THE RELATIONS BETWEEN DESIGN-IDEA EMERGENCE AND DESIGN-SOLUTION DIRECTION

Digital-Media Use in Mass Exploration of Architectural Design

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Abstract. The unfolding of research is that design is a creative activity of problem-solving, directed to achieve what architecture should provide man with. The first part of the research investigates Design-Idea Exploration in the initial phases of design process, in terms of exploring the links between Design-Idea Emergence and Design-Solution Direction. The second part of the research presents a use of digital media in Design-Idea Exploration of three dimensional shapes throughout the initial phases of design process. The research has concluded the links between Design Ideas Emergence and Design Solution Directions, and presented the features of the program, which distinguish it from other standard modeling software.

1. Introduction

Working in three dimensional forms demands the architect to be more than just a problem solver. Design is much more than mere problem solving, however, this depends on the definition of the word of problem. Rowe (1987), citing Thorndike (1931), maintains that "to paraphrase Thorndike's venerable definition, a problem can be said to exist if an organism wants something but the actions necessary to obtain it are not immediately obvious. It is hard to imagine circumstances under which the impetus for design is not covered by this definition". In other words, designing is problem solving in a creative way. In addition, design problems are classified under ill-defined problems, which need various courses of action along the design process to be continuously defined.

A design idea and its exploration process, therefore, should be goal-directed to the main objectives of design and architecture, in order to provide man with his needs, as creatively seen by the architect. Media use should

correspond to the same context of thinking, not a deviation towards one objective (for example, esthetic, form, function, etc.) over the others.

2. Design-Problem Solving and Creativity

Creativity plays an important role in the way design is created and completed. The bounded rationality that is a characteristic of design, refers to the concept that designers are rarely in a position to identify all possible solutions to a given problem; rather, they settle for what seems to relate to the required properties architects see at the time. According to Simon, this process is called "satisficing".

In order to comprehend Design-Problem Solving, it is important to conceive how designers perform the tasks of the design process. There are many tasks and activities, which elaborate the unique nature of this process. The tasks of design-process phases (i.e. problem definition, conceptualization, representation, form giving, and evaluation) are simultaneously conducted without any particular paradigm. The design process has no ideal algorithmic pattern.

Design-Problem Solving encompasses an exploration activity of problem space. Design priority in the initial phases of design process is to collect and sort information related to the program, create the content of design concepts, and then shape the initial masses.

Design-Problem Solving manifests common characteristics of different individual styles of decision making and design making. The similarity of these characteristics is derived from differentiable streams that architects employ to solve the design problem. The solution direction chosen by an architect emerges from many realms (creativity, design problem, design thinking, etc.)

The strategies of design-idea generation and the overall organization of search through a problem space, are areas in which no general theory seems to exist. Many researchers, however, introduce the idea of the streams for partial solutions of design problems, by which the designer/architect utilizes assistance during the design process. From these streams of partial solutions, complete solutions can be derived, for example 'patterns' of Alexander (1977), 'elements' of Krier (1988) and Thiis-Evensen (1989), 'enabling prejudices' of Schon (1988), 'visual chunks' of Akin (1986), and 'heuristics' of Rowe1 (1987); A heuristic is any procedure that contributes to reduction in the search for a satisfactory solution.

3. Design-Idea Exploration and Digital Media

Media and visual design thinking are inextricably related. Specific media or individual uses generate certain ideas, which may not emerge through different tools or uses of media. Media play an important role not only in Design-Idea Emergence but also in Design-Idea Evaluation, and consequently in Design Solution Direction. For design-idea exploration, three-dimensional modeling is the essence of digital media while sketching is the essence of manual media.

Each way of media use has its own characters that architects employ to benefit, modify, or reform the design ideas. The output derived from a certain use of media may defer from one architect to another, according to the personal style of design thinking and of media use. In other words, what might be conceived, perceived, and comprehended of a design idea, is related to how this design idea is modeled, presented, and represented by the type of media.

