

Title; Comprehending and Projecting Complexity in Urban Matrices;

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ABSTRACT

The paper presents the methodologies and the outcomes associated with a series of educational programmes originated to introduce Architectural students to the complexities of designing in the urban domain in both America and Britain. The programmes were developed for use within existing 'materially distressed cities' using the cities as laboratories to test potentials for providing sustainable and flexible redevelopment proposals that integrated with the existing urban fabric and functions. The methods used were influenced by the biological sciences, specifically referencing complexity and adaptation. Hence introducing students at an initial stage to the ideal of the city as the organic reflective landscape of man's actions within a global natural and economic environment.

The programmes initiated from an idea that pattern recognition and pattern creation is inherent to our comprehension and manipulation of the environment which we inhabit. This ability to recognise abstract and associate patterns of form and behaviour has enabled us to project and intervene successfully in the environmental patterns to our benefit.

As existing cities already contain innumerable diverse and complex patterns from the past, some of which restrain the city's re-facilitation whilst others are essential as existential footholds (they constitute the image of the city and hence give us identity, context and meaning). This sets up a conflict between the city matrix as facility and identity which can also be viewed as a relationship between transient facilities and more permanent image as meaning or spirituality. In redesigning our cities we need a methodology of approach that can reveal these city patterns as a holistic organism, accepting the prevalence of the past, and growing in a way that re-facilitates and reinterprets our cities advantageously with patterns that offer both appropriate facility and spirituality. Inhabited landscape somehow needs a means of starting from simplicity and building into the most complex of systems.

The aim therefore was to devise methods whereby these patterns were recognisable, to make the complex comprehensible and malleable, the patterns growing, reducing or mutating in an appropriate organic sense.

Keywords; Education, Urban Architecture, Sustainability, Simplicity, Complexity.

INTRODUCTION

The programmes were introduced in 1995 the school would concentrate on architecture within the urban milieu as a reflection of international concerns related to the deterioration and depopulation of inner city areas in Europe and the Americas. The aim was to educate students in the complexities of the urban environment and to make this complexity comprehensible and malleable by interpreting existing cities as a set of information layers which accurately represented the facilities and fabric of the city. This holistic set of information layers seen as a representative artifice of the city could then be utilised as a context primer for exploring and assessing future scenarios of development for the cities. These future scenarios were seen as the "Nth potential or a series of mightlihoods" (Hatton. B;1984)of what the city could become, by reinterpreting what exists through the insertion and integration of new fabric and facilities into the existing fabric such that the influence of the insertions extended beyond their actuality.

THE APPROACH

The approach to the redesign of the urban matrix was driven by the following theoretical stances which formed prodromes to each of the three programmes. 1; The city is an artifice hence artificial scenarios are an appropriate form of participation in the city matrix if they are representative images within which people can dwell; 2; Pattern recognition and pattern creation is inherent to our comprehension and manipulation of the environment which we inhabit. 3; The object is directly related to the field and there is a complex, animated, interactive nature to environmental reality. These theories were developmental as were the means through which the programme was implemented. The theories appear in an edited form at the start of the article, followed by the programme developments and outcomes.

URBANITY AS PARTICIPANT IMAGERY

We Live in an age of rapid theory formulation, cyclically perpetuated through rapid dispersion and assimilation techniques. These theories depend on the image immersion of the participant as a 'simulated communicable reality'. Physical space as the actuality within which our bodies move, no longer reflects the relevance of the theories which dwell within the mind and within which the mind dwells. Image technologies have initiated a divergence of body and mind, of inanimate matter and consciousness. This 'temporal mental physicality' has appeared in the form of the film and computer screen which are effectively today's utopias within which we participate, dwell. 'Temporal mental physicality' now affects an international cultures aspirations, simulation has effectively displaced production in terms of hierarchical importance, "the map precedes the territory" (Hussen 1989). 'Anthony Vidler in 'The explosion of Space; Architecture and the filmic Imaginary' explains this as ", I am kino eye: I am builder", I create image "I have placed you" (Vidler. A 1993). Where film has created a new attitude to time and space which is essentially flat but through oscillation produces a "pan geometric space" (Vidler. A 1993) which the mind moulds into plastic forms. Following films 'specific machine oscillation the

computer has enlarged this 'temporal pan geometric space's' potential to infinity, by formulating permutable choice within the oscillation and we live within a society of image simulation as the world of the hyper-real. This simulated hyper-real has become the norm of an urban theoretical reality. Media technologies' intensification of image production can be justifiably seen as participant temporal realities reflecting an emerging consciousness of a simulated cosmos. An architect shapes space as a reflection of human life within the cosmos. The environmental matrix as utopian ideal cannot however keep pace with our conscious ideals. The physicality we create, either needs to adopt more malleable forms of environmental medium in order to reflect and transmit the capricious nature of the age within which we live, or architecture has to accept and enhance temporal mental physicality within which the observer can participate, dwell.

