

“Lenticular Foil Display” new Geo-data visualization tools for Participatory Urban Planning

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SUMMARY

Visualization is one of the most attractive tools for participants to be effectively involved in planning processes. The development trends in Urban Planning and Management to more strategic planning with an emphasis on a more collaborative planning process. These developments play an important role in the planners responsibility, which has changed from ‘only’ preparing a plan to becoming a coordinator on between the many different stakeholders.

Many great advances during the last 50 years in the development of Geo-Information Technology has greatly improved its use in strategic planning. Particularly the integration of Remote Sensing and GIS for use in spatial data management, and specifically in Urban Planning, lead to the development of several visualization tools which can be useful for participants in the planning process. These new visualization tools have the advantage, especially in developing countries, of being easily handled and understood by the participants from varying levels of education and at same time can be easy integrated into GIT.

This paper will discuss the use of the Lenticular Foil Display as a new visualization tool for urban planning participatory enhancement by selecting an application case study of Tripoli-Lebanon. This case study was completed as part of PhD research study done by the author in corporation with the Dresden University of Technology (TUD) and the International Institute for Geo-Information Science and Earth Observation (ITC). The role of the Lenticular Foil Display was evaluated by interviewing various stakeholders from different background and levels of education. Their comments and contributions were the integrated into GIS software and analysed for Tripoli Master Plan evaluation.

“Lenticular Foil Display” as new Geo-data visualization tools for Participatory Urban Planning

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1. INTRODUCTION

As in most of the developing and developed countries, Tripoli has undergone rapid changes in land use/land cover as part of an intensive urbanization and industrialization process during the last three decades.

In 2000, a new master plan for Greater Tripoli covering Tripoli’s old and new city, El-Mina and the two neighbouring areas El-Bedawoui and Ras-Maska was required by the Director General for Urban Planning (DGUP). Until recently, the project was a work in process and not yet approved due to conflict among the many stakeholders involved in the planning process. The inclusion of many of the various stakeholders in the planning process was being attempted for the first time in Lebanon but was proving to be ineffective. Multiple reasons contributed to this unsuccessful attempt, including: lack of community planning tools, the wide range and varying backgrounds of the stakeholders and poor quality geo-data visualization techniques.

Remote sensing and GIS as “inherently linked technologies” can be basic tools for land use planning. The lack of remote sensing and geo information systems (GIS) in this crucial period shows, ex-negativo, the necessity of these technologies and the need of criteria to solve the problem of rapid development in Tripoli.

This paper will present the role of visualization tools in participatory planning and primarily the application of the Lenticular Foil Display (LFD) as new visualization tool for enhancing participation and to show the weakness of the existing planning process in Lebanon.

2. STUDY AREA

Tripoli is the second largest city in Lebanon following the capital, Beirut. It is located in the north of the country, on eastern coast of the Mediterranean sea between 34°25’ and 34°34’ northern latitude, and 35°48’ and 35°53’ eastern longitude, covering an area of 50 sq. km.

The topography of the area is naturally divided by a cliff between the low-land located at an elevation 15 m, and the high land, which forms an almost flat plateau at an elevation above 70 m.

Tripoli developed from an agricultural and harbour town to a city dominated by industry and commerce until the 1970th. With the beginning of the civil war in Lebanon, the city’s development continued without any organization, coordination, green spaces and parks in the

city centre and the residential areas. In addition, agricultural fields are rapidly vanishing due to the increasing urbanization.

3. LENTICULAR FOIL DISPLAY FOR PARTICIPATORY URBAN PLANNING

The interest in participatory urban planning is increasing rapidly as the process supports the global idea of good governance. Good governance, as referenced by the World Bank, is based on the two underpinning values of “Accountability” and “Inclusiveness”. These values demonstrate the importance of equal participation in the planning process. This has put more responsibility on the planner to identify into more effective and suitable community planning tools to support such participation. This paper will focus on the role of the LFD as a new tool which was used for the first time in participatory urban planning in Tripoli, Lebanon.

