

6.1 Assigning symbols

As stated earlier the most important question that arise due to the use of fractal geometry as form generator is that of signification.

Once again it is open to the question: *How does statistics give meaning to the Architecture, if at all?*

The Process of assigning symbols to the given statistical data was influenced largely by the ideas of Faber Birren (1900-1988) who on his turn drew upon the Work of Johannes Itten (1888-1967). For the purposes of assigning a specific shape and color to a statistical entity, a simplified summary compiled from the work of Birren was utilised (Dreyfuss ,1972 :233-246).

In this summary, 12 colors are directly related to 12 shapes and then through looking at different cultural, mythological and psychological associations are then linked to Symbolism, Folklore, Emotion, Cultural convention and even symbols and colors used in Technical Documentation.

As such the summary provided useful palette from which shapes were assigned to statistics.

The Challenge of this process was to find a link between a statistic and a two dimensional geometrical shape, but then also to interpret that shape into a three dimensional form that can be utilised as a Fractal Generator. Table 6-1 serves as a summary of the Statistics through to the assignment of a shape from the library of the software utilized, called Xenodream™. It is important to note at this point that as an objective exercise shapes were assigned to all data and objectively transformed by their respective quantities as inputs into Xenodream™

Table 6-1: Summary of the assignment of shapes

Statistics	Association	Color Association	Xenodream associated shape
Population group	Hexagon	Green	Quartz Prism
Gender by age	Disk/ Spiral	None	Disk
Highest education levels	Circle	Blue	Sphere
Labour force	Trapezium	Black	Square Disk
Language	Halfsphere	White	Bowl
Mode of travel	Maze/Spiral	None	Spiral spring
Dwelling type	Hexagon	Green	Hexagon
Source of energy for lighting	Triangle UPRIGHT	Yellow	Triangular Prism up
Water	Triangle DOWN	Yellow(Blue)	Triangle Prism down
Annual household income	Diamond	Brown	Octahedron

6.2 Discussion of each shape

The following text will serve as a discussion on how each shape was assigned to a statistical parameter.

6.2.1 Population group

It was decided that the associations of fertility, prosperity and life as outlined in the aforementioned summary of Faber Birren, were strong driving forces in all population groups and thus the decision was taken to assign the Hexagon to this statistic (Dreyfuss, 1972:235). It was interpreted three dimensionally as a Quartz Prism due to its Hexagonal Shape.

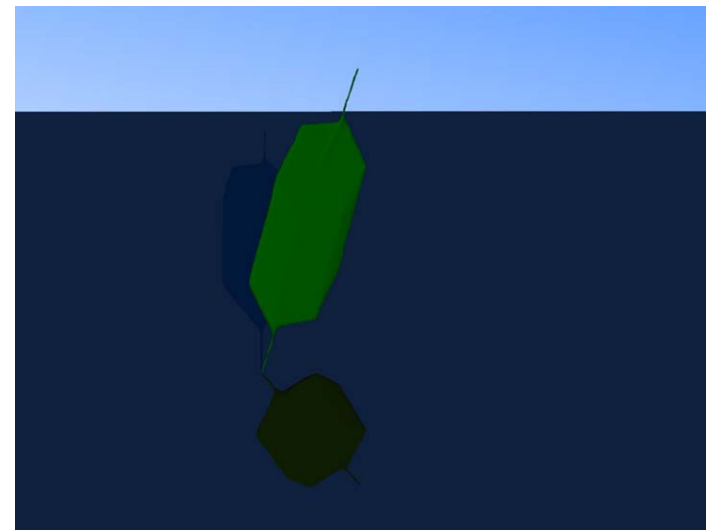
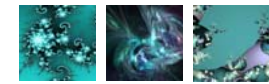


Figure 6-1: Hexagon - Population group (Source: Own Image)



6.2.2 Gender by age

According to Fontana (1994), the circle or spiral is associated with masculinity and femininity, while simultaneously signifying a journey. The circle has long been a symbol of completeness and union of opposites (male and female), while also being an analogy for the circular nature of life (Fontana, 1994:97; Jung, 1964:280).

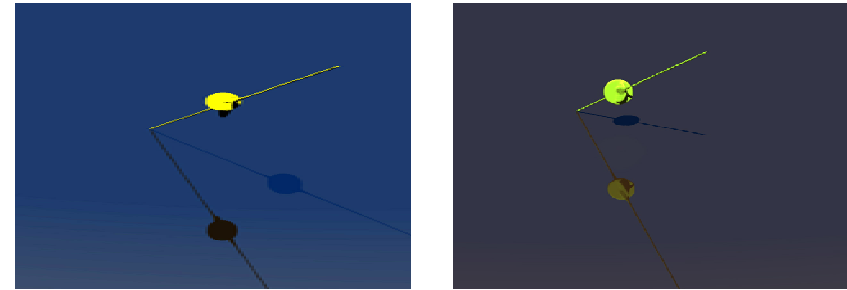


Figure 6-2: Circular Disc - Male and female (Source: Own Image)

6.2.3 Education levels

The circle and the color blue have also been associated with the realization of obligations and higher education (Dreyfuss, 1972:243). As early as Plato, the human psyche and the endeavour to understand was associated with the circle (Jung, 1964). This was interpreted as a Sphere for the purposes of generating a model.

