Studies in metamusical methods for sound and image composition

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A course in *Design Structures* is discussed. In this course students learn a multi-faceted approach to exploring mathematical and iterative ideas using sonification and visualisation techniques for their own compositional explorations. These ideas are discussed in relation to philosophy, history, technology, scientific paradigms, and cultural context. Some resulting student work is demonstrated.

1. EDUCATION FOR CREATIVE ARTISTS

Education for creative artists can be a thorny topic, one on which I have already been indiscrete enough (at least in terms of music composition) to have made some general comments (Worrall 1990). This paper describes the background to, and some details of, a course which has arisen out of a need to extend or even replace the dogma of functional harmony (or its 'modern' equivalent, serialism and/or chance operations) with a broader range of compositional techniques which are now accessible through the computer.

Composing is of course a contemporary activity which results in 'works' which somehow represent the age in which they are composed. Compositional techniques arise from compositional activity and new forms of expression frequently require new techniques. That is why serial or tonal 'style studies' are of limited use (despite their proliferation in our academic institutions) for the education of composers. Properly motivated studies in compositional technique should do more than develop technical skills. By encouraging the exploration of new relationships between structure, form and content, they should broaden and extend the development and maturation of compositional thinking, as well as strengthening the student's own ability to independently explore unfamiliar technical and aesthetic territory for compositional ideas.

2. SOUND AND IMAGE SYNAESTHETICS: A HISTORICAL CONTEXT

Practising visual artists, for example Kandinsky (1979), as well as composers, for example Schöenberg (1984) and Webern (1963), have realised that visual and aural perception are not mutually exclusive. Traditional theories of colour (Goethe 1840, Itten 1973) and harmony (Rameau 1971), and more recently psychophysics (Welch and Warren 1980, Evans 1990) provide theoretical and psycho-physiological underpinnings of this thesis. However, before the advent of electronic technology, it was not possible to integrate sound and light compositions except in the most general of ways, such as in opera and ballet.

As a medium, film is capable of exploiting the synthesis of sound and light more directly and this has led to an extension of technical and thus expressive possibilities, although the real innovative work (for example in Hollywood psychodrama style films) is for all intents and purposes restricted to special effects. Many artists, especially in the symbolist and transcendentalist movements, have been concerned with the issue: Scriabin's colour organ (Scriabin 1911) and Termen's light music projector (Galeyev 1991) are particularly interesting precursors, as are the colour-musical films of Bute (1964) (whose work was directly influenced by Termen) and Whitney (1980, 1990).

3. INTEGRATING MUSIC AND DYNAMIC ABSTRACT VISUAL COMPOSITION

Since the advent of computers, music and animation have become disciplines which have more in common with each other, at least technically, than they do with their traditional origins. This is due to the fact that they are both temporal arts and thus concerned with phrase, gesture, rhythm, tension and resolution, in no small part because they have become computerised: composers and visual artists are for the first time using the same tools – tools for which mental dexterity has for a large part replaced manual dexterity.

Digitally integrating the visual and aural domains is now possible on the micro-(sample, pixel) as well as macro-(gestural) compositional levels. This technical integration means that experimental composers and animators using very similar compositional tools can exercise extremely fine control over their polymedia compositions.

Xenakis's Polytopes and our polymedia compositions *Life Dreaming* and *Chromacron* for our

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multichannel geodesic performance space (Worrall 1996) represent a further integration, that of architecture and three-dimensional space.

For the first time experimenters can use a similar compositional environment and this is encouraging new artistic paradigms such as the movement some call Proceduralism (Worrall 1994).

4. COMPARABLE WORKING METHODS IN THE ARTS AND SCIENCES

Despite the fact that composers, visual artists, mathematicians and scientists are working with different social and cultural motivations, there is a greater degree of similarity in their working methods than is commonly imagined. In particular, the working life of a professional animator or composer is far from the popularist view of creative arts 'activity'. Most work long and consistently and most build structures and develop techniques with which to form, strengthen, develop and then enunciate their initial ideas. During this process, visualisation and sonification 'sketches' are frequently undertaken.

5. MATHEMATICS FOR CREATIVE ARTISTS?

Students who can demonstrate their computational skill through symbolic notation are traditionally considered good at mathematics, yet there are many whose conceptualisation skills are highly developed but whose skills with symbolic notation remain poor. These students are judged to be poor at mathematics and will most often discontinue their mathematics education prematurely.

