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The Trends of Geotechnology to Support Urban Planning: New Paradigms and Challenges

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Abstract: This work aims at making one brief contextualization on the state of the art of the geoprocessing in urban planning to present the new paradigms and challenges of the geo technologies related to the management of the cities. The visualization of planning process allowing the comprehension of the possibilities contained in public landscape planning represents the main challenge faced by this research. Another important goal is to investigate how to overcome a paradigm related to a coded urban planning system communication that hinders community understanding and participation. This state of the art of the space production justifies the current studies in the geoprocessing for the development of tools, techniques and methodologies that meet the necessities to create interpretative pictures of the urban landscapes that facilitate the dialogue among the technician, the administrators and the community. The methodology was based on the cloud of points using Lidar techniques, 3D modeling, tools of visualization and parametric modeling of urban parameters. In this direction, this work will point out the new trends of representation of the data and the decoding of the cartographic language from the geo visualizers within the values of interoperability, involvement of the actors, feedback and proposals from geo design.

Key words: Geoprocessing, 3D modelling, geodesign, urban planning

1. Introduction

The process of production of the space based on the reproduction of the society is currently carried out producing new contradictions caused by the extension of the capitalism. Hence, we face the necessity to deepen the debate around the contradictions between the public and private space, the space of consume—consume of the space, relative abundance of the production—new rarities, fragmentation—globalization of the space and the instruments for urban reform. Therefore, the contradiction between the process of social production of the space and its private appropriation is on the base of the comprehension of the space reproduction nowadays.

This work aims at making one brief contextualization on the production of the urban space considered the social functions of the city and the necessities of the urban contemporary reforms as the trigger of recent studies in the geoprocessing for the development of tools, techniques and methodologies that meet the necessities to create interpretative pictures of the urban landscapes. It is understood that the contemporary reforms are structuralized from two possible logics. The first one moves toward the entrepreneurship which is supported by the public/private actions of interests that aim at the growth and the economic competitiveness of the city. They are point transformations through speculative constructions of the territory. The second logic, in a much slower process, is based on the changes concerning the role and the actions of the urban norms. This way, the performances in the production of the landscape are in charge of the public power and they count on legal instruments with different scale parameters of planning and urban management.

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The research process allowed the comprehension that decoding the information of the master plan creates possibilities for planned landscape. So, one can deduct that the result for the lay community is the restriction of understanding and, why not say, of their participation, since often the lack of understanding can lead to lack of interest concerning the landscape planning production. In this context, one of the main challenges of the research can be highlighted: address the limitations concerning the landscape production communication by seeking for new languages to support decision-making processes.

The media mostly used for legislature visualization is the writing media (text, tables, or decrees). This means of communication demands a decoding that depends on technical knowledge and by consequence enables the community to understand the possibilities proposed for the designed landscape. In this way, this research face a new paradigm regarding the investigation of medias and tools that allow a truly community participation in urban management and planning.

Therefore, one of the pillars of this work is the geoprocessing techniques that produce a multiple vision over the territory. It not only allows the planning but also the management of the urban environment. It also allows the simulation of sceneries and a broad and interactive divulgation of the knowledge acquired about the reality. This work will show the state of the art in geoprocessing concerning the urban planning, the modelling and the models for urban environments to introduce new concepts, challenges, paradigms, techniques and methodologies for the management and urban planning, especially under the view of the Brazilian reality.

The geoprocessing lives a moment of concern with the transmission of the geo referred information through systems that allow the understanding of the non expert. The diffusion of the computer world-wide net and the multimedia have come as an aid to the consolidation of the importance of the three-dimensional models in this process of mitigation of the difficulties of decoding the cartographic communication. It is in this context that urbanism starts to narrow the relationship with the geo technologies. The three-dimensional models have gained strength and have become a major planning support system through the communication of the landscape potential approved by the regulatory norms along with the technicians and the planners who are responsible for the consent of urban actions. In this sense, it is visible the growth of the demand for techniques and technologies that enable to plan and build environments in an integrated process, including project conceptualization, analysis, design specification, stakeholder participation and collaboration, design creation, simulation, and evaluation. The geo design brings the planning approach that grounds design methods and practices together with human temporal and spatial knowledge and natural geographic contexts. It is from the convergence of geographic information systems and the building information modelling that we introduce a practical response study to the concepts that carry within themselves new challenges and paradigms of the urban representation of space, parameterized modelling of territorial occupation [1].

2. Geoprocessing on the Urban Planning

Urban planning decisions based on policies, operational and structural issues that unfold in so many difficult choices of variables to be set without a systematic study. Knowing the territory, stage of the transformations on the territorial dynamics, is the need to take mindful actions about the paths to be covered so that the objectives defined in the plan are achieved. In this sense, it argued that the best way to analyze and manage information for a good municipal management is through the application of GIS techniques, by favouring the integration of information, the composition of variables in a systematic manner, and proposing possible scenarios and the construction of portraits of reality according to different optical and values.