PATTERNS IN THE DUST

If pattern recognition and pattern creation are inherent to the comprehension and manipulation of the environment we inhabit and this pattern recognition has enabled us to successfully project and intervene in the environmental patterns for our benefit. Where pattern recognition is taken as the ability to group individual entities and events of empirical data under abstracted themes, forming categories and philosophies of association. These groupings are then capricious, evolutionary due to the dynamic nature of the environment and the specifics of the environmental application upon which we test and reciprocally assess the themes and philosophies of association. Nature possesses evolutionary patterns which have a base code, where information is strategically related to the environment to produce forms of growth and strategies of behaviour, optimizing each particular pattern to the contextual situation. The codes are manufacturing instructions but their precise expression is environmentally dependant". (Frazer. J; 1995) There is a world of difference between the reciprocal pattern language resulting from 'inhabiting the landscape' and 'inhabitation as landscape'. The complexities of nature prevail in 'inhabiting the landscape', whilst in 'inhabitation as landscape', the complexities of 'our own nature' prevail. City landscapes refer to ourselves, our actions and social strategies, but have failed to evolve relative to the dynamics of our own nature such that past patterns, in their majority, now influence our nature. Natural patterns are generative, the constituents recyclable; our patterns fail to evolve and are deserted rather than recycled. They become patterns in the dust.

Historically the city form reinforced spiritual rituals in daily life. Functional space and form were cultural content, creating existential footholds through the inhabitation pattern itself. Multi-cultural occupation and the machine deny distinctive spiritual content. Inhabited landscape needs a means of starting from simplicity and building into the most complex of systems that are capable of re-permutation over time. Generating fabric as both existential foothold and facility that appeals universally to a multi-cultural occupation; A series of base blocks which have meaning and an imbued coding system to form patterns that are contextually evolutionary where the context as an evolutionary dynamic is the sum 'our own nature' and nature itself. The patterns of the matrix need to be capable of becoming privately possess-able

either physically or mentally in order to recognise and appreciate them. The patterns also need to be capable of amending over time, retaining existential footholds yet evolving from generation to generation.

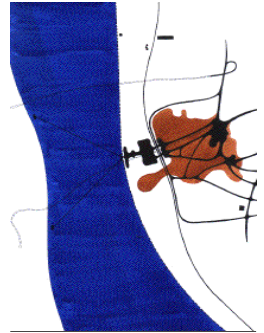
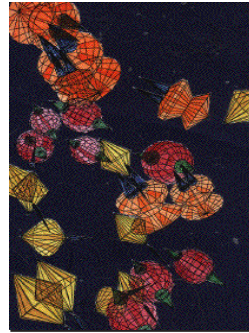
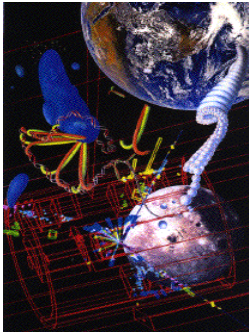
FIELDS AND FLOCKS

Temporal 'being' is revealed through change; it is animated, growing from one super-positioned state to another revealing the patterns of its strategies and hence the programmes which constitute the essence of its existence. The dynamic nature of the environment means that these patterns are in constant change. The recognition and comprehension of these changes as trace patterns of existence is an essential prerequisite to the manipulation of the environment. In considering this construction the difficulty lies in that our perceptions and judgements are self referential, preferentially recognising entities which have similar qualities to ourselves. We distinguish between figure and ground relating to figure as positive and ground as negative without seeing them as interactive or interchangeable producing a series of cognitively closed systems. The figure can itself be the medium for other entities such as fleas on a sheep and groups of figures such as flocks of sheep or blades of grass can be said to form a context or field. There is a relationship between the 'being' and the medium, the figure and the field; they are not distinct but form a *Gestalt* or interrelated whole. The 'being' of things should be seen more as emerging from the medium as its existence is dependent on this interrelationship. What is important then is to discover the interrelationship between being and medium that creates the programmes which constitute the organising forces between open systems such as urban landscapes. These programmes are more important than any specific physical form of the spatial matrix in time, because it is these generative relationships which create the forms and patterns of the urban matrix through time.

