The initial design process usually requires a long incubation time for architects to bring together form and function. In this exciting and painful process, architects use their professional training to adjust the relationship between spaces, and include the requirements from the clients. The computer has the potential to be the key and the most powerful tool in this long process. In the software market, the software packages for architecture now are mostly for computing values or drafting. They are not very helpful in the design process.

After analyzing design methods and comparing the potential of computer languages, I found that some computer languages have the possibility to virtualize some levels of the design process. One area of design that I investigated is space planning. Based on collected space relationship data a space diagram can be developed. In an ideal process, this result could shorten the planning time for architects and let them concentrate on design and details. AutoLISP within AutoCAD 2000 was selected as the programming language. To determine the logic for the program, the design process was compared with the computer process (Figure 1) and it was determined that the program should begin with a foundation consisting of a floor plan matrix. After the matrix is formed, the program was further developed so to able to recognize the shape and size of the site, its conditions, and the location of spaces. According to this data, the best possible positions for the spaces can were attempted to be found.

Another important objective of this program is the development of a function for locating the best position in the floor plan matrix. The premise for the program is based on Krawczyk [Krawczyk 1973] who had determined that by comparing the results of the relationship value and the distance between two spaces, including the definition of site constraints, it is possible to get the fairly good location for the spaces. The structure of this program is built on this concept. The program database contains the relationship value of spaces and the environmental elements of the site. Users can change the values and elements for their specific requirements. The software includes functions for space locating and computing the total relationship value.

A departure from other similar investigation was the development of functions for generating the following space diagrams to display the results for a specific case study (Figure 2).

1. Space diagrams in two-dimension, color coded by space.
2. Three-dimension space diagrams showing the location order by using different heights.
3. A preliminary space plan with walls which can be adjusted.

The program was tested on an apartment building with specific site constraints. The area of this site is 80,640 square feet. It is located in Chicago downtown and contains 22% of commercial area and 78% of residential area.

An analysis of the results included some observations of how the software could be improved:

1. Confusion of the private area and public area: In this stage, the program did not have a function to divide the public area from the private area. This function would be added to the program.
2. Irregular space shape: In the final test, the single-module function was used because of the irregular site. However, the space also became irregular. The proper combination of the single-module version and the multi-module function would improve this disadvantage.
3. Lack of connected space: there still needs to be more research to expand the database for this function.
4. Difficulty to repeatedly check the space relationship: In the developed program, there is no function to repeatedly check the locations of the spaces. This can be improved by inserting the option after the check-loop change.
5. Inaccuracy of space direction: This problem relates to the element’s characteristics within the database. More definition would overcome this problem and improve the relationship values.

The version of the program is only two-dimension. In the future, three-dimension and more complex buildings type will be researched. Then the program can more readily be-

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gin to provide the “Computer Aided Design” functions for an architect.

References

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