Concerning the importance of building, a previous portrait, or many portraits showing the urban complexity before the start of the process of proposal of its ordination, depends Niccola [2]: “Leggere il territorio prima di progettare, prima di programmare” (Read the territory before plan, before programming). The thought is completed by Van Der Berg and Van Der Meer [3] when they say that “il tempo passato pianificazione programmata. Si deve dare spazio ala creatività e a flessibilità” (Spend time planning a schedule. You must give space to creativity and flexibility)

Organized, correct and available information in an agile way is a strategic and indispensable resource to take appropriate decisions and in a timely manner. Moura [4] states that the GIS is an important management tool as it is a set of technologies for processing information whose geographical location is an inherent characteristic, essential for analysis. It is possible to automate the production of cartographic documents. The use of geoprocessing techniques assists the production of analyses in recent trends, especially when the goal is the production of synthesis of data and mapping of information obtained. In this way, the geographic information systems is able not only to store as well as to manage, cross and analyze a range of different sources and stemmed data with different formats, which makes it the ideal tool to represent the urban environment and all its complexity. It is relevant to say that the SIG produces multiple look on the territory and allows not only to plan but also to manage the urban environment. It also allows the simulation of scenarios and the large and interactive divulgation of the knowledge, acquired about reality.

Geographic information systems are structured ways of representing models or pictures of reality. Marine [5], when defining what is expected of geographic information systems, highlights the use of digital files as models of the real world. On the other hand, Tomlin [6], when talking about the cartographic based on which rests the geographic information systems, reports that the maps are based on the visual language and as a language, this is a formal system of symbols, rules governing the formation and transformation of those symbols.

On the same theme, Board [7] explains “It is comparatively easy to visualize maps the representational models of the real world, but it is important to realize that they are also conceptual models containing the essence of some generalization about reality. Hence, maps are useful analytical tools which help investigators to see the real world under a new light, or even to allow them an entirely new view of reality.”

When defining the geographic information systems, Cowen [8] as one of its main features: the data reporting subsystem which is capable of displaying all the part of the original database as well as manipulating the data and the output from the spatial models in tabular or map forms. The creation of these map displays involves what is called a digital or computer cartography. This is an area which represents a considerable conceptual extension of traditional cartographic approaches as well as the substantial change in the tools utilized in creating the cartographic displays.

With the strength of the worldwide network of computers, the geographic information systems were adapted to become accessible to the general public through geovisualizers.

The exploration of visual communication, or what has been termed as the geotechnologies visualization process especially in geographic information systems and their developments in geovisualizers, is defined as a discipline that allows you to “see the unseen” [9].

Three main systems with these values: WebGIS, three-dimensional models and WebScenes are 3D models available on the web. These systems brought with them the need of working languages and the data access and the construction of information mode that had communicability and could encourage the use of non-expert people. The decoding of the cartographic language as well as the interaction of the user in these systems is what allows the collection and action of the expertise of the various actors involved in a decision-making process for ease perception of the space.

The scientific literature recognizes that visual perception is a method for the identification and production of knowledge. Since the 1960s, the authors have already proposed methods that have been able to identify the construction of mental maps (which are decoding the image construction of the territory), with a view to building a bridge between reality and representation of reality.

There is a real territory. There is your mirror perceived on the mental maps of citizens and there is a way to represent this reality in order to extract the essence of what is the territory. In this sense, it is worth remembering the studies of Norberg-Schultz [10] who advocates the importance of identifying what is the essence of each territory through the principle of genius loci. The identification of this essence is the construction of a mental synthesis of what is the most essential and valuable in the landscape.

Among the authors who have proposed methods of decoding and applying the interpretation of the mental maps in the processes of recognition of notable landscapes and the support to planning and urban design projects, Lynch and Cullen must be cited.

Lynch [11], in the publication “The Image of the City” developed a method to identify the main urban structures and from these structures understand what value is for a territory. The same author explored in other publications the question of landscape value in Lynch [12, 13]. At the same time Yi-Fu Tuan published about topophilia (feelings about space) and the issue of identifying what value is and act in order to preserve these values were further explored. Another highlight is the work of Cullen [14] which aims to identify the meaning of urban occupation according to the visible landscape, showing a way to represent the essence of landscape captured through the eyes of its users as if you were performing the route in urban space.

The visual analysis of the territory is recognized as a value for urban planning authors and understanding that every representation of reality is a temporal, cultural and even individual perception, which means that we have adopted models to represent the territory. In this sense, there is a common interest between the GIS and the urban planning. The geovisualizers bring responses and communication simulation of visual impacts caused in the landscape before decisions about parameters changes, new policies or even edification.