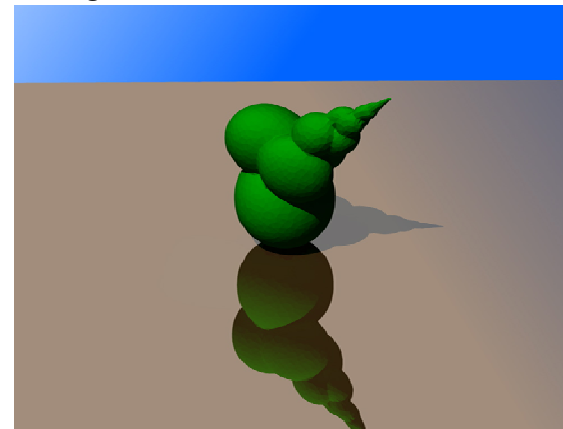


Figure 6-3:
Sphere
Education levels
(Source: Own Image)

6.2.4 Labour force

The colour black and the shape of a Trapezium have varied interpretations, ranging from positive to frightful. It is also associated with honesty, dignity and humility, which are all strongly associated with what is called the working class (Dreyfuss, 1972:245-6). The trapezium also can be interpreted as a square seen in perspective and thus a square disk was chosen as the model generator.

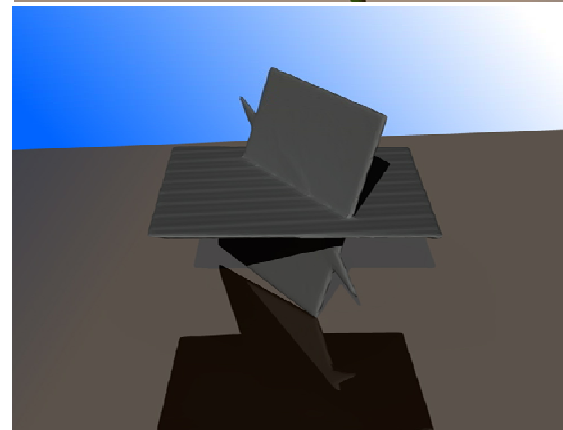


Figure 6-4:
Square disk
Labour force
(Source: Own Image)

6.2.5 Language

White is greatly associated with light and clarity, also colour used in academics to denote Arts and Letters. It is therefore associated with clarification and explaining and thus with language (Dreyfuss, 1972:245). White is associated with the shape of a semi-circle and as such was represented by a half-sphere.

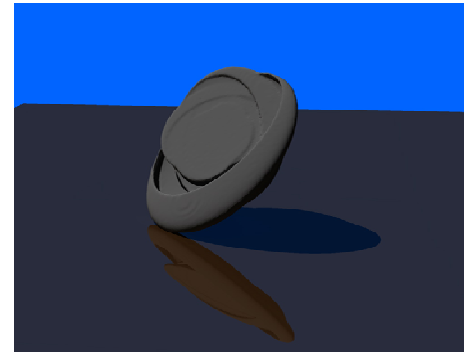


Figure 6-5: Half sphere - Language (Source: Own Image)

6.2.6 Mode of travel

The idea of a Journey has for very long been associated with the flow of energy and movement (Fontana, 1994:75). It was therefore decided to utilise a coil or a spring as a three-dimensional form generator to represent transport and movement patterns.

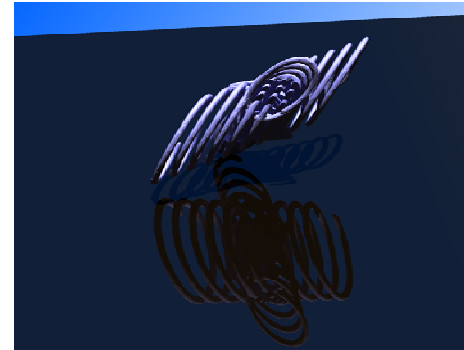


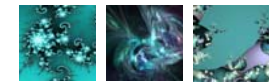
Figure 6-6: Coil - Mode of travel (Source: Own Image)

6.2.7 Dwelling type

The colour green and its associated form of a hexagon also signify fertility, prosperity and civility, or in other words a good citizen that subjects himself to social customs and etiquette of the bourgeois (Dreyfuss, 1972:241). It is therefore a symbol of neighbourliness and as thus can be interpreted as symbolic of the human dwelling. A hexagon was thus utilised to symbolise the dwelling type.



Figure 6-7: Hexagon - Dwelling type (Source: Own Image)



6.2.8 Source of energy

Since time in remembrance the upright triangle has been a symbol for fire, one of mans most important and earliest sources of energy, it was therefore decided that a three-dimensional triangular prism in its upright position should be used as a symbol for energy (Dreyfuss, 1972:86).

