Shaping emergent cities for all

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Abstract: *This paper describes work in progress in the area of producing affordable housing to underprivileged populations living in slums. This project is being developed recurring to a Shape Grammar approach, using a direct input strategy targeted to the common user with non digital expertise. The diversity of solutions are to be applied to three case studies in Mozambique, Angola and Brazil.*

Palabras clave: interface design, shape grammar, agents, housing

Introduction

Developing countries present huge needs as regards housing people: vast areas are occupied by very low income populations that solve the housing problem on their own hands, by means of self-building and informal survival settlements, with non-existing or very poor inhabitability conditions, the slums. This is a global problem, it happens in Africa (e.g. Mozambique and Angola), South America (e.g. Brazil), Asia (e.g. India) and other regions in the globe. Current analyzed tentative solutions (in Brazil, Angola, Guiné-Bissau) have not taken into account local human/geographical specificities, presenting insufficient inhabitability of the domestic space, typologies not adapted to the local needs and ways of life, lack of building quality, non-existing maintenance planning (Coelho, 2010), no facilitated accesses or space for disabled people (Justus, 2009). This is an added problem since some of the underprivileged populations were previously victims of war, with war disabled people in great numbers:

"*Angola, with an estimated 10 million landmines, has an amputee population of 70,000, of whom 8,000 are children*" (Machel, 1996, 26). With a population of 12.888 Million people (1996 estimation) this means that one person in every 184 Angolans is an amputee. Angola is the country in the world with the most landmines, several

sources stating from 10 to 20 million, which makes a ratio of 1 to 2 landmines per person (Metzler, 2007, 74). In Mozambique there are an estimated 3 million landmines (Ukabiala, 1999) and "*Landmines injure or kill approximately 20 Mozambican's a month, according to Handicap International*" (Owsley, 2011).

Due to insecurity, the population tends to flee to cities, considered more secure, where they increase the number of people living in the slums: "*Planted near water sources and under shade trees in the savannah, [landmines] are designed to terrorize, often with the goal of depopulating the countryside*" (Metzler, 2007, 74).

Any solution to the problem of slums has to take into consideration the local nature characteristics (e.g. climate, soil, available construction materials) and families' requirements (e.g. real needs, culture).

The paper is organized with this Introduction, followed by a brief description of the Emerg.cities4all project. The section "Creating an interface" describes the You See What You Input (YSWYI) paradigm, targeted to users with low or no digital expertise. The final section presents a first tentative design of icons for the definition of the family unit, to be used as input definition of the house typology.

The Emerg.cities4all project

Emerg.cities4all research project assumes it is possible to generate mass housing to create an urban environment, houses and building solutions based on the concept of mass personalization by creating a generative computer-aided planning system that, using a descriptive method as the Shape Grammars (Stiny, 1980), presents solutions to suit specific parameters of each situation (family group, budget, climate, natural resources). These solutions must be adaptable, evolutionary (following the evolution of the family) and humanized. To avoid the errors occurred in past experiences, from the analysis of three case studies in Mozambique, Angola and Brazil, rules from each case are inferred to create an analytical grammar, one for each case, on how existing slums are generated and what cultural, social and spatial dynamics are involved in their growth.

Despite the living conditions in slums, the adaptability characteristics of the houses and the social relations of the inhabitants represent some degree of quality. These are positive aspects to be retained in each case and introduced in the grammar rules in order to be contemplated to produce relevant and adequate local solutions.

The core architecture of our system is one of a multi-agent rule based expert system shell computationally supporting Shape Grammars which enables interaction at three levels/types of users:

- system specialist: builds and expands the shell;
- shape grammar specialist: with the shell, builds a system applied to a specific area;
- common user: applies the system to create solutions in the specific area.

In the next section we present the basis of the interaction approach and interface, targeting the common users with low or no digital expertise, and an initial design of the interface icons.

