in print].

[8] STARK, HJ., TREUTHARDT, C. (2011): Switzerland: Introducing Geo-Sensor Technologies and Cartographic Concepts Through the Map your World Project. In: *International Perspectives on Teaching and Learning with GIS in Secondary Schools*. Springer. Dordrecht Heidelberg London New York. 2011.

[9] YOSHIDA, D., SONG, X. AND RAGHAVAN, V. Development of track log and point of interest management system using Free and Open Source Software. *Applied Geomatics* 2(3) (2010), 123-135

[10] MODSCHING, M., KRAMER, R., GRETZEL, U. AND HAGEN, K. Capturing the Beaten Paths: A Novel Method for Analysing Tourists' Spatial Behaviour at an Urban Destination. *Information and Communication Technologies in Tourism*. M. Hitz, M. Sigala and J. Murphy (Springer Vienna 2006). pp. 75-86

[11] SCHLICH, R., SCHÖNFELDER, S., HANSON, S. AND AXHAUSEN, K. W. Structures of Leisure Travel: Temporal and Spatial Variability.» *Transport Reviews 24(2)* (2004), 219-237

[12] SHOVAL, N. AND ISAACSON, M. Application of Tracking Technologies to the Study of Pedestrian Spatial Behavior*. *The Professional Geographer 58(2)* (2006), 172-183.

[13] SHOVAL, N. AND ISAACSON, M. Tracking tourists in the digital age. *Annals of Tourism Research 34(1)* (2007), 141-159

[14] GOLUB, S. Heatmap. Retrieved 10.01.2012, from http://sethoscope.net/heatmap/