A new form of digital representation of objects called “BIM”—“Building Information Modeling” was born in the graphical representation of the project areas, among which is the architecture. According to Moura [1], the logic of BIM is composed to decompose, what the opposite of logic of the SIG, which is decomposed into alphanumeric tables and information plans to then compose in synthesis processes or integration of information. The BIM object is represented in the fourth dimension, and from the existence of the object as a whole it can be decomposed into its various plans, namely: plans, sections, facades, database, among others.

Because the object is represented as a system, any change in some of its features result in changes and updating of views in different planes of information representation. However, the focus of these tools remains on individual new building construction within representations containing almost no information about their geographic context. Conversely, the representation of built-in forms within GIS (geographic information systems) overlay remains simplistic, usually consisting of 2D footprints. This makes it difficult to conduct neighborhood, city or regional scale assessments that take into account important characteristics of design proposals.

It is based on the interest in not only shape the interpretative portraits, but also generate simulations of reality, that the Building Information Modeling took strength within the context of the technologies of digital representation, and move toward being incorporated into GIS, through symbiosis BIM GIS.

The BIM is still very recent, and does not have the same maturity of the SIG, but it will be the convergence and integration of these two models, concepts and systems that will bring to GIS a new way of thinking.

This new paradigm, called Geodesign, is a design and planning method which tightly couples the creation of a design proposal with impact simulations informed by geographic context. In an ideal case, the planner or designer receives real-time guidance on performance at every phase of design from early site visit or conceptual sketch to final detail. The use of geographic information design means that contextual performance can be evaluated concerning the local conditions, and that evaluation can and should consider off-site impacts. The focus is on supporting "human in the loop" design, providing continuous feedback on multiple aspects of performance and improving designs-in-progress rather than on post-hoc evaluation. The Geodesign information modeling are systems that allow sketching interface within GIS to connect this directly to geoprocessing models as to support a new mechanism for rapidly generating spatial features with attributes, tightly coupling design and assessment of sketch in the built-in geo referenced landscape and the design-time feedback. These first concepts guide the Placeways and CommunityViz software Criterion Planners INDEX.

These new planning support systems is based on tools to support projects that are not restricted only to the design of the territory, but it answers the propositions of simulation of streetscape with tools that facilitate communication of urban context through 3D models. The models can become even more innovative if the data modeling respond the proposal of creation of parametric scenarios of the composition of the occupation of the territory, which Moura [1] has called a "Parameterized Modeling of Territorial Occupation", or "Parametric Modeling of Territorial Occupation".

The new path, the Geodesign added to Parameterized Modeling of Territorial Occupation, comprises an environment of full use of GeoTechnologies for analysis, simulation, proposition, detailing projects and communication with different users. It is necessary to integrated systems, modeling and construction of interpretive portraits and simulators of reality, investment in visualization and best community involvement, interoperability among systems.

The conditions presented allow the urban planner to simulate, in an expanded reality, the landscapes resulting from their zoning propositions, models of occupation and urban parameters table. This employed more widely as a tool of urban planner's work will enable the bridge between technical, administrative and language of the community when adopting a long-term strategic plan and its parts. The users will be able to have a virtual representation of the meaning of the parameters proposed. Everyone can then decide, in a democratic way and with the support of the best ways of communication about projects that result from the expected and consistent landscape along with the values and the culture of the society inserted in its territory.

Giacomelli [15] states that the complexity of these models and the variety and volume of information need to be studied in terms of environment processing and post-processing, related not just to the technology SIG, but to the tool that will host this interface of scientific visualization system, image processing and data management. This planning support system is a result of the composition of various elements and forms of modeling which make the systems robust and heavy.

In this sense, the CityEngine presents 3D modelling software specialized in the generation of models of the urban environment. CityEngine was developed at ETH Zurich, by author Pascal Mueller, co-founder and CEO of Inc. Processual. During his doctoral research at ETH Computer Vision Lab, Mueller made up a large amount of innovative techniques of procedural 3D content modeling for architecture, which were compiled and today result in CityEngine software.

The CityEngine was purchased by ESRI, an enterprise of the main software SIG commercial in the world (ArcGis), and in the light of this change, the software went on to incorporate the logic of spatial geo referenced data, in addition to the possibilities of normative standards of the urban space soil definition, becoming interesting for a work in the direction of the MPOT.

This work will use the software city engine as the default of the interaction system of community, feedbacks and simulations of the landscape impacts. Will be done the simulation of the city as it would be if everyone build everything that is permitted by the law from a script of algorithms of parameters set by the strategic plan of Belo Horizonte in order to evaluate the landscape composition. In this sense it will be possible to provide the public administrators with a system to guide how the definition of areas with potential for transformation and the preferred areas for urban densification.

3. Methodology

The script of this methodological work begins with the investigation of new values and concepts in the geoprocessing, reading and reflection on the state of the art of the regulatory norms of the transformations of the urban landscape and the choice of the tools best adapted to the needs of the landscape planning and management, taking into consideration the specific interests of finding a planning support system that links the new concepts of the geovisualizers with the values of the communication and the interaction.