Three dimensional forms digitally generated by algorithms may introduce surprising results. However, delaying the validation of form, until it is digitally completely created, strays the content of design away from important architectural issues, and gives formalism the priority over main functions of architecture (such as: environmental, social, etc.) The initial ordering of Design Solution is relatively difficult to abandon and long lasting even against backtracking periods of design thinking.

Exploring design ideas along the initial phase of design process, through three-dimensional modeling of digital media, elevates the bases on which further design decisions are made. This media-use gives architects the clarity of what is being made, without depending on their imagining.

4. Design-Idea Emergence and Design-Solution Direction

The research maintains that design ideas may emerge from different streams, namely: 1) inside or outside of design-problem context, 2) subjective or objective interpretation of design-problem ambit, 3) creativity, 4) use of media, or 5) prejudice of design thinking. Through processes of exploration and evaluation, impacted by the same foregoing streams, design ideas lead to design solutions. Creativity has not only an important role in these processes, but also an influence on the use of other streams. (Figure 1) illustrates the relationships between Design-Idea Emergence and Design-Solution Direction, which are linked through these different streams.
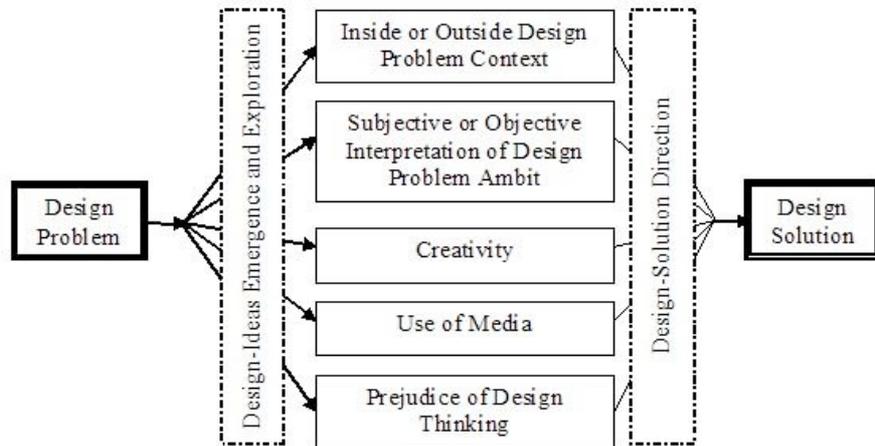
Figure 1. Relation between Design-Idea Emergence and Design-Solution Direction.

In most cases of design (one may maintain in all cases), more than one stream act as conspicuous features to dominate the design process, as one stream or organizational principle rarely suffices for all that is required to solve a design problem. In other words, Design-Solution Direction is generated from the array encompassing design problem's constraints and architect's interpretations.

5. A Program for Design Idea Exploration

This part of the research presents a Java program based on creating 3d shapes, in order for architects to create and explore initial shapes related to design ideas. This initial version of the program helps in the exploration of a 3d shapes combination that is used in design or urban design. The program displays eight camera positions that are located around the created drawing, with the option of controlling each camera position in Z direction through mouse drag, (Figure 2) to (Figure 8). The users of the program can explore a created drawing through two different ways: changing the position of camera from the selected eight positions, or rotating the drawing in one direction (X, Y, or Z) or all the three directions.

The main features of the program are functions of rotating and transforming the created form or forms in the directions of X, Y, and Z, by mouse clicking and dragging any point inside the boundary of one form to rotate or transform the chosen form (Figure 5), or by mouse clicking and

dragging any point outside the forms to rotate or transform the whole combination. The grid, also, can be solely rotated or transformed. The snap, grid limit, and grid view can be reset from the edit menu of the program. The program is based on creating 3d shapes, through controlling their dimensions and insertion point in two different approaches, namely: pull down menu, and mouse click and drag.