In the course of their secondary school studies, few students actually gain much experience in mathematising; most don't 'graduate' from computation, yet we live in an age where machines can do this computation much more quickly and reliably than humans. Someone once calculated that the first Macintosh computer (1984) could perform all the calculations that Newton had done in his lifetime in 11 seconds – and much more accurately! Why then do we continue to teach mathematics as if it is primarily an exercise in computation? I have explored this issue more fully elsewhere (Worrall 1992). If students are encouraged to develop their own conceptual methods of understanding mathematical ideas, no matter how unconventional, then they can sustain a higher level of reasoning with these ideas; in short, of mathematising.

Many of these structures and techniques can be developed and explored with the aid of mathematics. Much of serial music theory, for example, can be more deeply understood through group theory; Peano's axioms for the construction of number systems apply equally to the construction of scales of perceptual parameters (pitch, colour, etc.) and we commonly talk about algebras for mapping a-temporal structures into temporal constructions. Some correlations between these different activities are summarised in the Venn diagram in figure 1 in which I make a distinction between abstract, static and dynamic structures.

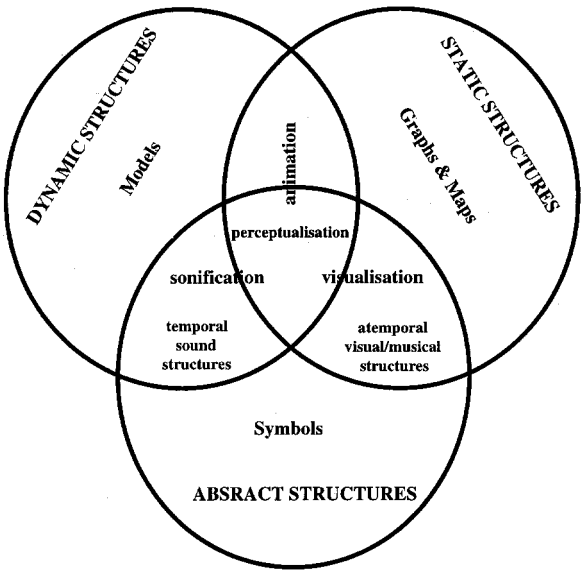


Figure 1. Structural interrelationships between music, animation and mathematics.

Abstract structures are the most general in form and are usually represented as symbols. They are basic entities, objects, constants, variables, etc., which we define as important foundations, discretisations, frames of reference. Static structures can be represented as discrete or continuous graphs and maps and are a-temporal (Xenakis' 'outside-time' structures) such as scales of various perceptual parameters (pitch, colour, duration, timbre-class, etc.) and maps of these parameters (group transformations, probability distributions, etc.). Most static visual art falls into this category. Dynamic structures are the most composition-specific types and can be represented as working models – temporal mappings of static and iterative structures into real time.

6. *DESIGN STRUCTURES* – A HISTORICAL CONTEXT

The course in *Design Structures* described here has evolved from my own creative work in algorithmic composition initially using groups and stochastics, as a collection of unconnected projects given to my composition students over the last fifteen or so years, and then about six years ago when we established ACAT, with the animator Stuart Ramsden who had independently come to see the need for such studies for his own and student's work. Stuart and I currently

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jointly teach this course to latter-year undergraduate and graduate students, sometimes with the assistance of Julie Tolmie (ANU Study Skills Centre's mathematics/statistics adviser) whose solid mathematical grounding and skill in amplifying notations into diagrammatic representations are invaluable. Her interest in music and the visual arts is a welcome bonus.

7. *DESIGN STRUCTURES* – AN OVERVIEW OF TOPICS COVERED

Design Structures explores mathematical ideas for experimental music and animation composition. It develops in the student an understanding of mathematical structures and procedures from their conceptual and foundational frameworks. In using computers for integrating sound and image technologies, it generates experience in visual art and music at the same time as studying abstract structuring principles.

Our *Design Structures* course, then, exposes non-mathematics students to modern mathematics in a non-trivial way. Whilst it is currently a one-year course it could and probably should be extended and expanded to two or three. In the current course, a broad range of mathematical topics is covered rather quickly. Figure 2 outlines the order of the topics covered.

Whilst many of the topics are quite technical, an underlying principle of the course is the development of aesthetic sensibilities together with technique. This principle ensures that the presentation of the material is moderated by artistic rather than purely computational concerns. This helps students to contextualise mathematical thinking both as a way of encouraging reasoning with aesthetic principles and as practical tools for making art (in our case, with computers). This, what we might call 'perceptual approach' to teaching mathematical principles, draws students to mathematics of a certain depth, complexity and generality, that would not be possible if the approach was computational, and it is this depth and beauty of patterning which makes the mathematics manifest – sometimes in unexpected ways.