The methodology is based on the following steps:

(1) The real city modeling through the simulation of rules determined by Plano Diretor plan and the Law of the use and occupation of the soil, reproducing the envelopes of the urbanistic parameters;

(2) The real city modeling, from point cloud technology (Lidar);

(3) The visualization of the relationships among the real city and the legal city, permitted by the law, in order to create the conditions to understand the different city actors (citizens, politicians and entrepreneurs).

3.1 Legal City Modeling through Urban Parameters Envelopes

We chose the CityEngine application (Fig. 1) because it allows the interaction with the user and it utilizes three-dimensional models.

It was necessary to test if the inclusion of new parameters that define the urban Brazilian standards was really open.

In this sense, it was necessary, in order to build up the rules, to tabulate the information of the urban parameters of Belo Horizonte to check what the permissions and restrictions of each type of zoning are.

Some urban parameters were extracted from the master plan of Belo Horizonte as: coefficient of utilization, area of the lot, occupancy rate, maximum height on the border, setbacks and others (Table 1)

After checking the parameters that governing each zoning area, it was necessary to develop the logic of how the urban parameters relate to one another (Fig. 2) to give the basis of the algorithm parameters to be inserted in the system. It was defined in that first moment of tests when creating the rules that the parameters would be the use coefficient, occupancy rate, maximum height of the border and setbacks. These parameters were selected because they showed a greater complexity at the entrance of the algorithm.

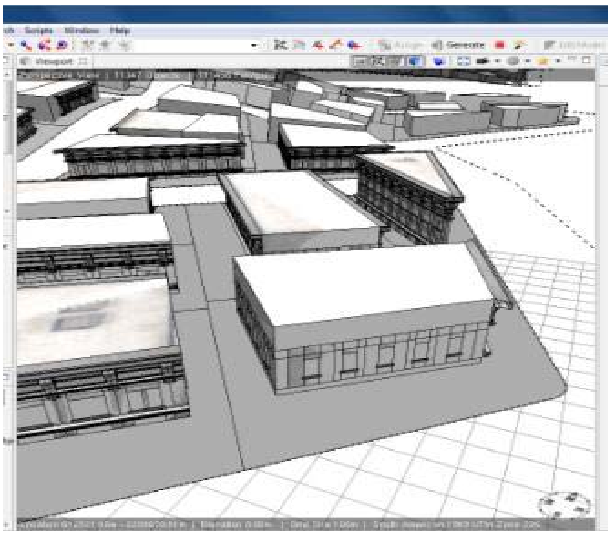


Fig. 1 CityEngine showing the possibility of the work in 3D.

Table 1 Table of parameters of Belo Horizonte.

Zone	Coefficient of utilization	Occupancy rate	Maximum height on the border
ZPAM	0.05	0.02	-
ZP-1	0.3	0.2	5.0
ZP-2	1.0	0.5	5.0
ZP-3	1.5	0.5	5.0
ZAR-1	1.0	0.8	5.0
ZAR-2	1.0	0.8	5.0
ZA	1.5	0.8	5.0
ZAP	1.7	0.8	5.0
ZHIP	3.0	0.8	10.8
ZCBH	3.0	0.8	10.8
ZCBA	2.0	0.8	9.0
ZCVN	2.0	0.8	9.0

Master Plan of Belo Horizonte.

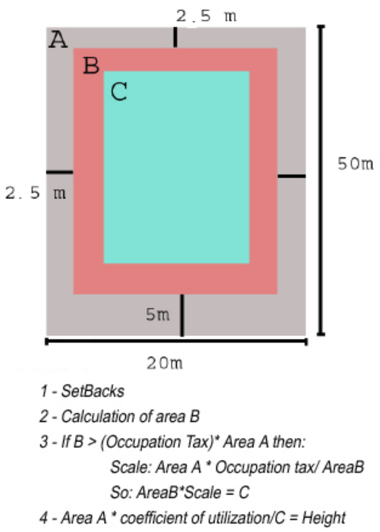


Fig. 2 Logic interaction of urban parameters for the creation of the algorithm.

It was created from the CGA language programming, the algorithms and rules for the simulation of the legally permitted city (Fig. 3).

We used a test area to check whether the rules could shape the city and a three-dimensional interpretive portrait of how the city would be if all the people build the maximum allowed in each lot according to the urban parameters defined in the master plan (Fig. 4).

The buildings in red mean the possible building area considering the minimum setbacks. Inside the red, it is possible to place the building in any position. The occupancy rate which is a value smaller than the surface left for the setback must be respected. That is why we applied the basic rule.

3.2 Existing City Modeling, through Point Cloud Technology (Lidar)

After the elaboration of this model, we used the Foundation of Belo Horizonte for the construction of the model of the real city. These data was acquired from the laser flight (Fig. 5).