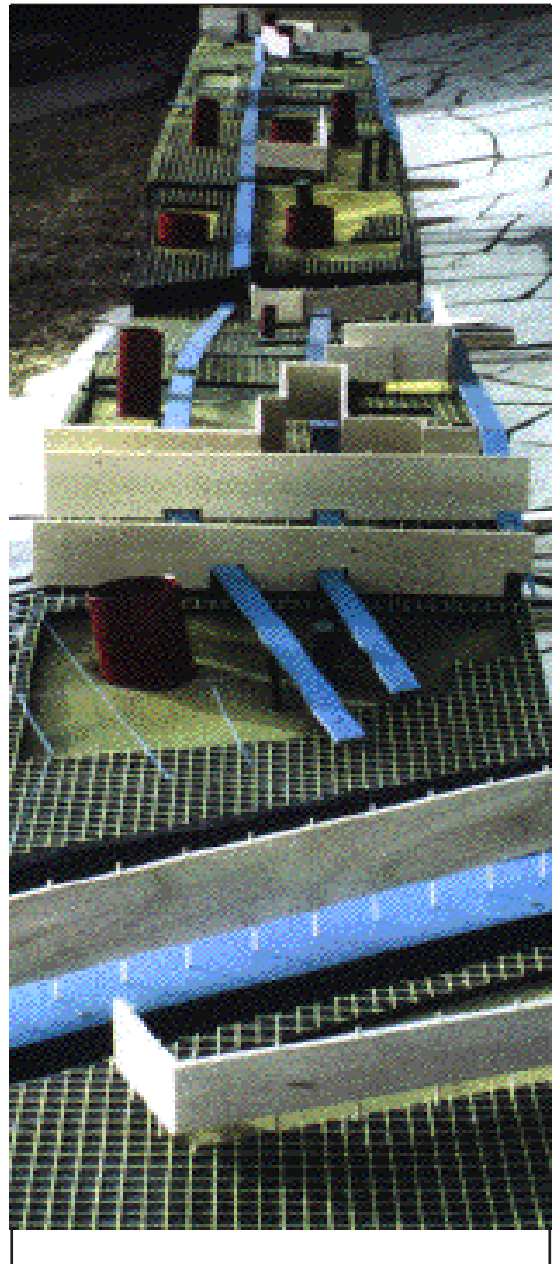
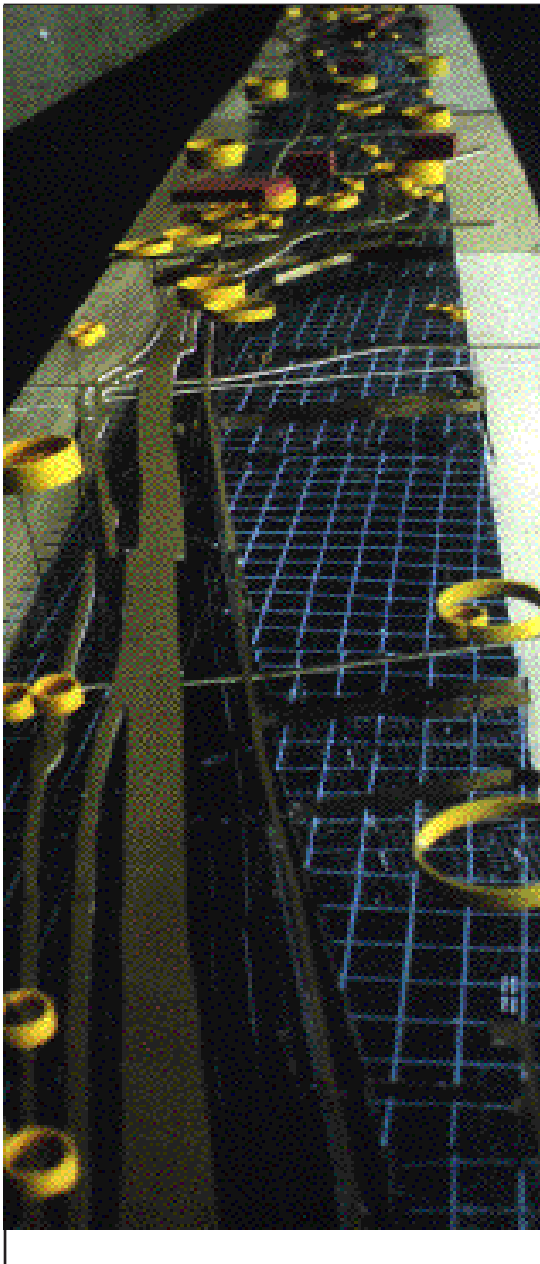
By comprehending architecture and urbanity as a series of fabric responses to events, it is possible to envisage a more dynamic state of urbanity where architectural elements can respond to amending local and global conditions. Or where groups of architectural elements can create new strategies within the existing urban programme. The application of some animated field theory to urban design would seem to be appropriate. The city can be conceived of as having emerged from the topography as a strategic material distribution in response to local and global forces emanating from the populace. The aim of urbanity should be to embed adaptive programmes into the urban matrix locally generating a series of base blocks that can respond.

THE PROGRAMME MEANS

1; Reciprocal learning methods; Utilising a categorised representative analysis of the city, where participants are responsible for building up a picture of the city and consequently acquiring knowledge of the city through their involvement in the process. This accumulated knowledge is later utilised in reverse, the amended patterns being converted back into an actual representations of the reformulated



1; Interacting beings; The Intangible likeness of Being 1993; 2; Signs in Space, 1994 inspired by Italo Calvino's article of the same title; 3; Interacting sprites in hyperspace 1995, inspired by Complexity articles in Scientific America; 4; City organism 1992, the city form morphing relative to local and global programmes adjacent to its contextual source.



5; The analysed strip of Liverpool city as a graphic layered interpretative pattern. 6; The analysed strip of Kansas city as a graphic layered interpretative pattern

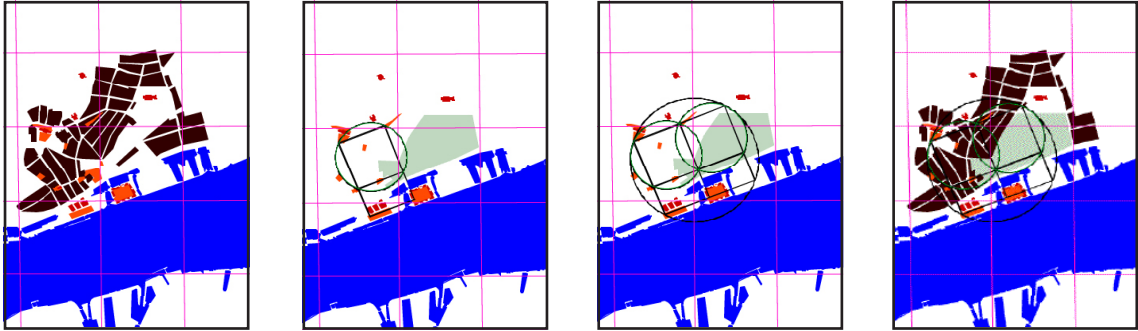
city's fabric and space. 2; Group participation and inter-group coordination. The programme was devised with a management hierarchy such that individual analysis, complete in its own right, as a learning process was always part of a larger picture encompassing all participants. This involved a feedback mechanism where individuals are associated into groups and an overall coordinating group formed of a member from each of the groups. This organisation providing an overall communication system, bottom up and top down to coordinate the information as a graphic whole that could be read by all participants.