8. TEACHING METHODS

Figure 3 summarises our approach to teaching the course. Students undertaking it engage in three main activities; the first two are undertaken in parallel and lead onto the third:

(1) Selective study of the considerable amount of reading material from books and journals that has been collected over many years. Each topic is covered by more than one reference and so there is considerable redundancy in the collected material. These references (see Appendix A) are updated when a new article with an appropriate approach is located or additional material is produced by the staff to further clarify a concept. Material from this 'brick' is read by students before each seminar and then there is a discussion of the topic with examples drawn from the mathematics, music and visual literatures.

(2) Learning to use an interpretive programming language for symbol, image and sound manipulation leading to a graduated practical exploration of the ideas with a computer. The need for the artists to program the computer themselves is fundamental to the exploratory process. Composers have, in general, understood this but it is yet to be accepted by most visual artists. The animator John McCormack states:

> Inevitably, to really exploit and understand the process I am referring to, you must write your own software. This puts you on more basic terms with the machine, it allows the direct implementation of ideas, as opposed to interpretation through another's constraints. (McCormack 1994: 23)

The choice of programming language/environment is thus very important. In the initial assignments we use APL (see, especially, Iverson 1980) because:

- it is designed for mathematics, and is particularly strong for set and multidimensional matrix manipulation,
- it is a very high level language, thus reducing the need for a major time investment in basic tool development and data structure management,

SEMESTER 1	SEMESTER 2
INTRODUCTION (AIMS, PRECEDENTS, HINTS ETC)	GAME THEORY
RATIO	GRAPHS & FUZZY LOGIC
SET	LYNDENMAYER SYSTEMS
NUMBER	GENETIC ALGORITHMS
RELATION, FUNCTION & GROUP	NON-DETERMINISTIC FRACTALS
RECURSION & AUTOMATA	FILTERS
EUCLIDIAN GEOMETRY	CHAOS THEORY
VECTORS	CATASTROPHE THEORY
PROBABILITY	TOPOLOGY
CALCULUS	NON-DETERMINISTIC FRACTALS
TRIGONOMETRY & SPECTRAL ANALYSIS	DETERMINISTIC FRACTALS
ITERATED FUNCTION SYSTEMS	VECTOR FIELDS &VECTOR CALCULUS
FOURIER TRANSFORMS	WORK PROPOSALS & EVALUATIONS

Figure 2. *Design Structures* topics.

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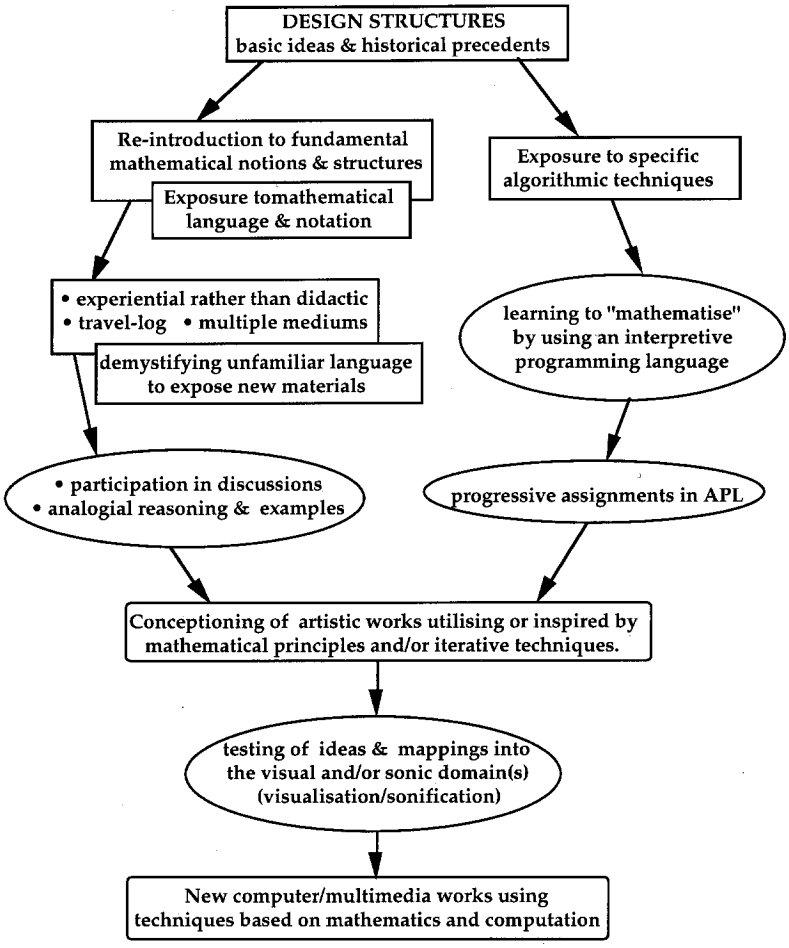


Figure 3. Summary of our approach to teaching *Design Structures*.