The famous 3d modeling programs (AutoCAD, 3ds max, FormZ, Sketch-Up, etc.) apply the approach of transforming the created drawing, when the user changes the camera position. The unique difference of the program from other standard modeling software is the approach of transforming the camera position (at eight positions) without transforming the created drawing, which allows the manipulation (of both the objects and the camera position) in the new created views. Rotating and transforming the created drawings in X, Y, Z, or all the three directions are available functions of the program.
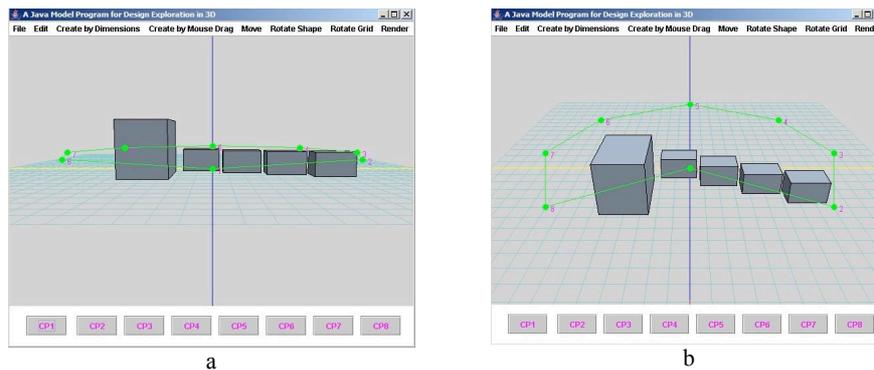

a   b

Figure 6. Camera position 1, a is from the default position, and b is from a higher position after dragging the point of camera 1 in Z Direction.
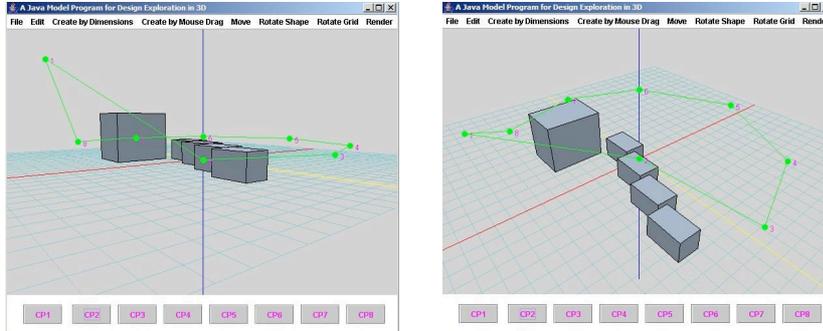
Figure 7. Camera position 2.

