Toward Smart Cities through autonomous detection and reconstruct The Brazilian Panorama in 3D MAPPING

NTRODUCTION

owadays, by the use of intelligent techniques, every single letter, word, face, car, urban object, and many others, can be easily interpreted by a computer once it is filmed or pictured. At the same time, we have lived under a great moment in research regarding large-scale 3D urban reconstruction. New lines of studies has been exploited in order to establish more sophisticated understandings in how urban spaces ranging from the use of more sophisticated hardwares. The appearance of LiDAR (Light Detection and could be better managed. Recently, and thus mature, a new demand in the areas of **Photogrammetry** Ranging) [VOSSELMAN, G.; DIJKMAN, S. et al. 2001], Structure-from-Motion (SfM) and Multi-View and **Remote Sensing** is leading the research to a next level of analysis, in which a **mix of technologies**, Stereo (MVS) workflows [SNAVELY, N.; SEITZ, S.; SZELISKI, R. 2006], for instance, brought to real the such as IoT (Internet of Things), Cloud services (e.g. SaaS, IaaS), ready-to-use Machine Learning libraries, possibility to acquire the volume of things. With this remarkable stage, together with concepts of urban have turn what were until then very unlikely, in something feasible and pratical in our daily lives.

Big Data acquirement, we heading increasingly **to semantic analysis** and better estimates.

5. Volumetry, for urban assessment

According to a recent survey, approximately thirty real applica-

tions with the use of **semantic cities**, have been reported, rang-

ing from environmental simulations, cost reduction in modeling

and decision making. Understanding the principles that establish

the organization of such environment, as well as its dynamism,

requires a structural analysis between its **objects** and **geome**-

try. Therefore, reproducing the maximum of its geometry and

of solar irradiance on rooftops, surveillance 🏪

cameras, Wi-Fi coverage, among others.

volume allows studies such as the estimation

1. Urban planning and land-use

By the use of remote sensing, all the urban perimeter can be monitored over times, by a different set of sophisticated devices, ranging from orbital sensors, airplanes (medium or

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7. Sustentability and Renewable energy

From the Cambridge University dictionary, Sustainability stands from "the quality of causing little or no damage to the environment and therefore able to continue for a long time".

long-range), UAVs, and even terrestrial. Sometimes, these plataforms are also hybrid, putting together the best in term of imaging. Once available, this kind of campaings provides a deep and precise perspective for the better use of their resources.

2. Internet of Things (IoT)

It aims to connect physical world to the Internet, thus, data from any eletronic device can be use to increase productivity and efficiency over a specific environment. Without you note, but with a huge impact in your life. Example of these elements: traffic lights, home devices, keys, smartphones, cars air-condicioner, based on the weather temperature, the flux of people on the streets, so on.

3. Green buildings

Increasing green areas in large urban centers helps reduce the impacts caused by high temperatures, pollution, and micro-climate conditions. Thus, potential areas that until then were little used, such as terraces, where it receives light solor for almost the whole period of the day, today are filled by large gardens and recreation areas. In Brazil, the Green Buiding Council Brasil regularize and certificate the sustainable buildings, what gives Brazil the 4th international position.

4. Navigation and Transport

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Real-time GNSS navigation systems provide accurate location and assist all the population and government who has been benefit from all the services provide, for instance, best routes, shortest routes, incidents control (e.g. car crashes, and under constructions paths), with smart algorithm for alternatives routes, so on. Besides, the population has access to the local transport network, with apps in their smartphones, where even the payment can be direct made. Of course, with data coming from all over the city, areas with low accessibility could also be used as information to coordinate a joint action to spread the technology.

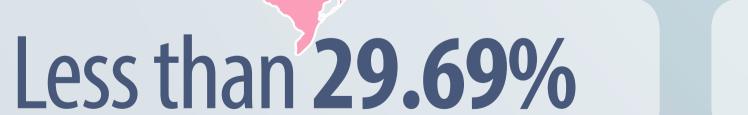
We are in a world that the thinks on "environment" is low or even null to a great majority of the population. Instruct and help people to know about the benefit of the rational use of our natural resources is something that has been so important as the resources itself. An example of that, is the adoption of the so called clean energy, which bring us the same facilities we need.

6. Smart water

Since thousands of liters are daily wasted, devices has been installed to monitoring certain areas (specially on agriculture, where the index is higher) to better assist and plan strategies to reuse the water. Recycled water can satisfy most water demands, as long as it is adequately treated to ensure water quality appropriate for the use. Besides, water recycling provides tremendous environmental benefits. By providing an additional source of water, water recycling can help us find ways to decrease the diversion of water from sensitive ecosystems.



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CONSIDERATIONS

- The technologies to **observe cities**, such as sophisticated sensors, reconstruction and classification techniques, evolve as the numerous architectural styles
- It is essential to think that the **multiplicity of architectural styles** is not the only problem
- **Materials** used in construction, might become **dynamic** and, therefore, do not present a single static structure of a building
- In Brazil, there are several issues that makes 3D mapping even more challenging

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MED. PRECISION

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