- it has many very powerful primitive operators for the easy creation and manipulation of data, and
- it is interpretive. By replacing the compile-link-run (-crash!) cycle with a 'what you see is what you get' interface, it supports the student's need to explore different approaches and solutions by encouraging examination of the output of each step of a process. The modularity that this provides is important when 'searching for the composition' because it minimally restricts the finished work to the structure of the original conception.

(3) Production of a work using principles and techniques learned in (1) and (2). At present students complete a number of set assignments and then undertake their own individually tutored creative explorations of a topic or combination of topics of their choice.

Appendix B is an example of a first semester assignment: it has a strong computation component and leads a student through a number of smallish sequenced steps to design visual and aural material using iterated function systems. Before attempting this assignment, students will have covered all the topics before it as outlined in figure 2 and, specifically, have attended a two-hour seminar in which Barnsley (1988) and Gogins (1991) have been discussed and illustrated with existing works. In this process the student will come to understand at least the following ideas: vector and matrix transformation, translation, rotation, scaling, sheering, contraction mapping and recursion. Figures 4–9 illustrate some of the graphic output produced for this assignment. As each image is composed, it is accompanied by a sonic 'mapping' of the same data set. Whilst it is not possible in a paper to give a dynamic illustration, readers may be able to imagine the image in figure 10 evolving as the sound examples on the accompanying CD play.

In the latter example, an inverted triangle (∇) is used as the basic shape which is transformed through five iterations with the four IFS codes shown in the table (see question 9 of Appendix B, using the Macintosh QuickDraw coordinate system). The pitch material is controlled by the height (y coordinate) and the delays between notes by the x coordinate. The image begins to be generated from the top right

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Figure 4. Paul Kirwin: *Thumbprints?*

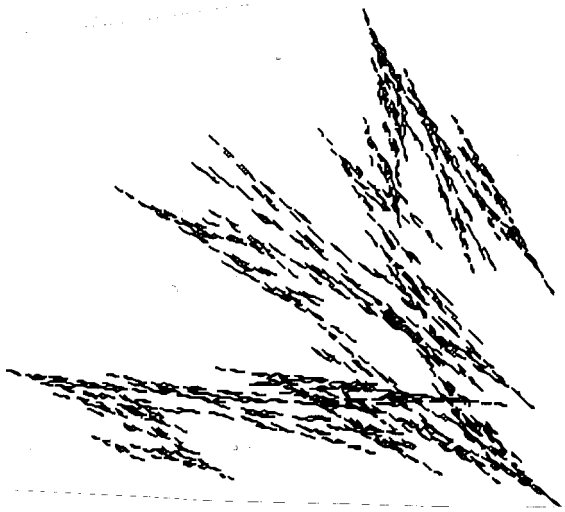


Figure 5. Paul Kirwin: *Ghost*



Figure 6. Nick Cross: *Procession*



Figure 7. Nick Cross: *Mountain*



Figure 8. Nick Cross: *Rider*

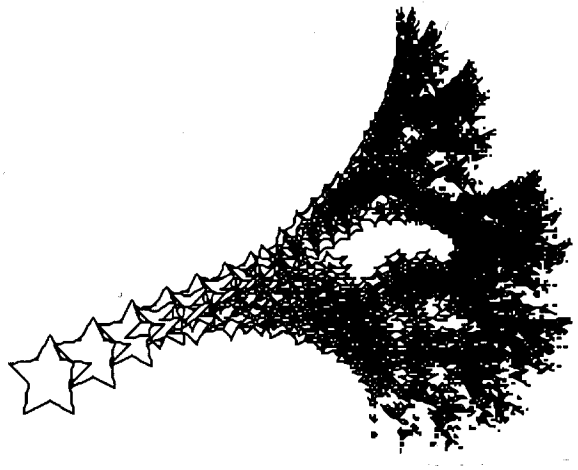


Figure 9. Bridget Dexter: *Fractal Coral*

The first sound example is with two recursions, the second with three recursions and the third with all five, illustrating the way the structure evolves over time.

By the middle of the second semester, students have covered a wide range of mathematical ideas and have gained some experience at highly directed visualisation and sonification. They then move into the

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Figure 10. Russell Davey: *Hooks*

Table

IFSMX		IFSVEC	
0.6241	0.5354	80	20
–0.2952	0.4788		
0.7450	0.3345	40	10
–0.1012	0.6430		
0.4563	0.5251	–80	–20
–0.4749	0.3026		
0.6489	0.1773	–40	10
0.0131	0.5304		

final stage of the course by choosing a topic or combination of topics that interests them. They submit a formal work proposal which forms the basis on which their final assignment is undertaken and assessed. These visualisations and sonifications may in fact be complete compositions. At ACAT, genetic algorithms for controlling emergent behaviour currently seem to be favourite areas of exploration.