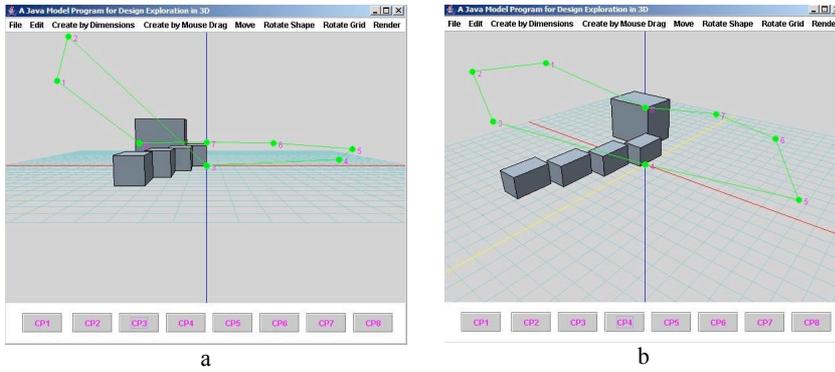a   b

Figure 8. a is Camera Position 3 from the default position. b is Camera Position 4 from a higher position after dragging the point of camera in Z Direction.
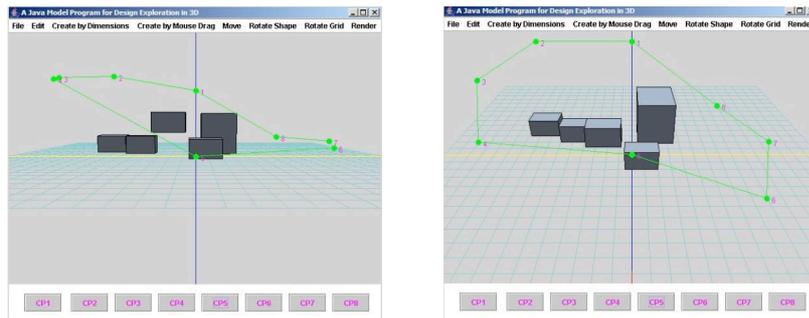

Figure 5. Camera position 5, (after moving 1st and 2nd shapes from the right in X and Y directions, and 3rd shape from the right in X, Y, and Z directions).
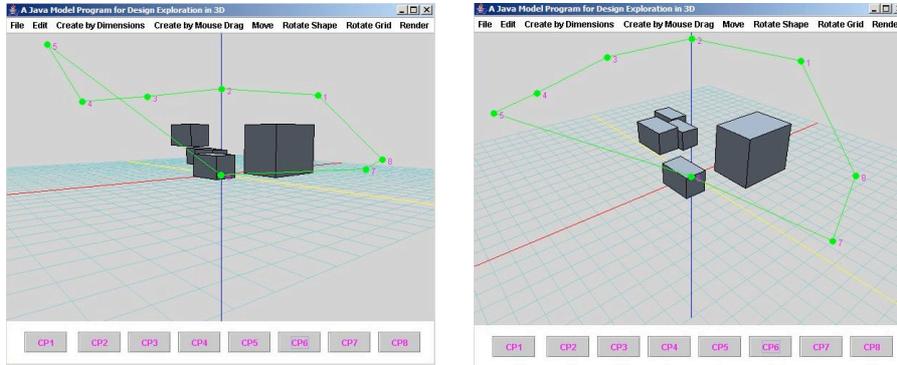
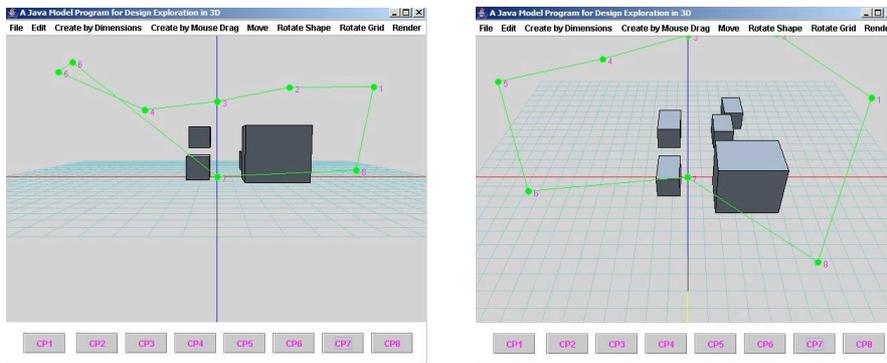*Figure 6*. Camera position 6, displaying the transformed shapes.

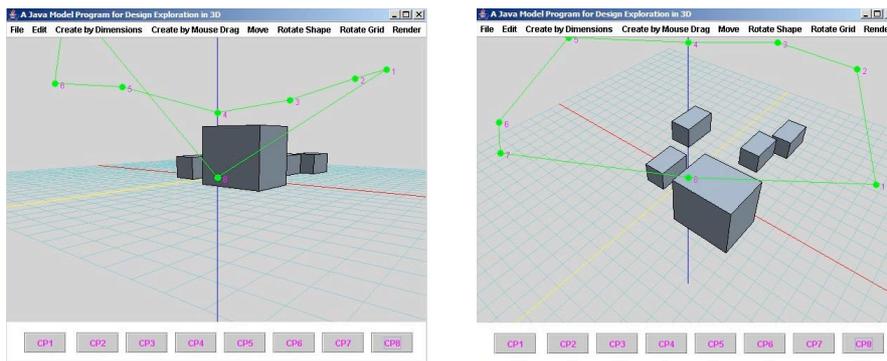*Figure 7*. Camera position 7, displaying the transformed shapes.