Creating an interface

Common/accepted forms of human-computer interaction are based on the desktop paradigm, where folders and files are present in a virtual desktop. Managing documents and folders, and using applications like Word or Excel, are based in click, drag and drop manipulations and forms of input/output like scroll, pop-up windows and menus, pull-down menus and drop-down list menus. For people used to using it, it is the normal way. For people with low or no digital user expertise, they represent true barriers and can be disastrous: scroll, pop-up, pull-down and drop-down list menus are in fact procedures to manipulate, select and introduce hidden information. As such, they should not be used when targeting common users with low or no digital expertise.

The Emerg.cities4all input interface avoids these barriers by adopting a direct You See What You Input (YSWYI) approach. The basic unit is the full screen, with no windows and no hidden information. Successive screens are organized to conform to the information input steps, from urban information to housing and construction. The input information needed is visually present all the time: images/graphics, text boxes and push-button used extensively to avoid barriers. The only pre-requisite should be the user being capable of seeing and interpret what is read: You See What You Input (YSWYI) users' interface targeting simplicity and usability in the real world.

The input icons

Defining the family group in terms of its elements is one simple way to enable the definition of the house typology. What is a family?

According to Euromonitor International, the industrialized nations have the lowest number of people living in the average household: Australasia (2.7), Western Europe (2.6) and North America (2.5), compared to Asia Pacific (4.1) and Africa (4.7) (Baumann, 2007). In order to achieve local solutions we need to gather specific information. For instance, the modern urbanized family in Angola "… tends to be small, and the average household size is becoming smaller and often limited to six people: parents and four children" (Oyebade, 2006, 120).

In the slums reality is however another: "In cities and towns, extended and polygynous families exist, although not on the same scale as in the villages, and consist of extended family members and even nonrelatives who have acquired family membership by virtue of a long stay in the household. During the civil war, the devastation in the countryside forced many people to flee the villages and rural areas for the relatively safer cities. For instance, many Luandan families took in refugees and displaced individuals who further swelled the size of the families" (Oyebade, 2006, 119).

The family unit is therefore composed of parents, children, cousins, aunts, nephews, nieces and grandparents (Oyebade, 2006, 118), with the possibility of having amputees in the household. Following this idea, a first draft design of icons to be present in the screen interface for the definition of the family structure is presented in Fig 1. Since children are also affected by war consequences (Machel, 1996, 26), this is being taken into consideration to decide on the creation of a child amputee icon. The final decision derives from answering: is it necessary in order to define the household typology?

Further steps involve using the icons with the target group creating a mockup and testing the interface approach in terms of readability and usability (Dix, 2004). This will be the next stage of the project.

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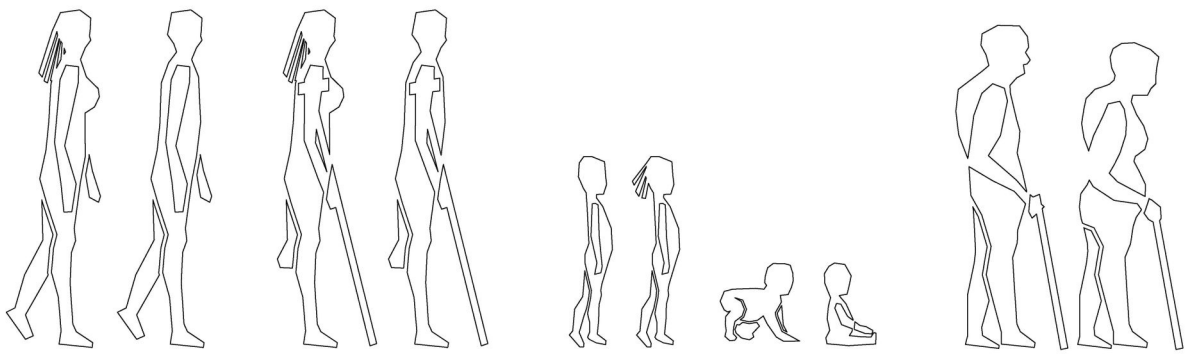

Fig. 1. Icons study for family input definition.