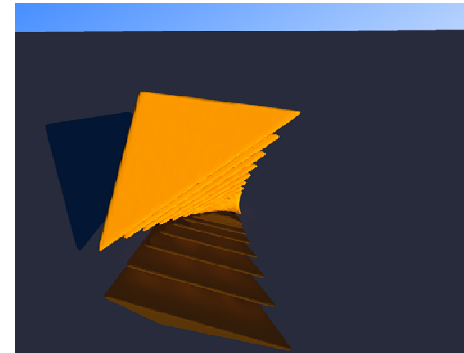


Figure 6-8: Prism - Source of energy
(Source: Own Image)

6.2.9 Water source

Similar to Energy the symbol for water is also an ancient one, and is an upside down triangle. The choice was thus made to utilise an upside down prism to create the model for the water source statistics (Dreyfuss, 1972:86).

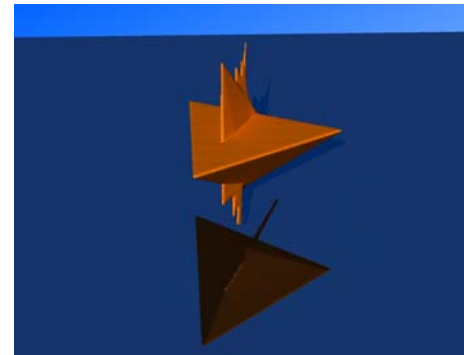


Figure 6-9: Upside down prism - Water source
(Source: Own Image)

6.2.10 Annual household income

Brown and its associated shape of a diamond have the associations of Earth and abundance, and also barrenness or poverty, associated with it. It is also a symbol of parsimony and shrewdness with money (Dreyfuss, 1972:236-244). It was therefore utilised as a symbol for the income per family in the area under study. An octahedron was assigned to the statistic as it represents a diamond from all sides.



Figure 6-10: Octahedron - Annual household income
(Source: Own Image)

6.2.11 Closing Remarks

After these shapes were assigned the models were generated in Xenodream™ by using their respective quantifiable data as inputs into the software. Thus far in the process there was a distinct shying away from the subjectivity of the designer although a certain amount of poetic license was taken with the interpretation of the symbolic representation of the statistics.

6.3 The Shapes as Fractals

As stated above the different values of each statistic were fed into Xenodream™ as rotation angles of the fractal. A decision was taken to be as objective as possible during this process, in other words, to define rules that are strictly followed without question. This was done based on the fact that the software only has six quantifiable inputs that can be fed in objectively namely a skew distortion in the X,Y, and Z axis and a rotation in the X,Y, and Z axis.

The rules are:

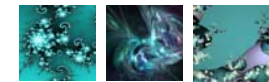
- If there are less than six partitions they are fed in the order that they occur; and
- If there are more than six partitions, the six highest are fed in.

It was observed that the smaller partitions had very little effect on the model and are therefore deemed insignificantly small.

6.4 Utilising the models as a form vocabulary

The subsequent use of these models as a form vocabulary has proven to be one of the largest challenges of this study. After the possibility of utilising the models as a single combined entity that is reworked into architecture proved unsuccessful, a decision was taken to explore each of the models separately in plan and section, but not excluding the possibility of three-dimensional experimentation. The combination of these three explorations proved to be highly successful in generating plan section and elevation while still giving high priority to spatial experience.

It is important to state that although all statistics were developed into models without bias, there came a point in the design process where the objectivity no longer as pure as it had been and the designer had to *regain control* of the design. In the same way that any coherent text does not try and give equal importance and significance to all the words of a particular language, certain pieces of the vocabulary were used directly, certain other with greater subtlety, and yet another with only a hint of reference.



It is also important to note that these entities were primarily evaluated on a formal level and secondarily at the level of their supposed meaning.

This was done because the authors believe that the meaning had already been encapsulated in the form itself and is therefore of lesser importance at this point in the process.

The process was not exclusively done in digital media as it is the opinion of the author that it is important to understand the process through both digital modeling and drawing.

6.4.1 Process

As described earlier, initially the models were combined into a single model as a starting point. This model can be seen in Figure 6-11. The model was however deemed too complicated and incoherent to be an expression of the architectural intent.

It was therefore decided to embark on a process of analysing the models in section and plan to unlock the spatial characteristics thereof.