THE PRIMER PROGRAMME

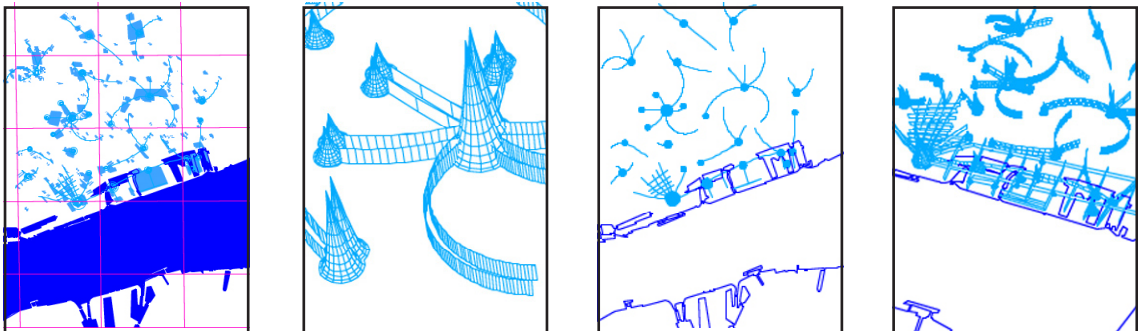
The initial programme 'Urbanity as Participant Imagery' was run in Liverpool John Moores University and Kansas State University using Liverpool city and Kansas city as the laboratories for the insertion of 'Nth' potential scenarios. The two cities have similarities, they are both located on a river, where the conjunction of river and land trade provided the reasoning for the cities foundation and boom periods. Both cities have suffered a similar fate from the loss of such trade leaving huge tracts of land located adjacent to the city centre's, empty or under used. The dilapidation of the city centre's has been amplified by the move of the populace, industry and service facilities out of the centre, to the suburbs. The actuality of the fabric and topography of the two cities were however quite different. The results of these two initial programmes run successively in Liverpool and Kansas became the spring board for the development of a system of analysis and representation of the cities facilities and fabric which could be 'seen' and amended.

There were three main phases to Urbanity as Participant Imagery, 'the Strip', the 'Life-force' and 'the Hole'. The analysis stage centred around a 'sampled' cross sectional strip of the city 200 metres wide originating from the main river gateway into the city to the main land gateway into the city. Sampling a five mile long strip of the city similar to the cross sectional slice of an organism which is then placed under a microscope. The categorization system used was the simplest to be found. Initially splitting the 'formal-fabric' analysis of the city from the 'activity-uses' which were ongoing within this 'formal fabric'. Then sub-categorising the cities 'formal-fabric' into *Edge, Route, Field, Positive Node and Negative Node*, (a series of subdivisions which were influenced and adapted from Kevin Lynch 'The Image of the City, (Lynch1960). 'Activity-uses' were also sub-categorised into *working, living and leisure*. The two sets of information patterns needed to be represented such that they could be viewed holistically and a layered model methodology of transparent and translucent materials was devised for this (see illustrations). The Life-force stage was a short programme to initiate design thinking on an abstract level by getting students to design and make a life form to live in the model abstraction they had devised. The final part of the programme consisted of identifying holes and breaks in the tissue of the urban matrix and devising schemes to repair these holes and breaks based upon a manifesto devised for a new city.

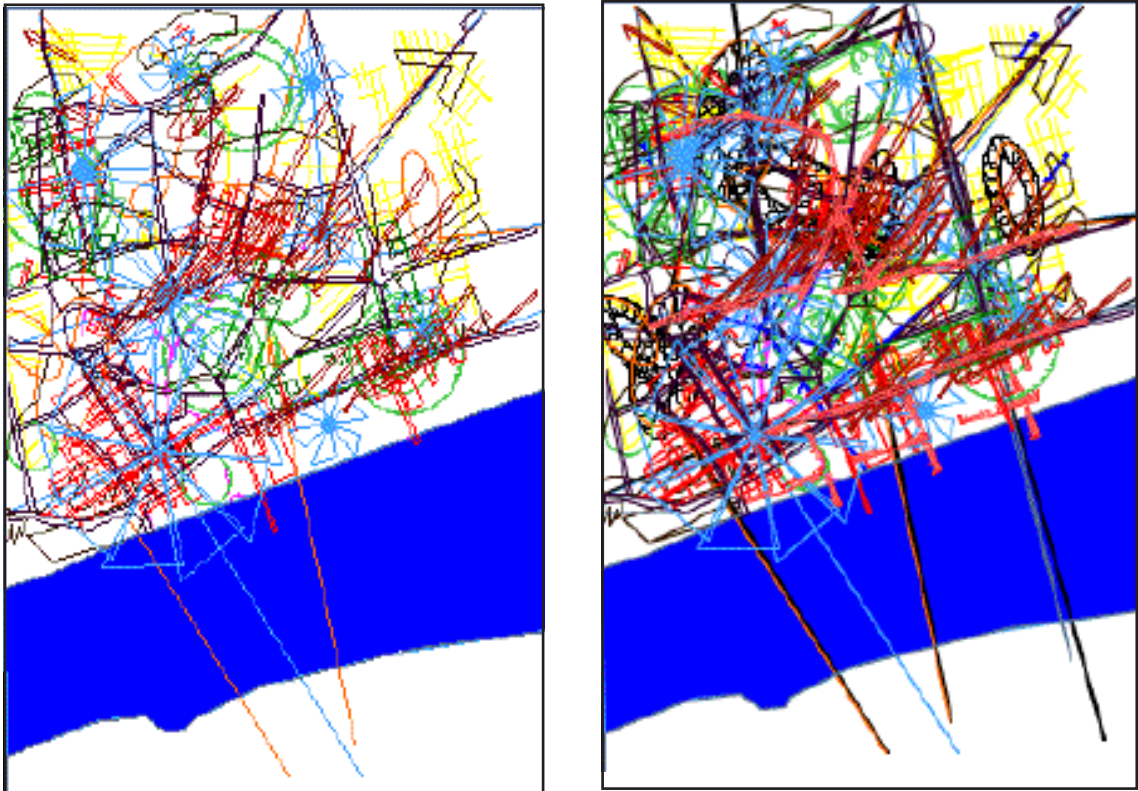
What became apparent in both Liverpool and Kansas was the dynamic state of the 'activity-uses' relative to the 'formal-fabric', and that the populace utilised and