Figure 8. Camera position 8, displaying the transformed shapes.

The program creates simple three dimensional shapes (prism, pyramid, cylinder, and cone), in two different ways. First is by specifying the insertion point, the dimensions of base and height, and the number of sides (Figure 9). Second is by clicking the mouse to insert a shape with the specified default dimensions and number of sides, and then through dragging the mouse according to the specified snap and grid, shape's dimensions can be controlled.
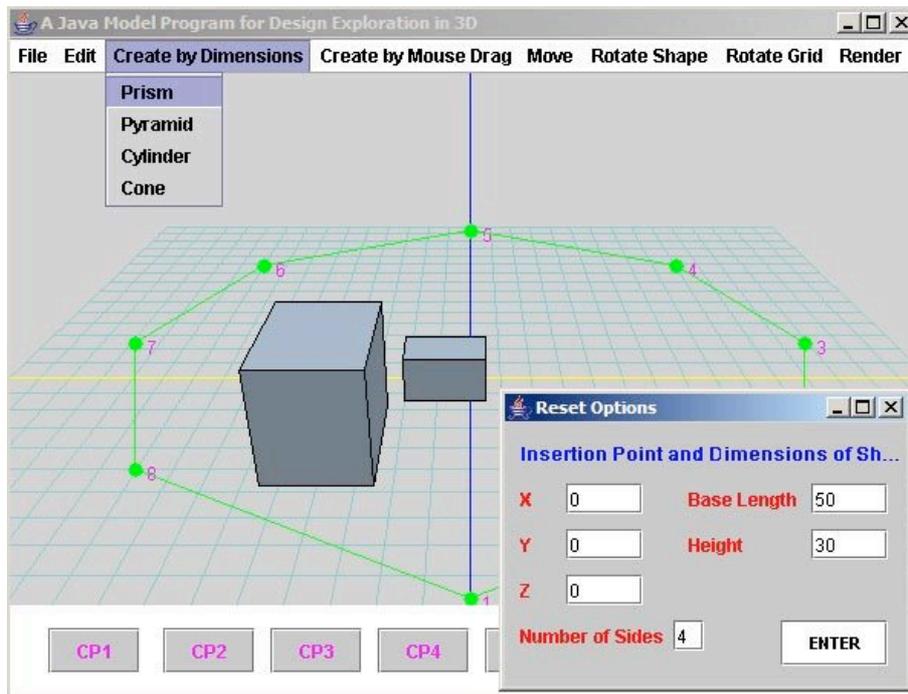

Figure 9. The default camera position of the program with a combination of shapes, created by specifying the insertion point and dimensions from the program poll down menu.

The program help architects explore 3d masses of design ideas they work with. This exploration process, through program's potentials, raises awareness of the proposed forms and their relationships. The feed back derived from these processes effectively helps in choosing between tentative design ideas and design solutions, and consequently in performing the design process. Decisions made in the initial phase of design process, therefore, would have clearer bases than ones that depend on our imagining. To continue in conducting the design process, architects may proceed or modify their initial designed forms. Finalizing the initial design into the proposed forms, architects may have the design into different media types for more details.

6. Conclusion

Design ideas and their exploration process should be goal-directed, derived from the creative vision of architect. The research explores the streams from which Design Ideas emerge, and builds the links between Design-Idea Emergence and Design-Solution Direction.

The research presents a java program in order for architects to create and manipulate three dimensional shapes, and explore their combination. The main approach of the program, which represents the unique difference from the other modeling software, is applying the transformation of camera position (at eight positions) without transformation the created drawing, which allows the manipulation (of both the objects and the camera position) in the new created views.

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