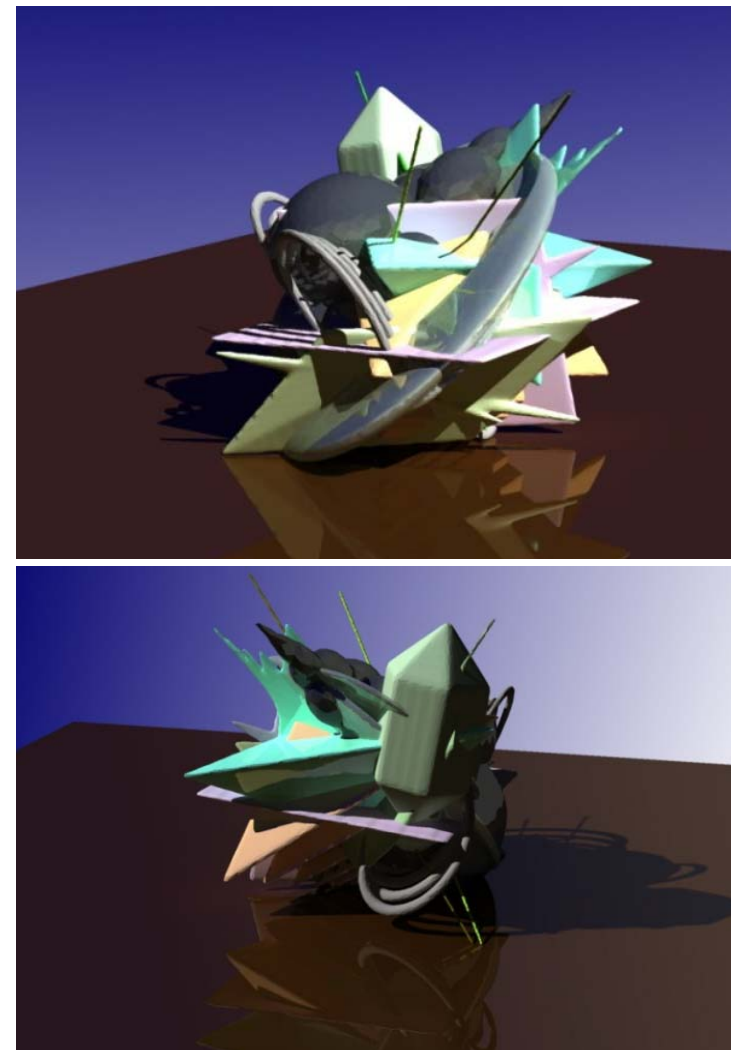


Figure 6-11: Combined Xenodream™ model
(Source: Own Image)

The designer had to move away from a purely objective design approach to a more integrated analysis of form that take the site, climate, area required and the existing built fabric into account. It was the intent to capture the spatial and other qualities of the models into a design that had a strong identity but drew on the combination of different forms, rather than trying to be monolithic and iconic. The intent was to carry the idea of combining different shapes through to the final design without trying to hybridise them into simpler forms.

By analysing the models in section and plan the vocabulary of forms not only included the eleven models but also one hundred and ninety seven line diagrams of sections and plans. With these two hundred and eight 'letters' the designer had to be very selective to combine without repeating unnecessarily, while still trying to create form that is interesting and true to the original concept both physically and theoretically.

The design development is exhibited in Figures 6-12 to 6-14.

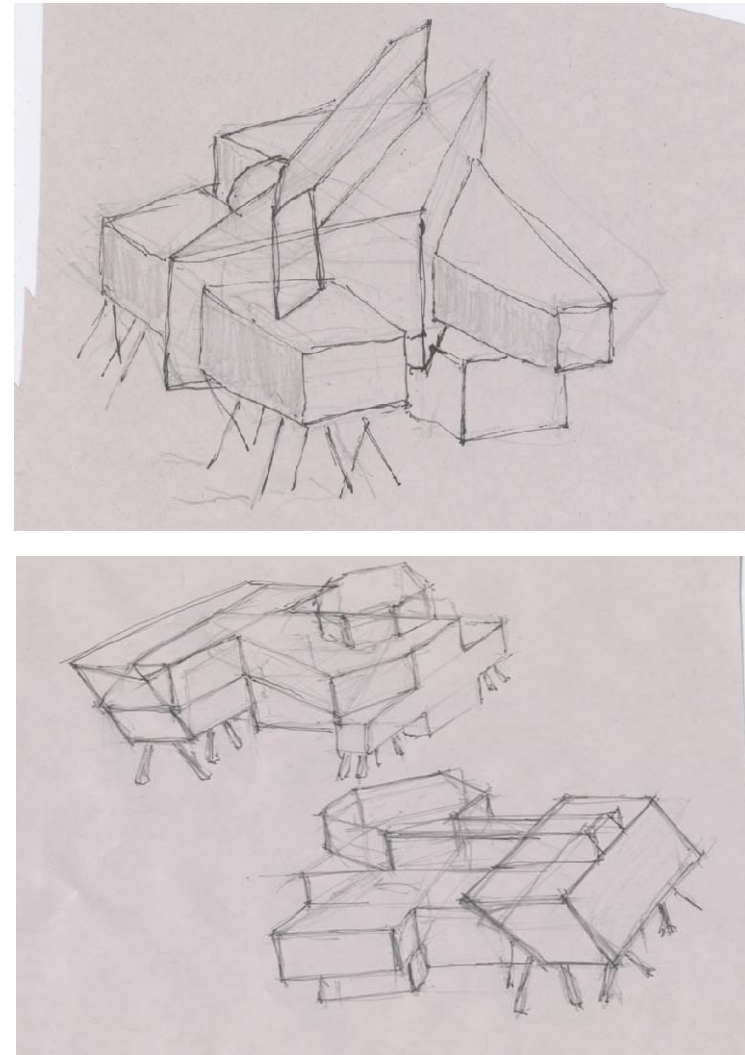


Figure 6-12: Design development (1)
(Source: Own Image)