According to Shufelt [16], the laser survey is done from Lidar technology (Light Detection and Ranging), more precisely, Airborne laser systems. The time and facility to obtain information of the Earth's surface have been practically overcome. However, routines for automatic setting of the edges of the objects with precision and efficiency (e.g. building outlines) are in full development.

After the laser profiling, the gross point cloud for the whole municipality of Belo Horizonte was available. The first step was the insertion of this cloud of points in the MicroStation software by extending TerraScan.

After the entry of the data, it was necessary to do a preview using the hypsometric scale that works with the symbolism of color order (Fig. 6).

The cloud theme mapping process facilitated the identification of the highest points of the city. The identification of these points, displayed in red, will be the basis for the adjustment of the incorrect points.

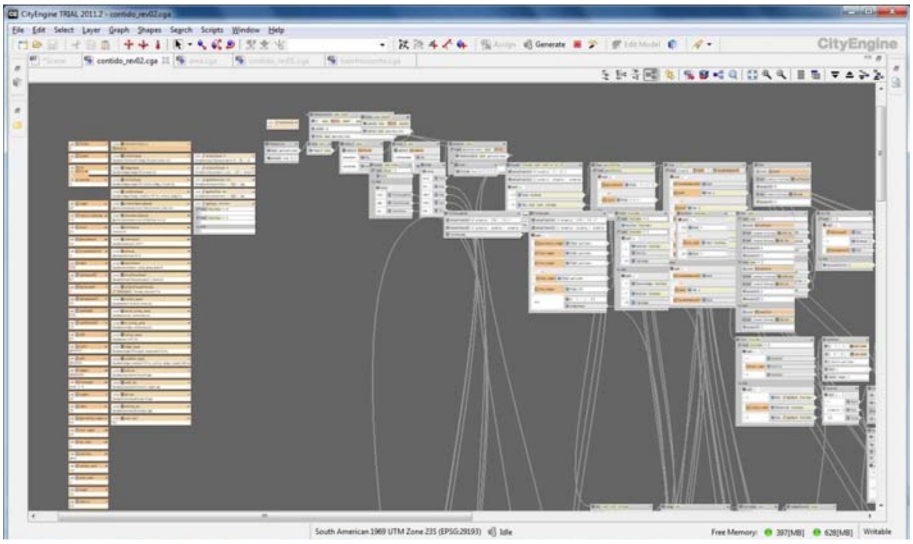


Fig. 3 Rules developed in the CityEngine.

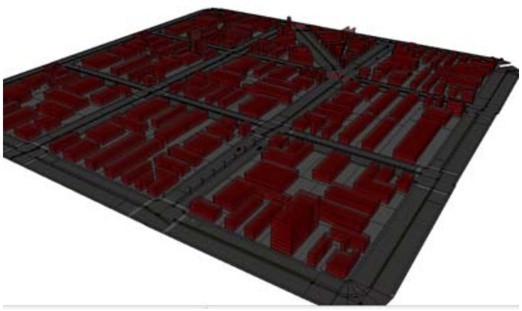


Fig. 4 In red the builds of the legally allowed city generated from the algorithm developed in the CityEngine.

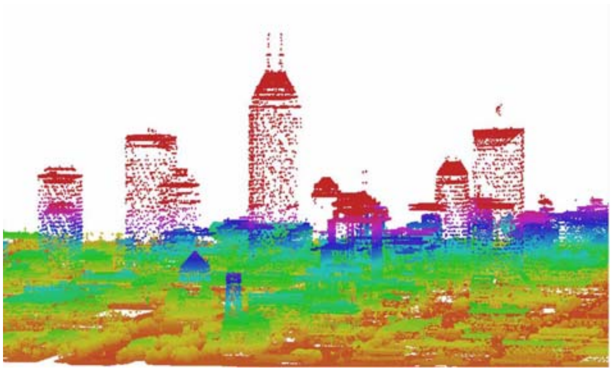


Fig. 5 Perspective view of the point cloud.

At that time, the visual identification of the locations where there were buildings was made (Fig. 7a) and it was necessary to make the profile view to calculate the maximum height of the buildings and the values that we would consider a mistake in the process of the acquisition of the points through laser scanning (Fig. 7b)

Fig. 6 View from the top of point cloud through hypsometric color representation.

After setting the height considered correct for the definition of the buildings, a clean sweep in the cloud of points for extraction of points with height values inconsistent with the analyzed space was made. After cleaning the incorrect points, it was necessary to separate the points corresponding to the ground, the points corresponding to vegetation and other features of the city.

