Section Sciences et Ingénierie de l’environnement
Design Project 2018 (semestre de printemps)

Proposition n°18

Use of GIS to improve client database for waste services in Chiclayo, Peru

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Project description

In low income countries, planning and financing public services is a challenge. Cities are growing rapidly and public services (water, waste collection, electricity) have to be extended at a growing rate. On another hand, the cadaster and the billing system don’t follow the growth of the cities and population. The business and the households of new area are not in the system, don’t receive bill and don’t pay for the service or the data are not up to date and the billing is lower than it should be. The insufficient financial resources is often the most important restriction to the sustainability of the service, and doesn’t allow to provide sufficient stability in the service, increasing the vicious circle of under development.

On another hand, a good knowledge of the number, characteristics and position of the clients (citizens, family, business, institution) is a key element for the planning of the public services. In particular for the waste collection and street cleaning services, knowledge of the clients type and position will allows to plan and optimize the waste collection tours, quantities and schedule.

In Chiclayo, some old cadaster exist in form of AutoCad maps and other format, as well as data base from different services (electricity, water, waste, etc.) and different database. The integration of data and moreover updating process are weak and numerous areas of urban development have not been integrated at all. The formal cadaster, needing specific accuracy and official data, will take too much time in regard of the urgent necessity to plan and to bill the waste collection service.
Idea of the project is to use open available data like GoogleEarth, OpenStreetMap and satellite images to build a tool for the establishment of a first building GIS database by image analysis. Then, developing a tool that would help the municipality’s employees to control and improve the available information about the occupation of each building directly in the field, through smartphone or tablet would improve a lot the Municipal services efficiency and billing system. Result should be a GIS database with client address and typology of use.

Such tool are of great interest in a lot of cities in developing countries.

Objectives

The Objectives of the project are the following:

1. Develop a simplified buildings cadaster by systematic image analysis.
2. Develop a tool for smartphone, based on GIS tools, in order to provide in the field the following possibilities:
   1. To verify and to adapt the building cadaster.
   2. To see which building has no information, in a map
   3. To see and to control what are the existing information of each building (address, number of apartments and business, household number, inhabitant number, names, etc)
   4. To introduce, to improve or to adapt the missing information of each building, apartment, household, business
   5. To introduce additional information like fee category of provided service.

3. To test the tool, identify difficulties and challenges
4. To provide a user manual (for a client like your grandmother, who doesn’t know anything about GIS)
Main tasks

The Municipality has access to the property register, which is not accurate. It seems that the Municipality has access to a list of citizens, distributed per area. It is not known how accurate this list is. The GIS layers on existing buildings and roads exist, based on recent satellite images, and seems to be much more complete and accurate.

First phase is to

- Compare the AutoCad cadaster map and other available data with the satellite, Google and OpenStreetMap, identify zones of major missing data and propose 1 or 2 pilot area for developing and testing the tools.
- Analyze the existing structures of the Household and Business data and of the billing system data.
- Specify, in collaboration with CSD GIS and waste experts, the output and functionalities of the tool to be developed. Propose a model of databases and additional information if necessary, in discussion with CSD and local team.

Second phase:

- Propose a solution of image analysis that could provide a first GIS buildings cadaster of the pilot area.
- Develop a simple data base of buildings and clients
- Elaborate a tool for Android smartphone, based on data from OpenStreetMap (OSM) and ArcGIS Online or other easily available data in order to provide in the fields the missing information of each building and complete the database.
- Have the tool tested by local students who will be organized by the local CSD team if possible.
- Show gaps and difficulties, present propositions and road map for the implementation of the system at the municipal level.
- Elaborate a training document (user manual) in order to explain to Municipal employees and other service providers how to use the tool.

The project will be based on a real present data and situation of the Chiclayo Municipality, Peru. Data will be facilitated by CSD local team. Project will be followed by Swiss CSD experts.

Skype meeting with the students, CSD Lausanne and Chiclayo will be organized during the project.

Divers

Students should develop they knowledge and experience in the fields of

- Cadaster, client database and billing system for public services
- Using GIS, OSM, Image analysis and databases for public services in low income countries.
- Development of tools for Android smartphone and ArcGIS Online (or QGIS)
- If possible the project language should be Spanish. If not, report will be delivered in English.
- As a pre-requisite, students should have taken the “SIG” course taught by François Golay.

F. Schmidt/E. Gex/P.Blunier / 7.12.2017