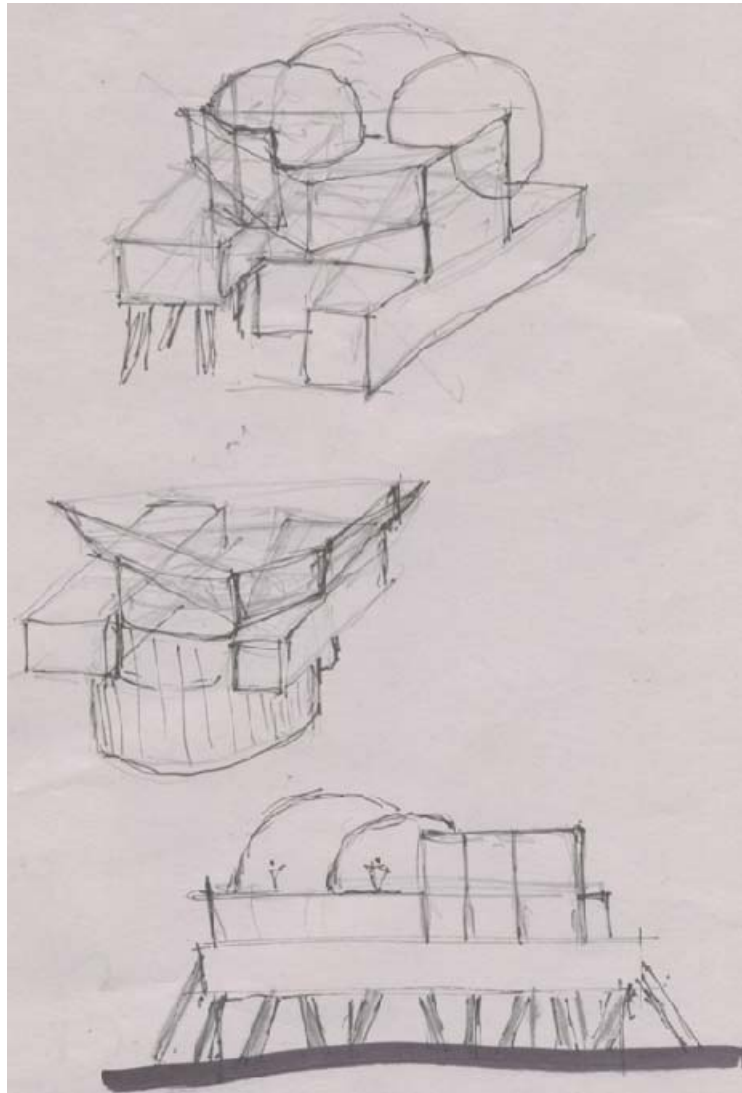
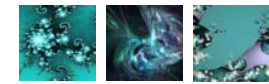


Figure 6-13: Design development (2)
(Source: Own Image)

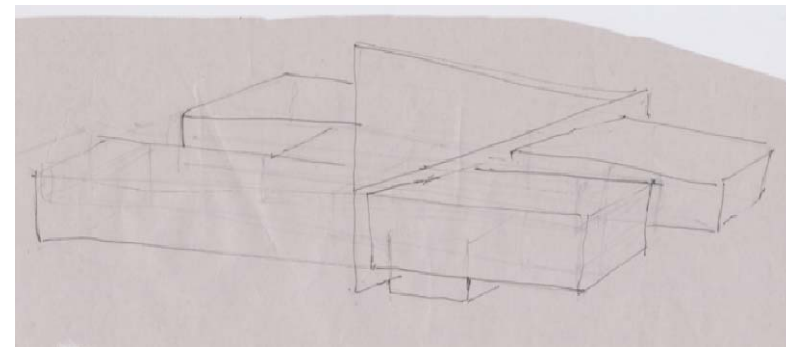
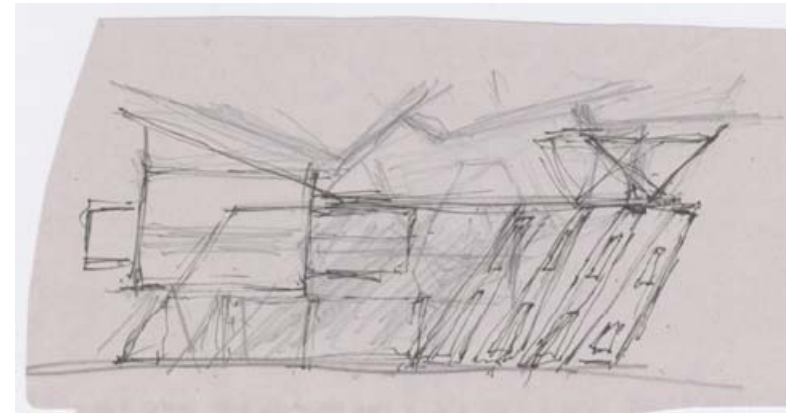
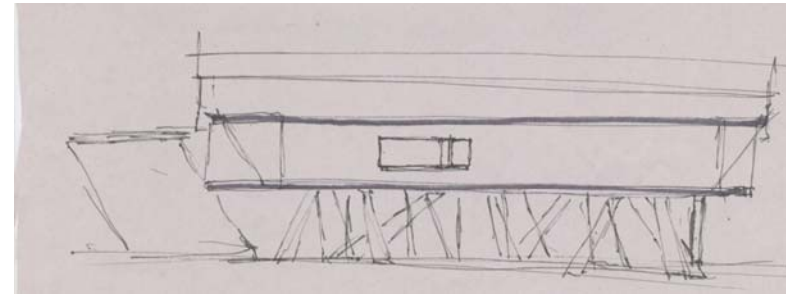


Figure 6-14: Design development (3)
(Source: Own Image)

As stated earlier the form vocabulary that was created was utilised to create form. Here are some of the 'words' that were used in deriving plan.