9. CODA

Whilst simple visual representations such as graphs and charts have long been employed in interpreting pattern in numeric data, there has recently been an increased use of more sophisticated mathematical models in many disciplines. Whilst this comes in part from new technologies making it possible to run models 'without having to solve the equations yourself', it still brings with it the need to understand the mathematical concepts in order to correctly interpret the results.

In the scientific world, the move from static maps and graphs to dynamic animated models has been rather straightforward. Incorporating sound has not been so, despite the fact that humans have an acute ability to perceive certain types of relationships aurally (density, speed, harmonicity, location, etc.) and the psychophysiology of hearing makes it better suited than vision for certain recognition tasks. For instance, the ear/brain can filter sounds simply by a shift in attention; it can be peripherally aware of many hundreds of complex sounds and their evolution simultaneously and yet easily detect small particular changes.

We know that in exploring mathematics there is a danger in abstracting ideas algebraically too early, because in doing so the student can learn a set of rules and then just manipulate the symbols with them to form 'well-formed' statements without obtaining an intuitive grasp of the underlying principles.

We continue to experiment with new ways of exploring mathematical ideas for sound and image composition, and how and when to use different representational types such as symbols, graphs, maps, and models. In doing so, we are finding alternatives to the dogma of serialism, and/or 'chance' operations which all-too-quickly replaced the dogma of functional harmony in many composition courses; alternatives to studies in navel-gazing post-modernism in visual arts courses where the computer is simply a 'modern' tool with which to realise The Work. We are exploring new ways for students to develop compositional techniques in which the computer is more of a collaborator in exploring new paradigms compositionally more fecund than species counterpoint and mobile form such as fuzzy logic, fractals, L-systems, genetic algorithms and emergent behaviour.

10. INFORMAL EVALUATION

Currently this course is taught over one academic year, moves quickly and is thus quite challenging. A slower more graduated course over a number of years would be more appropriate and many of our students have expressed that desire. The reading materials (Appendix A) need to be completely rewritten for stylistic consistency, stronger integration of the ideas and better cross-referencing both of the text itself and the text with 'real-world' compositional examples.

I mentioned earlier that the choice of programming language/environment is very important. Whilst APL has the advantages I've outlined and this is not a course in programming techniques – at ACAT we teach this separately – it does have some severe limitations because of its vintage, speed and esoteric characteristics. An integrated hypertext and compositional environment with graduated exercises, etc., would be best and, although we have begun, it is a big task and should probably be undertaken as a coordinated/edited WWW site.

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APPENDIX A

Details of the *Design Structures* "Brick"

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RATIO	
Ghyka: *The Geometry of Art & Life*	1
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Stewart & Tall: *The Foundations of Mathematics*	7
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GAMES	
Singh, J: *The Theory of Games: The Logic of Rational Decisions,* in *Great Ideas of Operations Research* Ch 7, pp.120-151.	394
Conway, J (and others): *Winning Ways*, PP 4-13,16-18,21-26,29-45,54	410
Xenakis, Iannis: *Formalised Music*, Ch. IV, pp 110-123.	430
FUZZY LOGIC	
Swaine, M: *Fuzzy Logic and Prejudice*	438
LaQuey, R: *Fuzzy Query Language*	442
Zimmermann, H: *Fuzzy Set Theory - and Its Applications* pp 0 - 23	452
Vidyamurthy, G & Chakrapani, J: *Cognition of Tonal Centers: A Fuzzy Approach*	466
VECTOR FIELDS AND CALCULUS	
Kreyszig, E: *Advanced Engineering Mathematics* pp 363-365.	472
Schey,H.M: *Div, Grad Curl, and All That.* pp 1-10, 86-91, 115-119, 136-143.	476
Perlin, K: *An Image Synthesiser* Siggraph Proceedings 1985, pp 287-296.	492
Turk, G: *Generating Textures on Arbitary Surfaces Using Reaction-Diffusion* in *Siggraph Proceedings 1991*, pp 289-298.	498
LYNDENMAYER SYSTEMS	
Prusinkiewicz, P & Haan, J: *Lindenmayer Systems, Fractals and Plants* in *Lecture Notes in Biomathematics #79* pp3-32, 41-54, 69-85.	508
McCormack, J: *Interactive Evolution of L-System Grammars for Computer Graphics*	552

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GENETIC ALGORITHMS

Sims, K: *Artifical Evolution for Computer Graphics* in *Siggraph Proceedings 1991*, pp 319-328. 542

