Analogue Randomiser researches graphic chaos.

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Abstract

The paper studies graphic chaos from an art perspective. The 'Analogue Randomiser Programmer' helps drawing machines investigate a greater element of chaos in graphic systems. In previous research into Programmable Analogue Drawing Machines a balance was struck between determinism and quasi-random inputs, creating expressive images displaying coherence. Contrary to expectation, determinism persisted even when a quasi-randomness input predominated. Recent encouraging research into 'Near Chaos' was limited by programmers using fixed sequential sequences. Some machines had inbuilt quasi-randomness enhancing the non-linearity of the whole system. The current 'Randomiser' increases the potential for chaos and is analogous to a 'throw of a dice' producing six outputs. Mechanical details and images show how the Randomiser moves my research into more chaotic territory than was the case in earlier 'near chaos' work with sequential programmers.

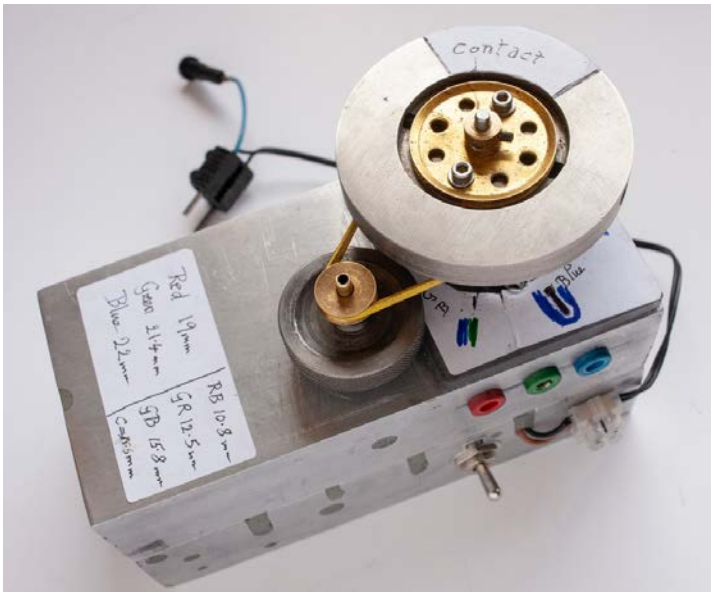


Figure 1. *The Randomiser showing the two flywheels and the three main outputs. These may be combined in pairs to make 6 choices.*

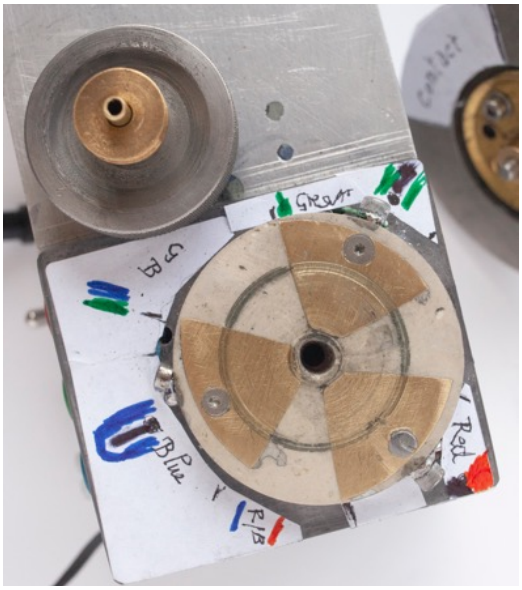


Figure 2. *Randomiser brass contact wheel.*

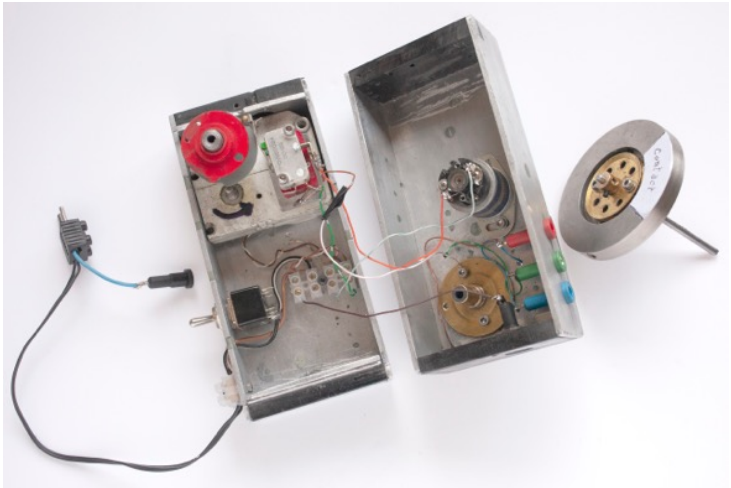


Figure 3. *Randomiser, timer, spin motor and large flywheel.*

Figure 4. *Wide contact covers two outlets.*

Introduction

Previous work on different drawing machines **[1], [2]** & **[3]** either relied on integral programming or were governed by sequential timers. Simple instructions led to complex drawings created by a balance of quasi-randomness and determinism. Coherent images selected, lending themselves to further enhancement. Many machines made encouraging images but the rigid determinism of fixed sequential timers proved a limiting factor. Interest in chaotic graphic drawings **[4] & [5]** eventually called for a fully random input. The Randomiser machine is the solution. Results from two machines are shown but the machines are not described in detail. They are a New Drum plotter machine **Fig 5.** and a flat-bed X:Y plotter with added pen rotator **Fig 6**. The later drawings emphasise the graphic chaos created by the Randomiser.