In order to obtain the DTM (Digital Terrain Model) it was used the routine “Classify Ground”, which uses a filtering process on the MDE (Digital Elevation Model), where the user sets some parameters of the studied area (e.g. terrain slope, maximum size of existing


(a)

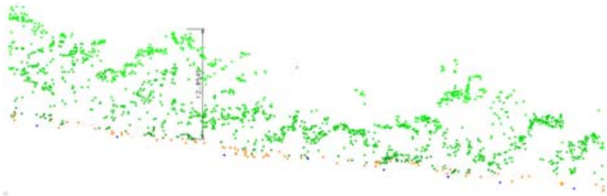

(b)

Fig. 7 (a) Visual identification of the buildings the definition of the area that we would like to see through the profile signed in red; (b) Profile view of the points and height calculation of the highest points.

buildings etc.) and having the lowest points of the terrain as the base, the routine creates a preliminary surface through the method of triangulation designated as TIN (Triangulated Irregular Network). Through interaction, the research and routine sorts the remaining points that belong to the ground in a fully automatic way, defining this way the digital elevation model (Fig. 8).

The separation of the points of the vegetation of the buildings was to select all the points between 0.5-3 meters height.

After this classification of dots corresponding to the terrain, the average dots of the low vegetation and incorrect scans dots it was possible to identify the corresponding points to the buildings (Figs. 9 and 10).

The last process was the automatic construction of vectors that consisted in detecting corresponding dots to flat surfaces and the criteria such as, maximum distance between the plans; minimum building area for representation; maximum roof slope; among other existing parameters at TerraScan default routine.

The construction of the vectors began with the largest building found. As a result, forms were created

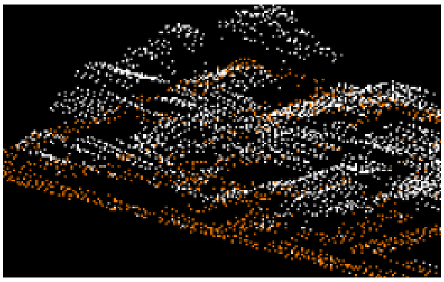


Fig. 8 Digital Elevation Model whereas the orange dots represent the points related to land and the white dots correspond to other features.

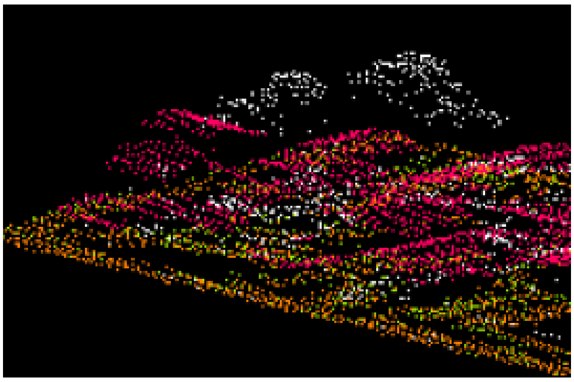


Fig. 9 The orange dots correspond to the terrain, the green dots correspond to vegetation, the white dots correspond to scanning errors and the red ones the buildings.

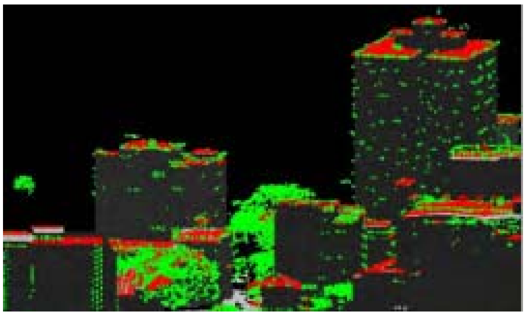


Fig. 10 Profile view of the dots in red that correspond to the buildings and the green ones to the vegetation.

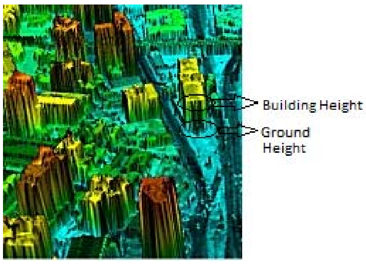
for each plan from the roof and side walls, according to the settings of the program. In addition to these, details like the edge of rooftops and notable objects on the coverage of the buildings were also represented in the model (Fig. 11)

After the elaboration of the polygonal vectors relating to the buildings, it was necessary to undertake a process for an estimate calculation of the height of the buildings.

It was necessary, for this work, to make a laser intersection with digital elevation model in order to

Fig. 11 In red, the automatically generated vector created from the points related to the buildings.

Fig. 12 Surface Digital Model-Digital Elevation Model attached to buildings from laser data.



(a)

Location: -75.160234 39.957397 Decimal Degrees

Field	Value
MapTip	
Stretched value	1
Pixel value	4

(b)

Fig. 13 Calculation of the height from the highest point of the building from the lowest point of the terrain.

make the calculation of the height of the feature, as shown in the Figs. 12 and 13.