7; Accumulated image of Liverpool; edges, fields, routes, positive and negative nodes. 8; Formatting of the existing image into a geometric order based on the negative nodes. 9; Extending the existing geometric order into the hole, as a skeleton around which the activity uses can generate. 10; The new geometric order in the context of the city's fabric image and the hole.



11; 1996; Block pattern of the activity uses (Services) within Liverpool's inner city 12; 'Megalope' pattern, relating services to their market i.e. radiating. 13; Plan view of the service 'megalope' patterns within Liverpool's inner city. 14; Three dimensional view of service 'megalope' patterns.



15; 1996; Plan Wire frame view of all existing activity uses within Liverpool's inner city. 16; Plan wire frame view of the proposed activity uses within Liverpool's inner city after the uses have been amended in relation to the manifesto aims for a future city i.e. the 'N'th potential'.

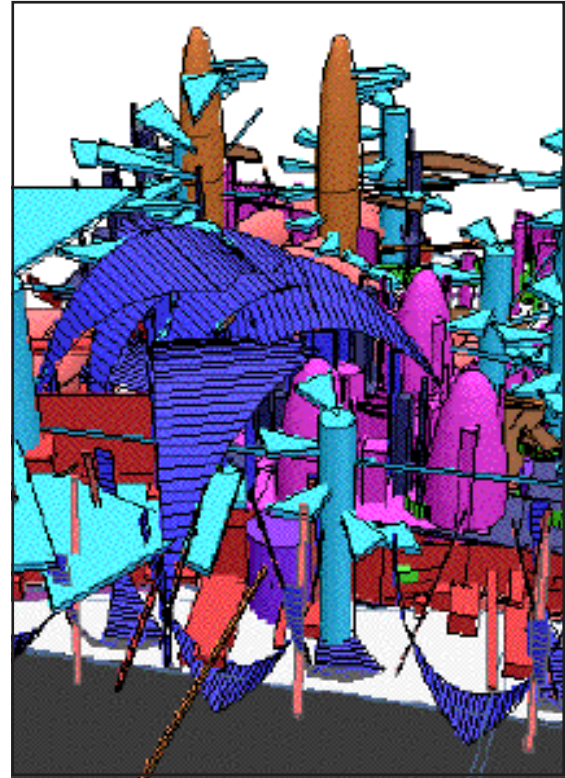
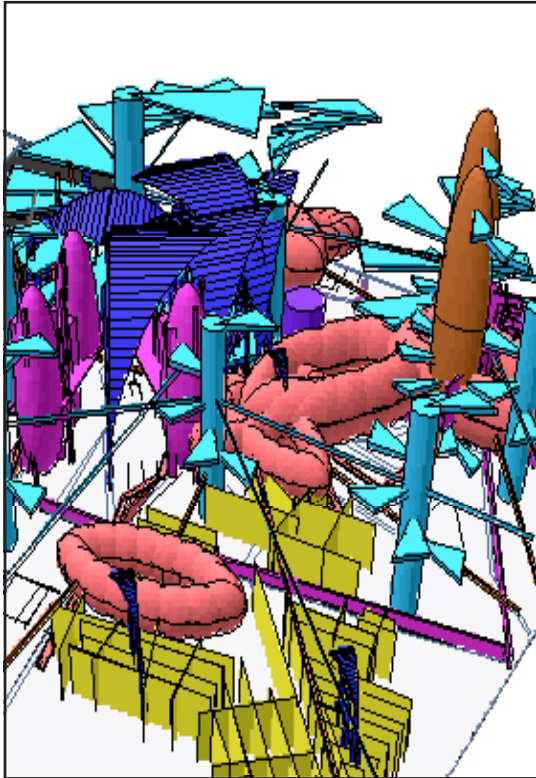
consequently recognised the city as much through its 'activity-uses' as they did through the image and iconography of the 'formal fabric'. The most successful areas of the city were however a combination of both facility and fabric. Areas of the cities with coherent recognisable images and multi-use scenarios would be constantly utilised even if the 'activity uses' amended over time. There was then a need for an expanded analysis and definition of these 'activity-uses', relative to the 'formal fabric', to more accurately represent the cities in the way that they functioned over time.