3.1 Lenticular Foil Display Introduction

Lenticular Foil Display (LFD) technology, as Buchroithner described, is the technology of the “glasses-free stereo-vision” which is one of the greatest advantages of this technology. The LFD is based on transparent synthetic foil for image separation. On the top layer there are semi-cylindrical parallel micro-lenses running in vertical direction (Figure 1) and the bottom layer is the image of interest.

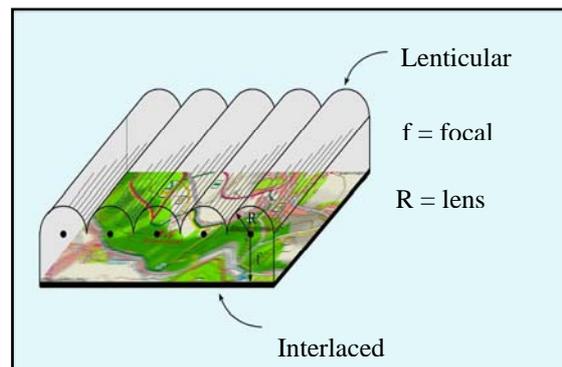


Figure 1: Principle of LFD technology
Source: Buchroithner et al. 2005

LFD offers various effects which allow us to generate a flip-image effect, short animations or true-3D displays in the form of hardcopies, or a combination of the different effects. In the case of Tripoli, a Multi-Flip LFD was used as a geo-data visualization tool and its effectiveness and usefulness was evaluated by interviewing the stakeholders.

3.2 Tripoli Multi-Flip Lenticular Foil Display

Tripoli Multi-Flip LFD was created by interlacing three different geo-data “layers” (Figure 2). The three “layers” selected for the purpose of the study were the following:

- The recent Master Plan of Tripoli Metropolitan
- The present Land Use map of the Study area

- QuickBird satellite image covering the whole study area with 61cm resolution from the same period.