This same process was repeated for all existing buildings (Fig. 14) and later they were elevated in the city engine from the information of height in the table of attributes, as shown in Fig. 15.

It is important to highlight that at this point we used the three-dimensional collaborative mapping through Google sketch. This process was important to texture the buildings according to the actual information. In this process, over 50% of the city has been mapped. The process is based on the fitting of blocks in several perspectives of the buildings as illustrated in the Figs. 16 and 17.

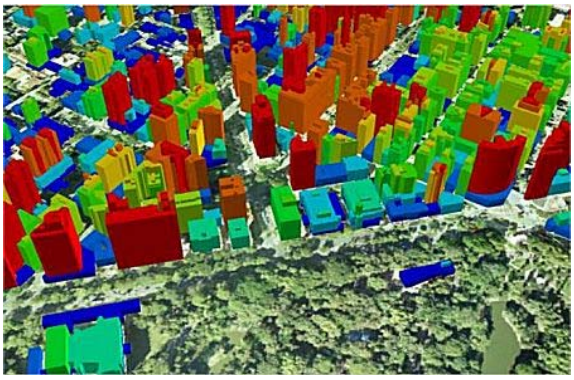


Fig. 14 3D modeling over the city of Belo Horizonte highlighting buildings with a height greater than 10 m.

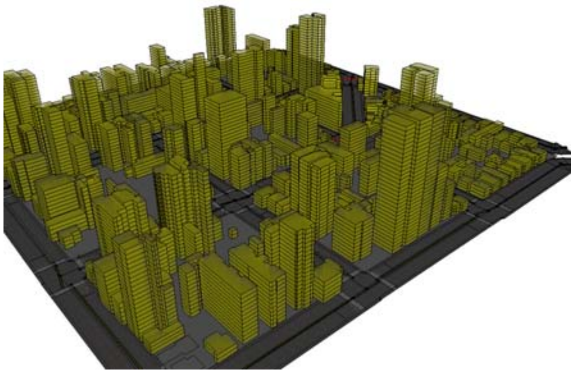


Fig. 15 In yellow the builds of the real city extruded without texture seen through the CityEngine software.

3.3 Viewing the Relation between the Real City and the Possible City, Permitted by Law

With the modeling of the real city and the city according to the urban parameters, it was possible to make a comparison of the locations where there are stocks of construction, i.e., places where people could build more according to the master plan but decided to build smaller buildings (Fig. 18).

It was defined for the specific analysis of volumes built and allowed to work with textured images, once the beauty of a building can have an impact on the process of approval of a project.

The definition of these construction stocks was the first step to check the sites subject to urban growth (Fig. 19).

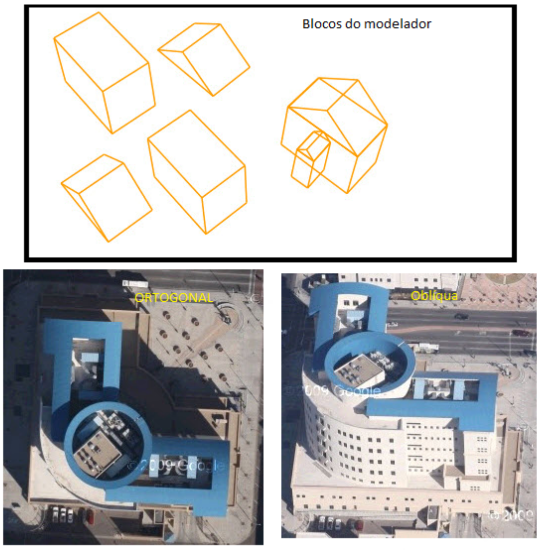


Fig. 16 Modeling in blocks and perspectives of the buildings.

Fig. 17 Example of docking blocks in building and texturing process automatic.

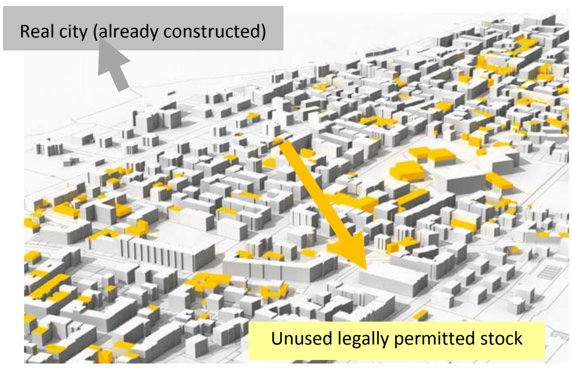


Fig. 18 Comparison between the real city and the city legally allowed.