DEVELOPMENT

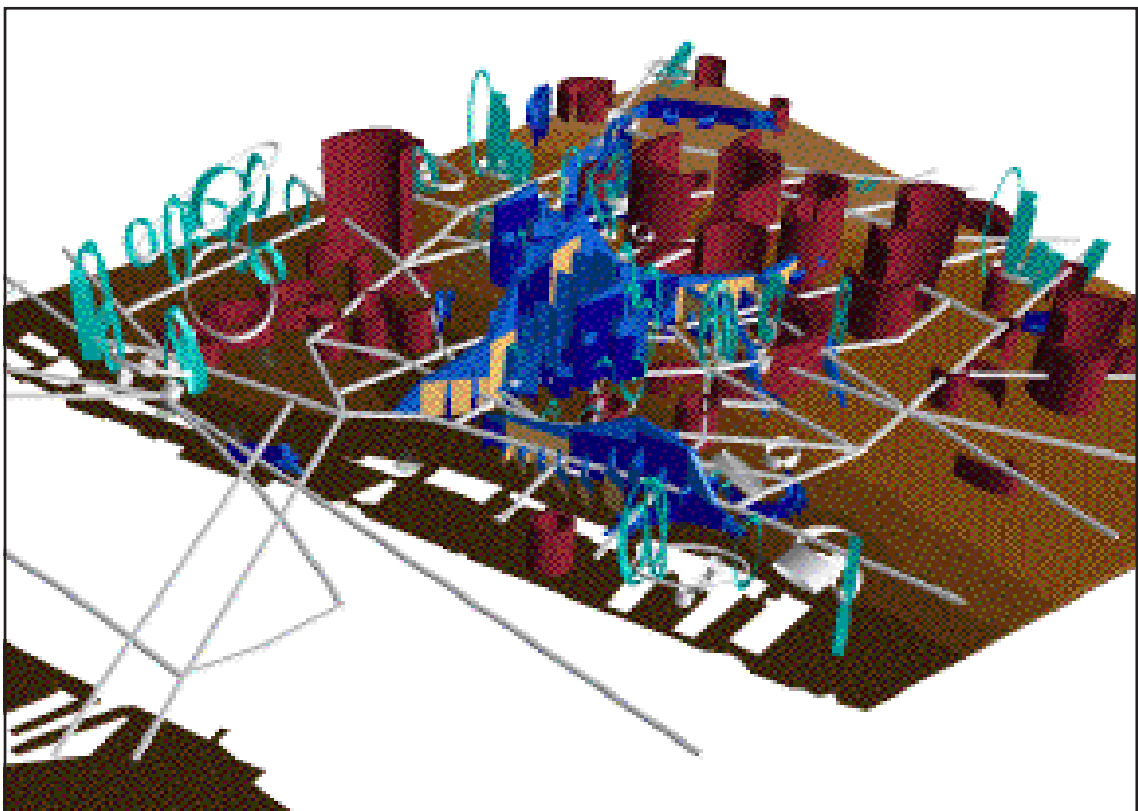
The problem of increasing the amount of 'activity use' categories was two fold, to represent them such that they could actually be 'seen', using a medium which was more malleable to amendment. The patterns themselves forming a direct primer for the redevelopment of the city. This was initially set up as a series of extrapolated information layers by mapping the categories of the city onto layers of film. The method however became too cumbersome, and was not open to transfer between the groups to form a whole. The solution came from the use of electronic graphics. Computers are useful tools when processing large quantities of complex information. The layers (for lighting, floors, ceilings etc.) in Archi-CAD and other CAD programmes enable the storing and variably displaying of information at one point in time and space by simply turning the layers on and off. These layers revealed the complex interrelationships between representative patterns of information and also enabled the cities patterns to grow as a set of variably evolutionary dynamic scenarios. Where the outcome of overlaying, inserting and amending of any pattern or combination of patterns can be assessed in association with all the other patterns.

The conflict between the 'formal fabric' and the 'activity uses' became the primer for the second programme 'Interstitial Layers'. The city patterns were accepted as two associated but distinct forms of information consisting of facility, (the activity uses) conceived of as mutable and image or (formal fabric) conceived of as immutable. Immutability, though relative, referred to the fabric image that the populace identified their city with creating existential footholds. The combined city image as represented by the sub-categories *Edge, Route, Field, Positive Node and Negative Node*, was inserted and assessed in the computer, revealing any breaks and or potential pregnancy within the patterns. This potential pregnancy within the patterns can then be projected into a future skeleton of existential footholds, or the bones around which the flesh of the city's re-facilitation can grow. (see illustrations).

This initial study of the city as image was then overlaid with an extended study of 'activity uses' that comprehensively described the inner-city. These activity-uses were sub-categorised as *Administration, Communication, Education; Retail; Service; Accommodation; Entertainment; Production; Storage; Waste*. Inspired by Ubiquitous Urbanism; Total Architecture (Hadid . Z & Columbia University 1994). The existing city information as 'activity uses' were initially inserted as block patterns within different layers of the computer. These block patterns were then interpreted into



17; 1996; Three dimensional view from the land side of all activity uses as projected by the manifesto aims. 18; Three dimensional view from the river side of all activity uses as projected by the manifesto aims.



19; 1997; Three dimensional view across the river of a select number of activity uses within the inner city of Liverpool. The activity use combination shown consisting of services; communication; accommodation; retail

three dimensional patterns that related to the essential characteristics or behaviour of that 'activity use' as a planned morphology within the city. This interpretative move was termed 'megalope' behaviour (see illustrations). Interpreted 'megalope' patterns are overlaid within the same space of the computer as those of the initial 'image patterns' revealing how the city functioned as a set of facilities in relation to the populace's image of the city, or the mutable overlaying the immutable. Each of the 'megalope' patterns was considered to have a potential for growth or reduction relative to innumerable possible future scenarios, (the 'Nth' potential) in the form of an illustrated manifesto. The effect of amending one pattern in any layer, (as related to the aims of the manifesto) can be assessed in relationship to the holistic city artifice within the computer, as can any permutation of amendments. The computer thus allowed the testing and reciprocally assessing of potential future city scenarios. In this way the machine space becomes the means 'to see' and actively participate in the city. The participants start to associate not only with the existing fabric and its problems but also actively participate in the cities potential and hence take an interest in its future sustain-ability.