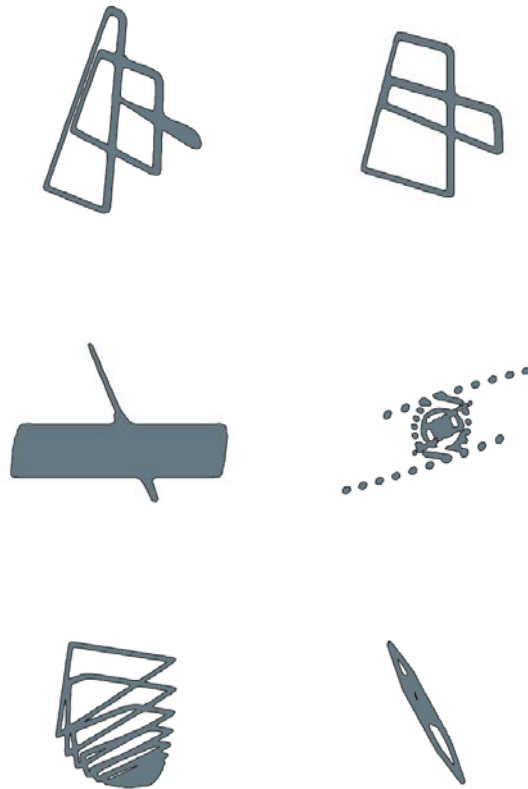


Figure 6-15: 'Words' utilized for plan generation
(Source: Own Image)

The 'words' were combined into sentences through sketching and 3D modeling into a ground, first and second floor. In certain instances the geometry was rotated or mirrored but the original aspect ratio was always maintained. It is important to note that the internal structure was maintained through the design process. It would negate the original premise of this thesis if the internal geometry of the fractal was destroyed. In certain instances minor adjustments had to be made but always trying to remain true to the original concept

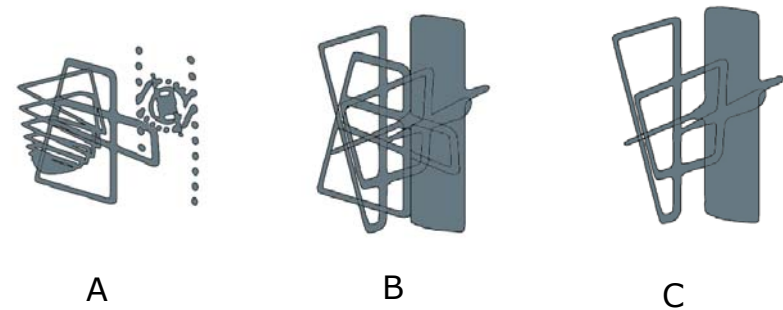


Figure 6-16: A Ground Floor
B First Floor
C Second Floor

(Source: Own Image)

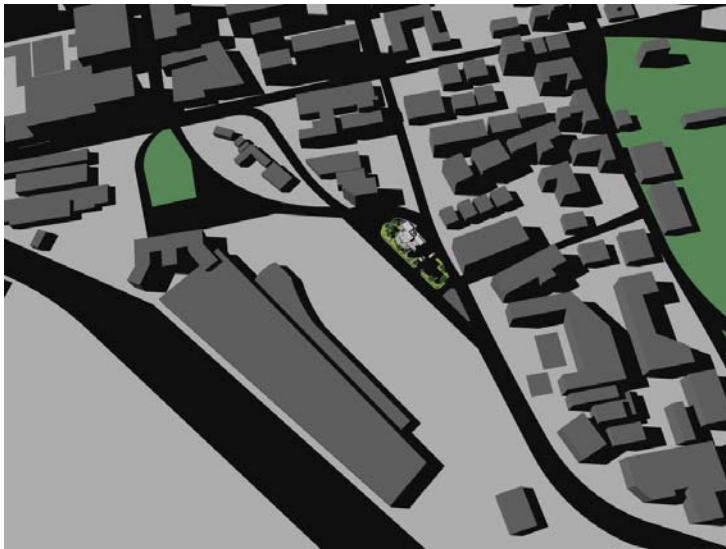
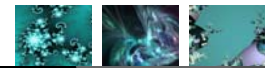


Figure 6-17: Greater Context
(Source: Own Image)