McCormack, J: *Interactive Evolution of L-System Grammars for Computer Graphics Modelling.* from *Proceeding of Complex Systems* pp 118-130. 552

Latham, W: Form Synth: *The Rule-Based Evolution of Complex Forms from Geometric Primitives*, from *Computers in Art, Design and Animation.* pp 80-108. 559

CONTINUOUS PROBABILITY AND NON-DETERMINISTIC FRACTALS

Voss, R: *Fractals in Nature* from *The Science of Fractal Images*, pp21-44. 574

Saupe, D: *Algorithms for Random Fractals* from *The Science of Fractal Images*, pp71-90. 598

Pressing, J: *Nonlinear Maps as Generators of Musical Design.* Computer Music Journal Vol 12 No. 2 ,1988. pp 35-46. 698

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Holden, A: *A graphical zoo of Strange and Peculiar Attractors*, in *Chaos*, pp15-57. 618

Pickover, C: *Mathematical Chaos* in *Computers, Pattern, Chaos & Beauty.*, pp141-171. 640

Bidlack, R: *Chaotic Systems as Simple (but Complex) Compositional Algorithms.* in Computer Music Journal Vol 16 No. 3 ,1992. pp 33-47. 656

DETERMINISTIC FRACTALS

Martin, B: *Graphical Potential of Recursive Functions* from *Computers in Art, Design and Animation.* pp109,129. 672

Lauwerier, H: *Fractals*, pp 124-151. 684

Pressing, J: *Nonlinear Maps as Generators of Musical Design* from CMJ, Vol. 12, No. 2, 1988, pp 35-46 698

TOPOLOGY

Connell, S: *An Introduction to Topology* 710

Hilman, J: *Topics in Analysis and Topology* 719

Appendix B

Design Structures A Assignment: Iterated Function Systems (IFS)

Preamble

In order to do this assignment you will need to start APL.68000 with the custom workspace **IFS**. This workspace contains various functions and variables for graphics and sound output. The following "high-level" functions are specifically provided for your use for this assignment:

Glossary

INITIFS - a nulladic function which pops up a window into which APL will draw. You should always close earlier versions of this window (if any exist) before executing this function again.

DRAWIT S - a monadic function which draws the shape described in the variable **S** in the window. ⍴S = N,2. N[;1] contains the x coordinates and N[;2] contains the y coordinates, thus:

```
x1   y1
x2   y2
x3   y3
...  ...
```

CLEAR - clears the window

BOX - a variable which represents a square box shape with a side length of 20 units, centred around the origin which is located roughly in the centre of the **IFS Test** window. Note that to draw closed shapes the first (x,y) point is repeated as the last point.

DOT - a variable which represents a dot shape, centred at the origin. It is actually two(x,y) points in the same place (0,0).

Assignment

1. Test out the functions in the IFS workspace. Pop up the window and experiment with drawing BOX and DOT and clearing the screen.

2. Compose three other shapes, a triangle, a star and one other (your choice) and store them in matrices (as a series of (x,y) values like BOX).

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3. Compose a 2 element translation vector (x,y) (TVEC). Design TRANSLATE, a dyadic APL function which returns a translated shape. It should take the translation vector and the shape (such as BOX) as inputs and return the translated shape's matrix. You should now be able to draw the translated shape at any location in the window.

4. Compose a scaling matrix (SCALEMX) in the form

$$\begin{matrix} Sx & 0 \\ 0 & Sy. \end{matrix}$$

Design TRANSFORM, a dyadic APL function which takes the scaling matrix and the shape (such as BOX) as variable inputs and returns the transformed shape's matrix. Hint: use the APL inner product function. You should now be able to draw the shape scaled to any size.

5. Compose a sheer matrix (SHEERMX) in the form

$$\begin{matrix} 1 & SH_y \\ SH_x & 1 \end{matrix}$$

Using TRANSFORM, you should now be able to draw the shape sheered vertically and horizontally by any amount.

6. Design a monadic function ROT which takes a single scalar argument in degrees and returns a matrix:

$$\begin{matrix} \cos(\ominus) & \sin(\ominus) \\ -\sin(\ominus) & \cos(\ominus). \end{matrix}$$

Hint: Use the circular function operators.

7. Design a function (MULTMX) which returns the transformation matrix resulting from the multiplication of the scale, sheer and rotation matrices. Hint: Use inner product.

8. Design a monadic function (TRANS) which accepts a shape and returns it transformed by MULTMX and translated by TVEC. You should now be able to draw a shape anywhere on the screen with any degree of rotation, scaling and sheer. Note: The four values in the output of MULTX and the two values TVEC constitute the six numbered IFS code for the contraction mapping.