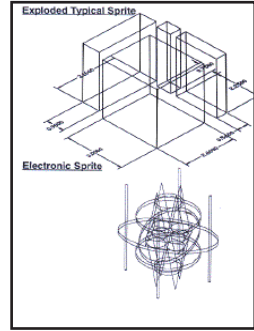
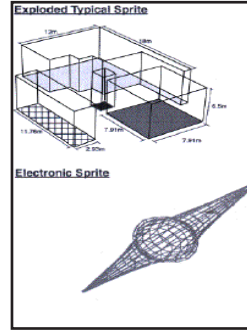
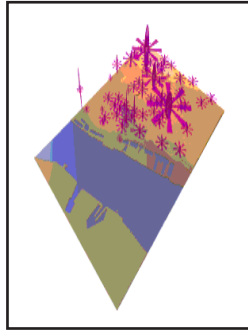
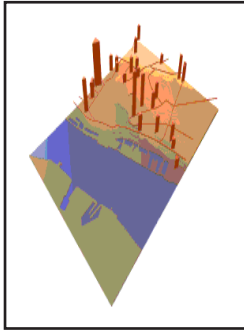
The third programme utilised a similar system, except it introduced another layer of information by splitting the 'activity uses' behaviour into 'megalope' and 'sprite' form. The 'sprites' were the smallest unit each 'activity use' could exist as (for example an office work-station in an administration building or the portal frame of a storage shed) whilst the 'megalope' behaviour remained how the 'activity uses' shaped themselves into morphological forms within the city. The overall 'megalope' patterns were thus made up of small units the 'sprites' which could theoretically be redistributed within the city topography as was gravitationally appropriate forming new planned morphology's in the new city as future scenarios demanded.

OUTCOME

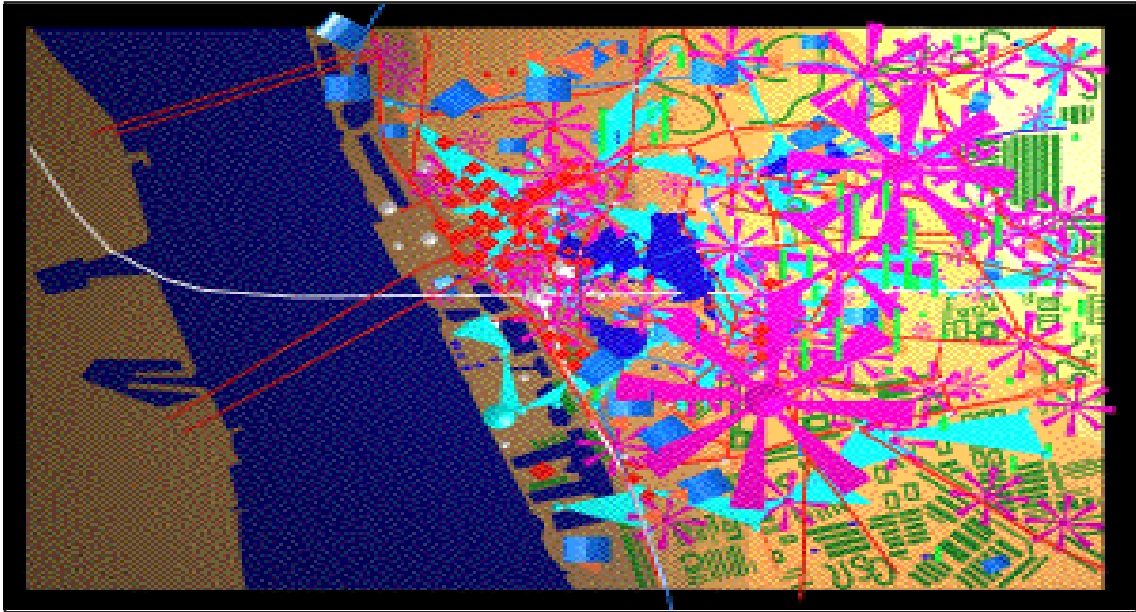
The success of the programme was evident in the product, the later programmes proving to be a catalyst to the use of CAD throughout the school. The main difficulty experienced in the programme came with the interpretation of the 'activity uses' block patterns into 'megalope' patterns. Participants would constantly return to these patterns in an attempt to distil the essence of that 'activity use' with the most appropriate representative pattern. The 'formal fabrics' reflection of 'activity uses' developed throughout the ages such that no singular pattern was in fact appropriate, however in order to recognise and manipulate the patterns within the computer it was essential that representations of the 'activity uses' have similar pattern characteristics. Whilst the programme could be criticised for treating the city too much as an information artifice with only 15 primary information categories, the approach did however yield a certain interpretive freedom in terms of the city's future. Students were unafraid to create sweeping changes that nevertheless knitted into the existing fabric of the city.