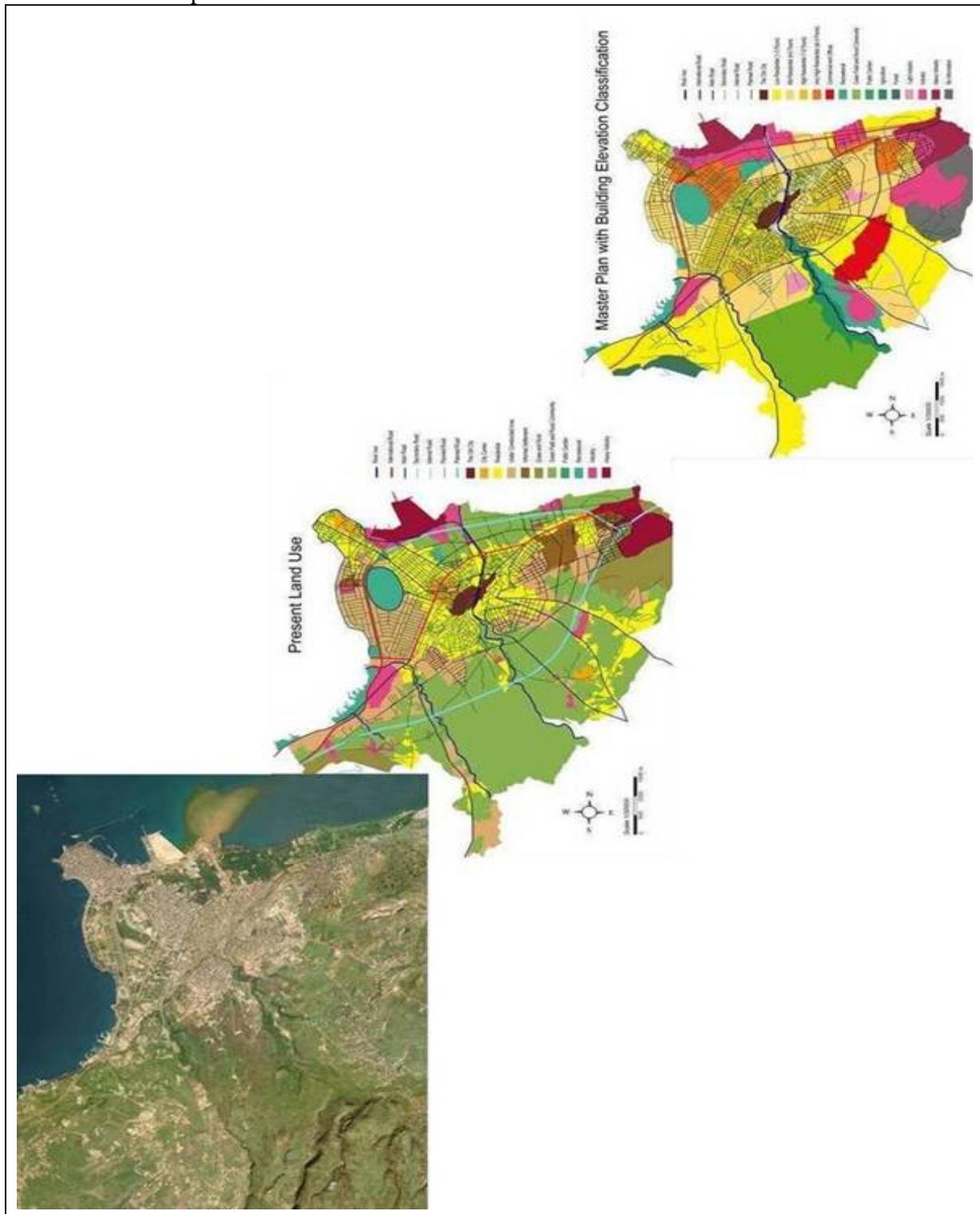


Figure 2: The three layers used in the multi-flip LFD. Upper left image: QuickBird scene of 2003
Source: El Nabbout 2006

The three layers were Geo-referenced in ArcGIS and reclassified under one Projection system “UTM WGS84 Zone 36N”.

The reason of selecting these “layers” provided a holistic view of the plan to the stakeholders. Use of the recent Master Plan map allowed the planning participants to be able to discuss the proposed plan for their particular area of interest and make contributions. The present Land use map gave participants an overview of the existing situation in comparison to the planned situation. Finally, the hyper resolution satellite image of QuickBird with 61cm resolution background image offered the stakeholders a realistic bird’s eye view of the study area.

4. METHODOLOGY

The biggest advantage which the Multi-Flip LFD could offer the participants was the three “layers” of the study area in one hardcopy display. The role and effectiveness of this technology in participatory urban planning was evaluated by interviewing 78 participants from three different stakeholder groups (Table 1). The stakeholders were divided into groups based upon their backgrounds, interests and roles in the community.

Table 1: The different respondent groups

Group A	Group B	Group C
Mainly civil or architectural engineers representing the different municipalities of Tripoli Metropolitan and the DGUP and 2 active NGO’s.	Mainly academics representing different organisations and leaders of syndicates and members of academic institutions.	Mainly leaders of active NGO’s, CBO’s, expert in urban planning, academic and interested individuals.

The interview questions covered addressed a variety of topics but this paper will focus only on the role and evaluation of the Multi-Flip LFD. All participants were asked during the interview if they were interested in discussing the Master plan and 93% of the stakeholders agreed to discuss their area’s future plan.

By fixing a Geo-referenced transparent map over the LFD, every participant was able to discuss and contribute their opinion and idea by annotating the map using a permanent pen. This resulted in 75 transparent maps that were then scanned and imported into ArcGIS for data analysis.