9. An IFS consists of several contraction mappings. Design a 3D ARRAY (IFSMX) which can hold four 2x2 transform matrices and then fill it with four different transform matrices. Do the same thing with TVEC, i.e. make a new array (IFSVEC) which holds 4 distinct TVECS. Use array indexing to single out particular contraction mappings when assigning or retrieving them.

10. Define a new function based on TRANS which in addition to a shape matrix, accepts a scalar to be used as an index into your IFS arrays. You should then be able to numerically select one of four contraction mappings to apply to your shape.

11. Design a monadic function (SHOWIT) which draws a given shape after it has been transformed by all the contraction mappings.

12. Use SHOWIT as a guide to building a dyadic recursive function (SHOWIFS). It should accept a shape and them call itself, passing a transformed shape. It will need to do this for each contraction mapping. It should also accept a depth scalar which specifies the depth of the recursion. It should draw the resultant shape after the recursion ends.

13. Design a monadic function (PLAYIT) which plays a given shape (delay= x, pitch = y) after it has been transformed by all the contraction mappings. Assume constant durations and amplitudes.

14. Use PLAYITas a guide to building a dyadic recursive function (PLAYIFS). It should accept a shape and them call itself, passing a transformed shape. It will need to do this for each contraction mapping. It should also accept a depth scalar which specifies the depth of the recursion. It should play the resultant shape after the recursion ends.

15. Design three interesting Iterated Function Systems. For each system write a nulladic function which assigns the appropriate values to the IFS arrays and executes SHOWIFS and PLAYIFS on one of the shapes you designed in question 2 to an interesting depth.

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A DOING RESOUNDS

an anagramic sound poem by David Worrall

Edgard's nous, I
searing sound, do
drag noise sound
  as ignored sound
  goes sour
and din
  a gross odd ennui
as sound eroding
drains ego sound.

Dare I sound song?
Do sounds regain
grand noise? Us do
  reading sound
    so
    near sound
so dig
age sordid nouns
  sounding ears
do
dig reason sound.

Daring sun ode
  so
  gird on sea sound
rousing Danes do
rouse and sing, do
  in seadog rounds
sing our sand ode:

Souring Sand Ode
and Good Sunrise
on Druid Sea Song

Our design, and so
our sedan do sing.
  A sun-door design,
  a sound design, or
  a design so round.

On guard, EDISON'S
NUDE DRAGONS
  so I
  doused in groans
  and rousing odes
do a singer sound.

Sending us a door
  assign donor due
a used donor sign
  as donor sign due
so design around
unassigned door.

No dragon is used
  donor's snug idea
dragon is nude, so
no dragon issued.

As our dog Dennis
is sonar dune-dog
  A sour dog, Dennis
  adores dingo sun
so darn dingo use
a dog siren sound.

Dog neurons said
sedan's gin odour
aids nose dog run.
"Dennis, Us road go!"
I surged, and soon
goad iron, "Send us!"

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Sad ground noise,
Gas ends in odour,
our nosing's dead.
Is our gas donned?

Dead ring. Soon us
add ring, soon use
an odd reusing, so
us dang ride soon
and I roused song
on our sad design.

Us Edison Dragon
used, so dingo ran.
Dog sure soda inn
do drug in season.

Dog sound arisen
on rude soda sign,
as odour signs end,
our sign – SODA DEN.

Sadie's noon drug
did noon user sag,
so sad groin nude
did soon user nag.

Dog is nude sonar,
dog is round sane,
dog rosined anus
    on duress
do gain
danged rosinous
Grandiose sound!

Dingo sounds are
odour designs; an
end-sag-sin odour
searing sound do.

Resin sound goad,
in gas odour send,
sag used inn door
as dingo-end sour!

Using node roads,
DUNGEON ROADS is
dune roadsign, so
    nosing roads due
do ensuring roads.

Road unsigned so
no roadsign used.
Nude roadsign, so
guess! No road din.
Nod. On surge, said
"Darn guides soon!"

Nudges on radio's
ride-song sound, a
snug radio's node
sonar diode sung.

Song rends audio
as diode run song
is soon urged, and
I used song adorn:

Sad Igor's undone
using Edna's door,
no sugar Noddies,
noir Degas sun.
So nude Igor sand
ode sand Igor sun
sanding door use
noised Durangos
noised Durangos
noised Durangos . . .

In sad rodeo sung
duo Sardine Song
"Go sardine!" sound
and rodeos
    using
    doused iron nags
arode sign sound.

No rude sing-soda
around side song
so danseur dingo
    on grin soda
used
sordino nudge as
organ sound dies.