PROGRAMME SUMMARY

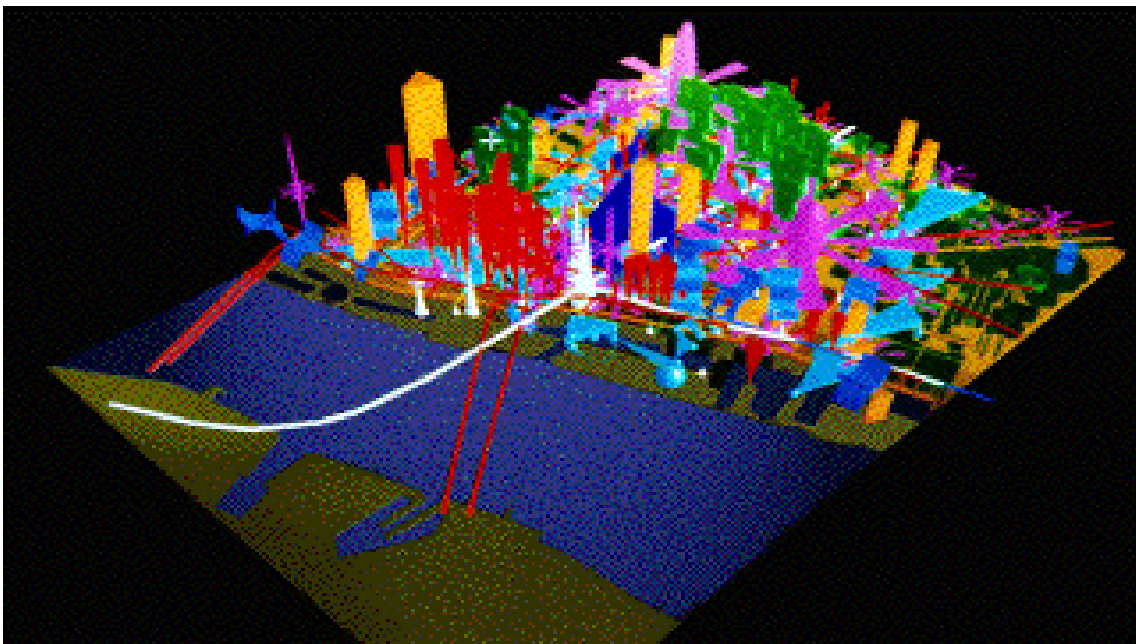
To summarise, the steps of the programme were; 1. Choose a dysfunctional city;



20; 1997; Production megalope pattern; 21; Service megalope pattern; 22; Production sprite; 23; Service sprite; Archi-CAD images edited in Photoshop



24; 1997; Plan view of the proposed redistribution of 'megalope' patterns as related to the topography of the inner city of Liverpool; Archi-CAD image edited in Photoshop



25; 1997; Three dimensional view of the proposed redistribution of 'megalope' patterns as related to the topography of the inner city of Liverpool; Archi-CAD image edited in Photoshop

2. Analyse the city in terms of a set of observer - memory classifications. 3. Input the information as a series of extrapolated overlaid layers into a computer. 4. Assess the information in combination and project the un-realised potential of the city as a skeleton into holes in the fabric. 5. Fix any existing bleeding elements of this skeleton through city surgery. 6. Analyse and categorise the city's 'activity uses' in a set that comprehensively describes the city. 7. Overlay these 'activity use' patterns on the un-realised city skeleton. 8. Interpret the 'activity uses' into patterns that occupy the same space time whilst also representing the essential characteristics of that particular 'activity use' as a planned morphology's within the city ('megalope' behaviour) .9. Assess the city as a facility within a global context and project its future potential as a manifesto. 10. Apply these manifesto aims to each 'megalope' pattern amending each relative to the potential future. 11. Assess the impact each amendment in combination with all other patterns and redesign the patterns such that the most appropriate permutation emerges relative to the manifesto aims. 12. Convert the patterns into model representations of fabric where holes appeared in step 4;

References

Frazer. J, (1995) *An Evolutionary Architecture*; Architectural Association; Hadid. Z & Columbia University (1994); *Ubiquitous Urbanism; Total Architecture*; Columbia University Graduate School, cba, USA; Hatton. B, (1985) *Ark Albion*; Architectural Association; Huyssen. A, (1989) *In The Shadow of McLuhan, Jean Baudrillards Theory of Simulation*, Assemblage 10 MIT; Lynch. K, (1960) *The Image of the City*, MIT Press; Vidler A, (1993) *The explosion of Space; Architecture and the filmic Imaginary*, Assemblage 21 MIT

Bibliography;

Allen. S, (1997) *From Object to Field*; Architectural Design 127 ; Boyer. C. M, (1992) *The Imaginary Real World of CyberCities*, Assemblage 18 MIT; Gutzwiller. M. C, (January 1992) *Quantum Chaos*; Scientific America; Holland. J. H, (July 1992) *Genetic Algorithms*; Scientific America; Kaufman. S. A, (August 1991) *Antichaos and Adaption*; Scientific America; Lynn. G, (1997) *An Advanced Form of Movement*; Architectural Design 127; Penrose. R, (1990) *The Emperors New Mind*; Vintage ; Ruthen. R, (January 1993) *Adapting to Complexity*; Scientific America; Stewart. I, (Febuary 1993) *Complexity; A New Order*; New Scientist 6;

Programmes and tutoring by Gary Brown assisted by Douglas Wall. CAD teaching by Jon Moorhouse; CAD computer programme used Archi-CAD , Graphisoft Budapest; and Adobe Photoshop 4

Student work illustrated is from ADS 6 Students of Kansas University 1996. The 3rd year degree students of Liverpool John Moores University 1995,1996 & 1997;