Since all the data were inputted into ArcGIS, the analysis of the data was completed by digitizing each map and comparing the different areas of interest among the various stakeholders as well as the different groups. The results from these comparisons would demonstrate the role that Multi-Flip LFD could play in enhancing participation in participatory urban planning and supporting Decision Support Systems since the technology is GIT based.

5. RESULTS

One particular result of the study related to the role of the LFD in enhancing participation in urban planning was the readiness of 93% of the stakeholders to participate and give time to discuss their city's Master plan. Additionally, a review of the output percentages of the different stakeholders interest among the different land use classes (Figure 3) it was noted that more than 70% of the participants focused on the old city.

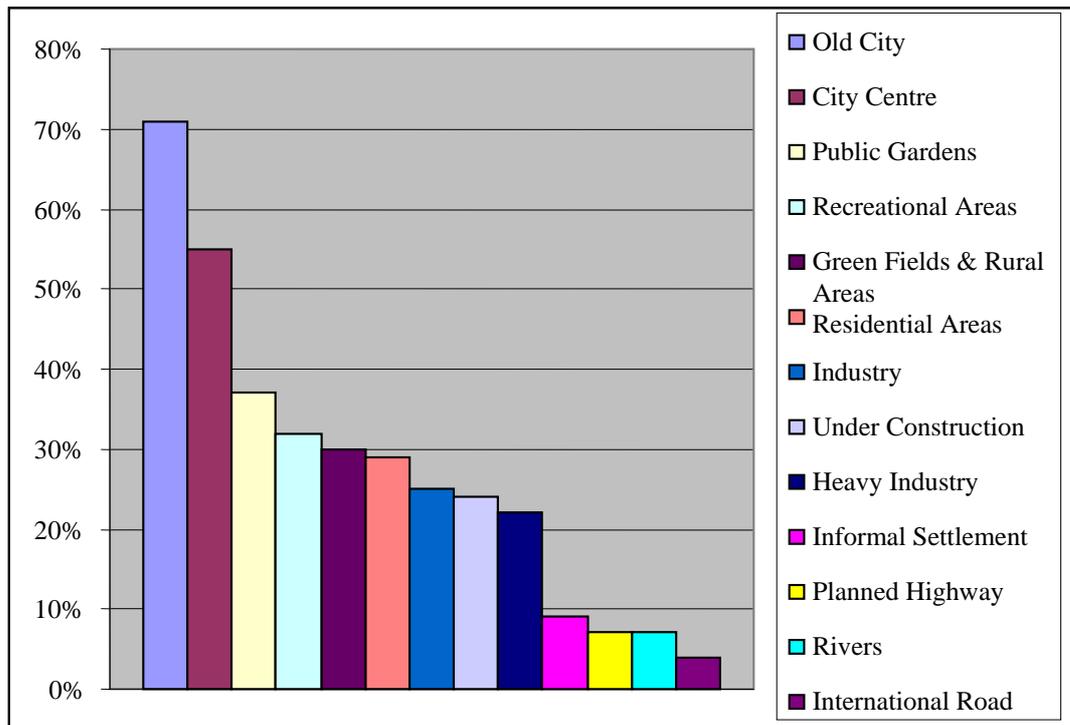


Figure 3: Classes outlined and discussed by the participants using LFD

Source: El Nabbout 2006

These results indicate that the city needed to focus more on a strategic plan for the old city instead of Master plan. Even more interesting is if we look at the results among the different groups (Figure 4) (are you missing a graph it looks like there should be one that shows the classes broken up by group based on what you discuss here) we see that the old City remained the most interested class for the participants.

The result of the interviews also showed that there was a high degree of interest to look into the importance of the different stakeholders' involvement in the planning process. Figure 4 shows that most of the participants see that Non Government Organisations (NGOs), Community Based Organisations (CBOs), Universities and Syndicates (also Municipalities at Technical Level) should be the most involved players in the planning process. For instance, the Order of Geomatics in Lebanon, one of the important Syndicates in the field of Urban Planning, was excluded due to highly centralized system of the planning process.