Sun dosed, I groan
as sun-doged iron
sad din soon urge:
    "Is grade sound; on
    erosion snug? Add
    sod grade unison
    in used road song?"

So,
    as iron nudged
gears soon undid.
    "Is goo under sand
    ensuing road sod
    go round sedan? Is
    sand-goo run side
    dangerous?"
Nod is
ignored as sound!

No sand guide, so
    on snug roadside
us roadsign done.
So
    using end road
our sedan do sing
"Undo Design" or
    as
    sour design
do an
    "Iron, Us Dead" song.

Noon sure did sag
as odd region sun
drained us goons.
Soon sun did rage
and den us go
    or is
    den our sad song?

No raised sun. Dog
    on a dingo duress
rouses dingo and
den guard soon is
sounder, as dingo
odes
    rousing DNA
    odours
a den sign
rondeau dog sins.
Dingo sonar used
sand
    or dingo use
    a dog resin sound
and so dog insure
nine sad sour dog
sad dog reunions.

As den dingo sour,
dingo do snare us.
Insane dour dogs
ruin sedan. So dog
I snare; dog sound
near sinus do dog
dingo's ear sound.

Nuns go roadside!
Guns on roadside!
Raid soon nudges
said red gun
    soon
    guided on sonar's
    grin.
    "Us dead soon!"

Soda grin used on
age sordid nun, so
    as dingo resound
"Dog sore" said nun.
Soon use grin, add
dung on said sore.
Raid sounds gone
as do dingo nurse.

"Is gun reason odd?"
"No" nurse said, "dog
song so arid, nude
dog-sound is near,
airgun so sodden,
undoings so dear,
roan dingos used,
I send guard soon.

"I gander sound, so
    on guided arsons,
grade on sound is
so grained, sound
grain odes sound
sound in grade so
nearing us so, odd
do a sounder sign".

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Soon snug, I dared
do rondeau signs.
"Dear, I sound song;
sing ode as round".
Round song ideas
soon nudged airs
as sound on dirge
I odd reason sung.

Nun adores God, is
on duress, doing a
song under aid, so
as dire song undo
Non-gourds aside
drones go unsaid
sienna gourds do
gourd sand noise.

Nine soda gourds,
rondo sueding
as
insane gourds, do
gourd noises and
ensuing sarod do
sun-ode saroding.

Dungeons airs do
unions so graded,
sadder unions go
as undoings redo
and soon is urged
saudi drone song:

Ogden's dinosaur
is an odd surgeon.
A sordid genus
on
good Sudan resin
does sing around
rondo gaudiness.

On raised sun god
and using Eros
do
dinosaur dens go
dinosaured song.

Sudan groin odes
dens odious rang.
A din song roused,
good nuns raised,
sad rousing done.

Dungeon raids, so
arousing dens do
go in undress, do a
'Gonads or Undies –
Us Ordained!' song.

Song did rouse an
arid nude song. So
good in undress, a
signora sounded!

Nun orgies odd as
do a snoring used.
Go near odd sinus
as during, nose do
side organs, undo,
rousing a sodden
resounding soda.

So drug insane do,
on sun orgies add,
a sordid nose gun.
Rude nosing do
as
a nosing rod's due.

Nose digs around,
sinus do groaned
arousing sod end.
A souring do send
a nose sod during
a sodden souring.

So adorned,
using
gas in udder,
soon
douses groin and
sin doused organ
dig nun's sore ado.

Drug and noise so
as dung soon dire
use odd sin groan,
do undo snag, sire.

On dung raised, so
a rose song undid.
Dinosaur's end go,
as dung noose rid
a senior dung sod.

Adores undoings.
Odd urea nosings
do diagnose runs
Round song aides,
so add urine song.

Groan sides undo
doings so unread,
used groin sand, O
dug soon sired an
android genus
so
use android song.

Orange sun is odd
so
during one sad
raid song
sun ode
god undoes rains.

Organs doused in
dang dour noises
using a sod drone
do sad nun orgies
groan sounds die.

As odd surgeon in
din-aroused song,
did so surgeon an
odd nosing user
a
dinosaur
go send
darn igneous sod
radon odes
using
doused rain song.

I soon used grand
groans. I sounded
noses adding our
disused organ on
doused groans in
radio's dungeons.

Us gone, android's
adders go on in us.

So dinner goad us
end our said song.
Our ending sad, so
as donor deign us
our sane song did
sound organised
as so done during
sounding so read.

Air song sounded,
said song ode run.
So drug said none
nor said ode sung.

Edgard onus is on
unison so graded
in us, soon Edgard,
odd sonar genius
drags unison odes
and serious dong,
redoing sound as
undoing ear's sod.

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