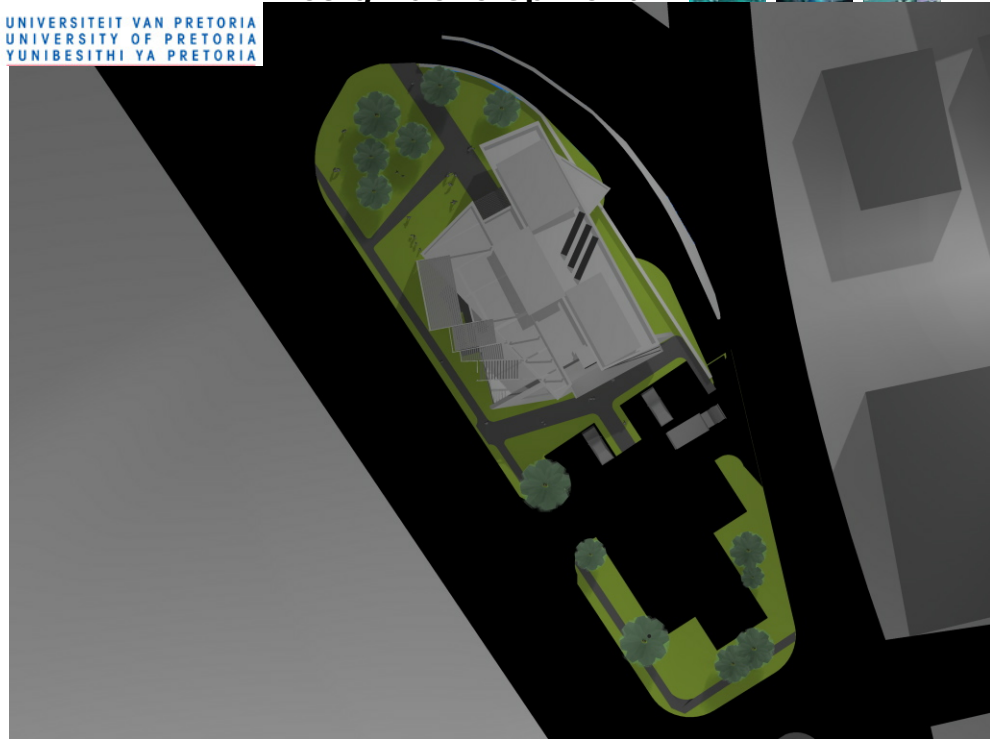


Figure 6-18: Site



Figure 6-19: North Eastern Perspective
(Source: Own Image)



Figure 6-20:View From Gautrain Station
(Source: Own Image)



Figure 6-21:North Western Perspective
(Source: Own Image)

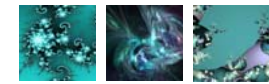


Figure 6-22: Southern Perspective
(Source: Own Image)

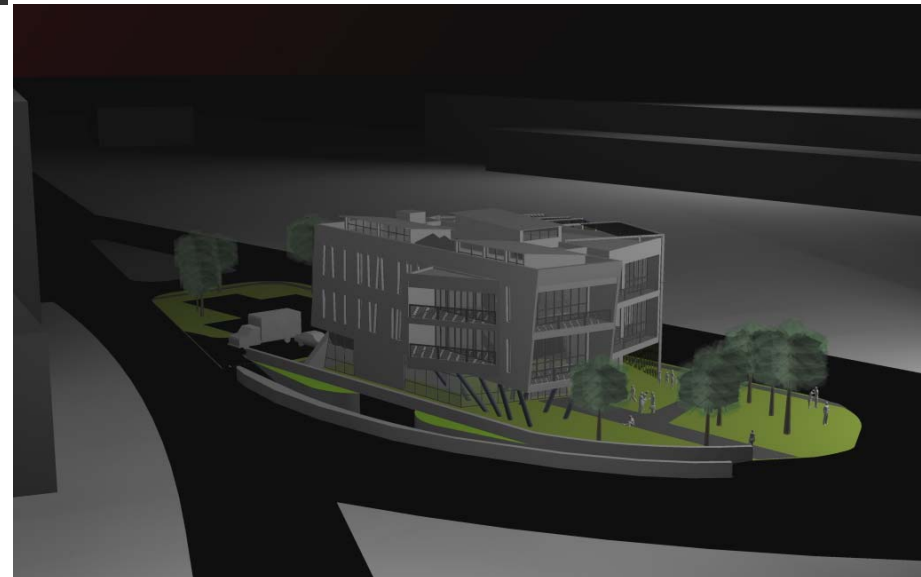


Figure 6-23: North Eastern perspective with
Gautrain Station in the Background
(Source: Own Image)