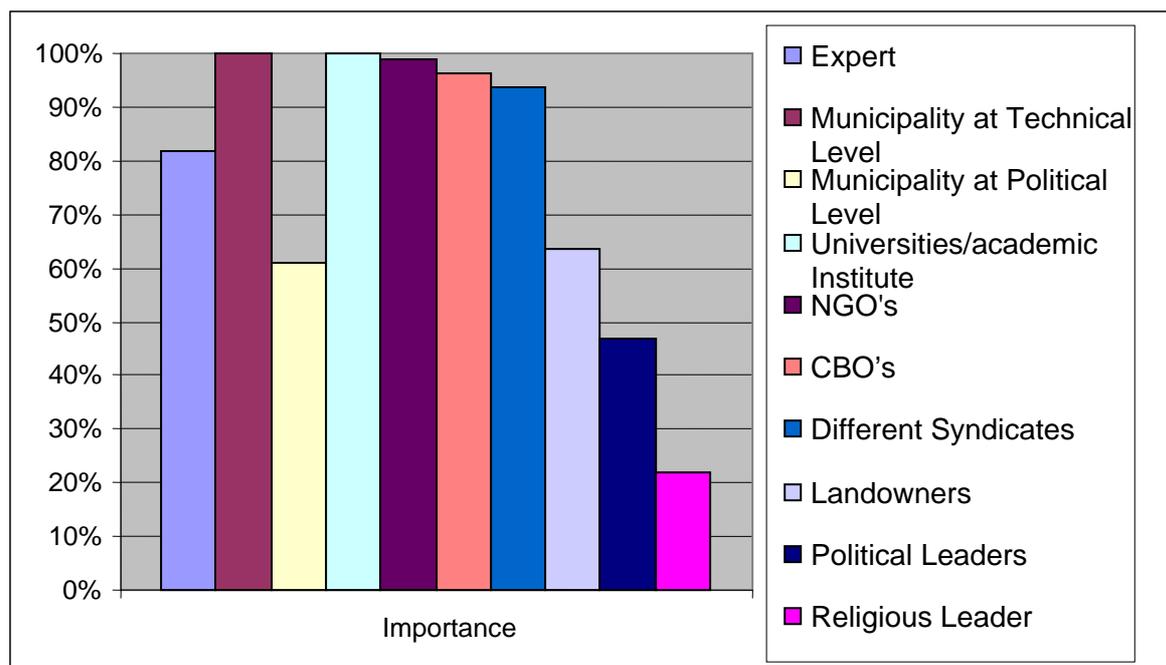


Figure 3: Participants' assessment of the importance of the involvement of the society's different players in the urban planning process
Source: El Nabbout 2006

The lesson which could be learned from this study is that participation of many additional stockholders in the planning is possible by identifying and using suitable tools. The use of the Multi-Flip LFD in the case of Tripoli shoes the great advantage and benefits of the use of such tools that GIT can offer the urban planner.

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BIOGRAPHICAL NOTES

Dr. -Eng. Khaled El Nabbout is a researcher at the Dresden University of Technology-Germany. He is holding a Master in Geomatic and a PhD in Geo-Science. His PhD project was a cooperated study between the Dresden University of Technology/Institute for Cartography in Dresden Germany and The International Institute for Earth Observation and Geo-Sciences (ITC) in Enschede Holland.

His research focuses mainly on the role of Geo-Visualisation in participatory urban planning, Governance, 3D modeling and Strategic planning.

The author is member of the Urban Remote Sensing, Special Interest Groups (SIG) of the European Association of Remote Sensing Laboratories (EARSeL) since 2005 and the “International Federation for Geomatics -FIG”. He was appointed as new technology specialist for FARO Europe GmbH.

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