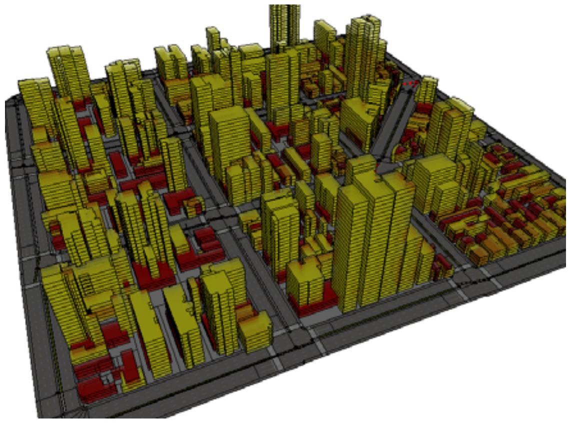


Fig. 19 Existing buildings generated from the dot cloud in yellow, envelopes generated from the rules of the city parameters in red. Comparison between the two cities. In red the legally allowed city and in yellow builds of the real city.

Some tests were carried out with the technicians to check whether the system actually comprises the basic premise of interaction so that the end user becomes a participant of the collective landscape. This interactive process was initially conducted with the technicians performing a test to know the understanding of the planners in relation to the changes of the urban parameters. This test was conducted within the City Engine software where the volunteers could use bars to increase and decrease the occupancy rate parameters, the utilization coefficient, setbacks and other (Fig. 20).

Later, the two models were published on the web to provide data to the community and to do some tests of interaction and communicability (Fig. 21). This integration of the models in the web is performed from the export of models and geometries to glued files. These exported models are inserted into the proprietary platform of the CityEngine software online. This step of the WebScene is still in test phase since the web platform still does not allow changes to the parameters. Some investments around the customization of the interface with the values of interaction and visualization are welcome.

4. Results

This work is part of the doctoral thesis of student Sheila Santana, under the guidance of Prof. Dr. Ana

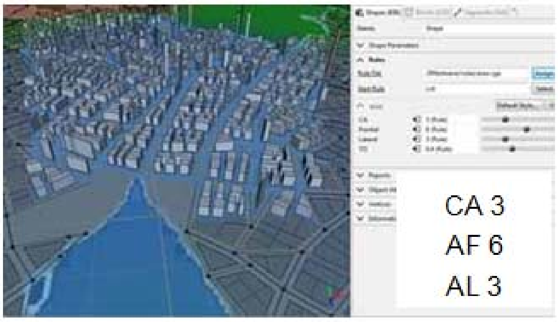


Fig. 20 Landscaped responses to changes in parameters.

Fig. 21 Visualization of both scenes: Swipe layers from the built-in city up to the legally permitted city.

Clara Moura on the postgraduate program in architecture and urbanism in the school of architecture at University of Minas Gerais-Brazil.

We are facing new challenges and paradigms of territorial representation, especially in urban areas. This study indicates that we are on the right path for the preparation of a planning support system that will show the conformation of the urban propositions of technicians to a more effective and participatory planning. The preview of the landscape to be built will make it possible to assess whether we are leading the town to an urban expansion aligned with the logic of maintaining the social function of the city.

The development of this prototype showed that the system has several applications, from the presentation of the visual impacts of a new building through the textured city model to definition of construction stocks for the assessment of potential areas for urban densification.

The next steps are to advance in the development of some existing rules and exceptions in relation to urban parameters and start the discussion on solar envelopes analyses and energy efficiency

5. Conclusion

It is a work quite innovative in the Brazilian context where the discussions about the participatory involvement of the various actors in the city are in focus.

The geovisualization through 3D models and the WebScene brings a new way of thinking within the urban planning and the geoprocessing. The decoding of the geographic information bringing the top vision to the perspective vision ensures that people of different skills and experiences interact more with public authorities in the decision making process.

According to Chorley and Hagget [17] the models, which are the simplifications of the reality, are characterized by the conditions of selectivity (choose the most relevant information), structuring (recognition of the relations among the elements involved), suggestiveness (present explanatory potential), readability (should be simple to be recognizable) and re-applicability (should be re-applicable in different instances of the same class).

Thus, the choice of viewing modes of urban landscapes information must consider these conditions, and should meet the role of facilitating the dialogue among community, planners and the territory managers.

This prototype has shown that it can be one of the answers that meet the new values of interoperability, interaction, feedback and proposals discussed within the new concept of Geodesign.

It can be an instrument that will help to build a truly intersection between landscape planning processes and the community, by allowing the understanding and participation in urban planning management.

The next steps are planned to be the text of the prototype with the application of a new law in Brazil, called “City Statue” that defines the possibility of transference of volumes among lots, to provide urban equal distribution of densities and volumes. It is denominated “onerous grant the right to build” and it permits to negotiate extra volumes on new constructions, but to be authorized it is absolutely necessary to take control of the transformations of the city landscape and use, taking into account the opinions of the society as a hole. By to take part of decisions, the stakeholders must be able to visualize, to understand and to construct a real idea of the urban planning and its possible transformations. We believe this methodology can be quite useful to develop this knowledge and capacity.

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