Figure 6-24:View of the Context from South –

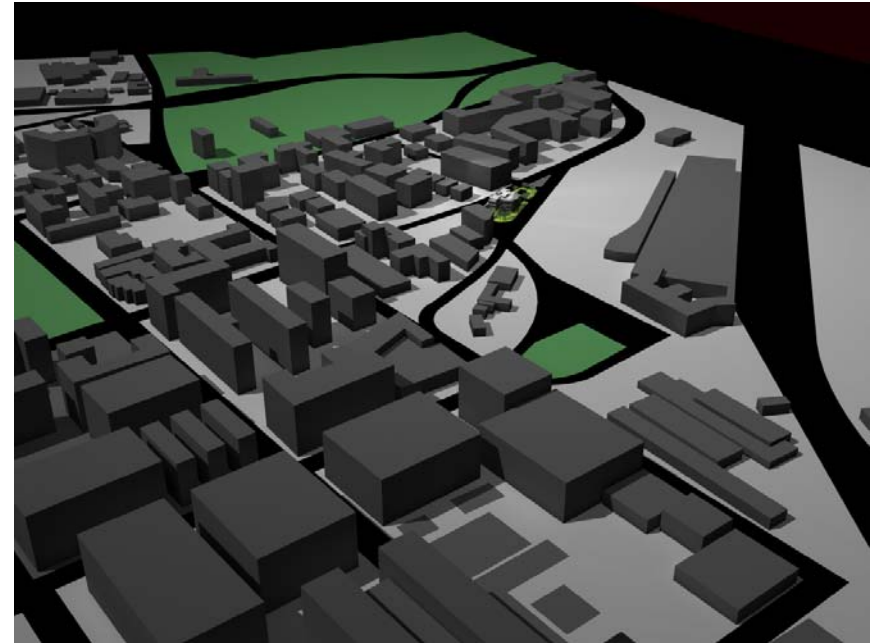
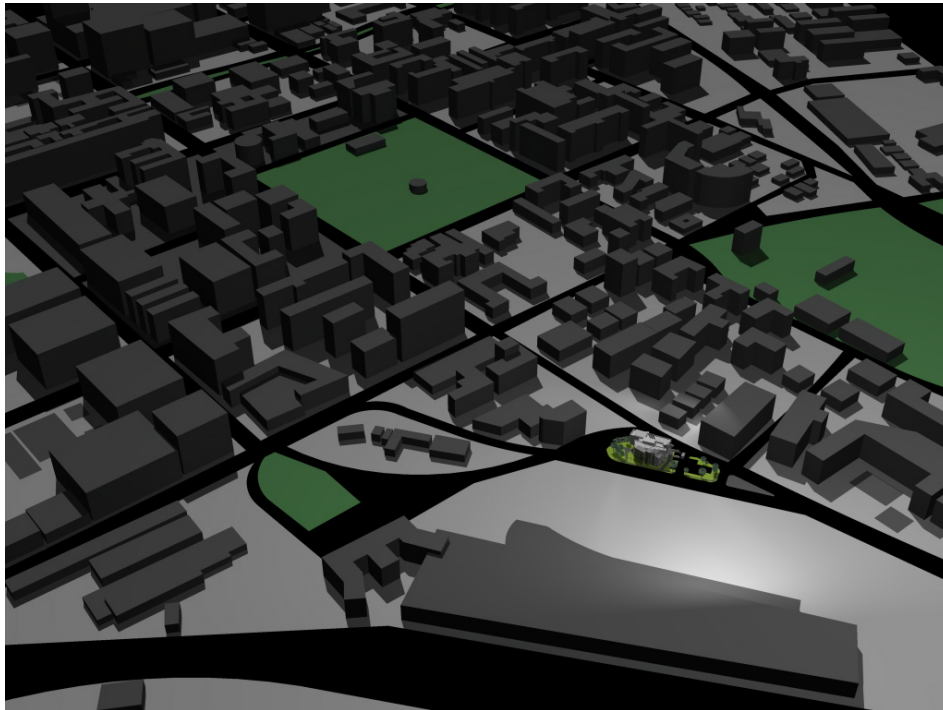


Figure 6-25:North Western Perspective
(Source: Own Image)

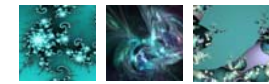


Figure 6-26: South-Eastern Perspective
(Source: Own Image)

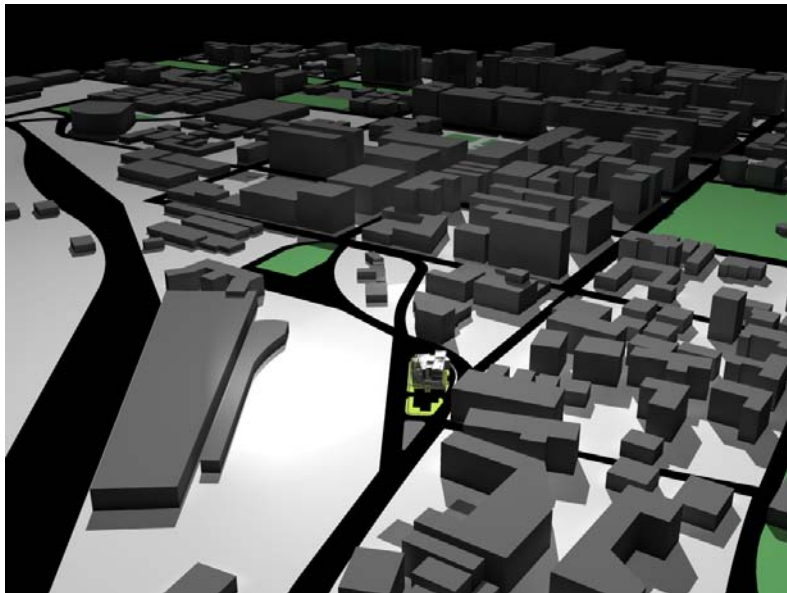


Figure 6-27: North Eastern perspective with
Gautrain Station in the Background
(Source: Own Image)



Figure 6-28: Eastern Perspective (Source: Own Image)



Figure 6-29: Public Space on Northern Side
(Source: Own Image)

6.5 Conclusion

Through the process as described above, a large amount of subjectivity relating to form was removed. The design was developed in conjunction with the area in which it manifests, through the transformation of quantifiable entities into form. The programme and the process have become a *unified whole* in that mathematical concepts were utilised to design a building to house people involved with mathematics.