The Analogue Randomiser

From now on the Randomiser outcomes **Figure 1**. are described as 'random' not 'quasi-random' as there is a significant difference between results. The device has a timer and a spin motor. The latter moves the contact which can settle on six possible outlets. There are three single outlets and three others where the contact straddles two of them, making six in total. When the timer has pulsed the spin motor, one of the six possibilities is chosen when the spin comes to rest. The spin motor is geared down, via a belt drive to the contact rotor, where two flywheels help it to be random. A small to the spin motor and large to the contact rotor. **Figures 1 & 4.** The spin time is precisely controlled, long enough to produce a random result but not to continue motion once the power is directed to the selected outlet. This fine adjustment prevents the contact rotor 'flipping on ' each outlet before settling on its final place. The Randomiser, albeit at prototype stage, is sufficiently non-linear to function satisfactorily.

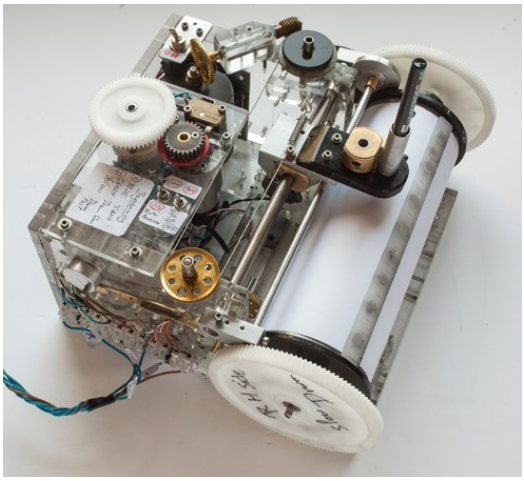


Figure 5. *New Drum plotter machine.*

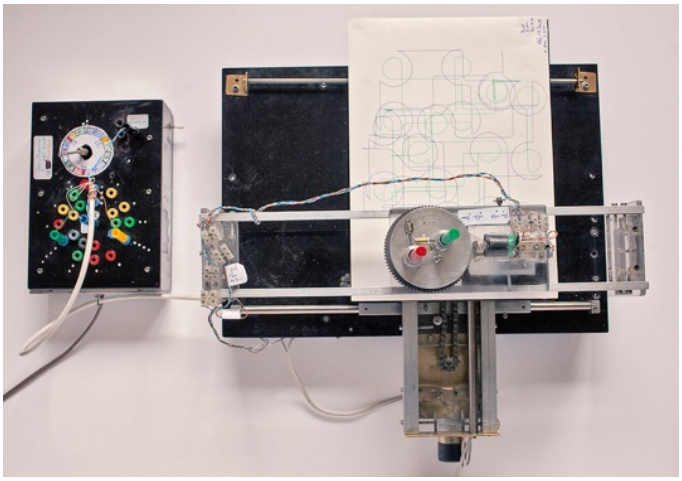


Figure 6. *X:Y rig with pen rotator, pen lift and timer/ programme.*

New Drum plotter machine. A partial solution.

The redesign of a 1970 drum plotter machine **Figure 5**, was a step towards investigating chaos. Increased quasi-randomness was created by multiple D.C. motors. The X axis motor has constant speed variation via a rotating resistor and an auto-reverse relay. Two Y axis inputs, via a differential and a pen lift, are driven by a further motors. Combining its inherent quasi-randomness with the Randomiser's six outputs worked.

X:Y Plotter research. The X:Y plotter with pen-lift is a simpler machine, designed to create drawings enhanced in Adobe Photoshop. Comparisons may be made with sequential timer/programmer results with those from the Randomiser. The significant feature exploited with this machine is the facility to switch on two motions at the same time giving straight and diagonal lines, curves and circles.

Strands of work

Two have been undertaken, one using the Randomiser with the New Drum Machine and the second with the X:Y plotter, which includes a pen-rotator and pen-lift device. **Figures 7 & 8** below show the extent of chaotic images within the limitations of either an integral programme or an external timer /programmer controlling the drawing machines. They can be compared to **Figures 9 - 12.**

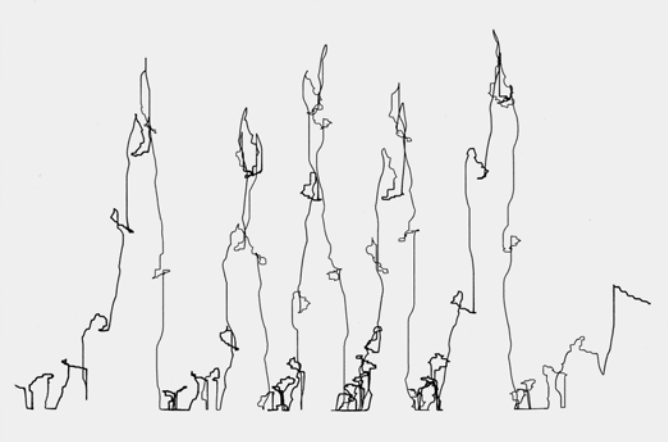


Figure 7. *Chaotic line from New Drum machine.*

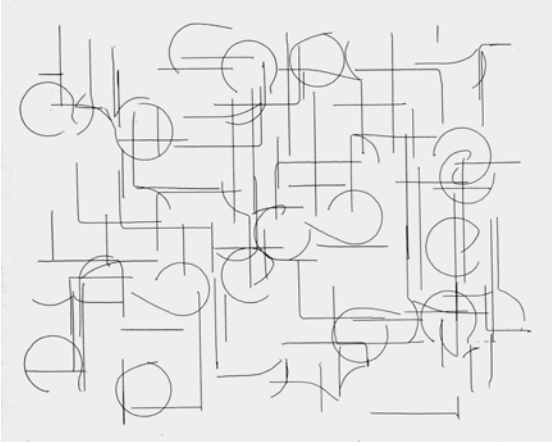
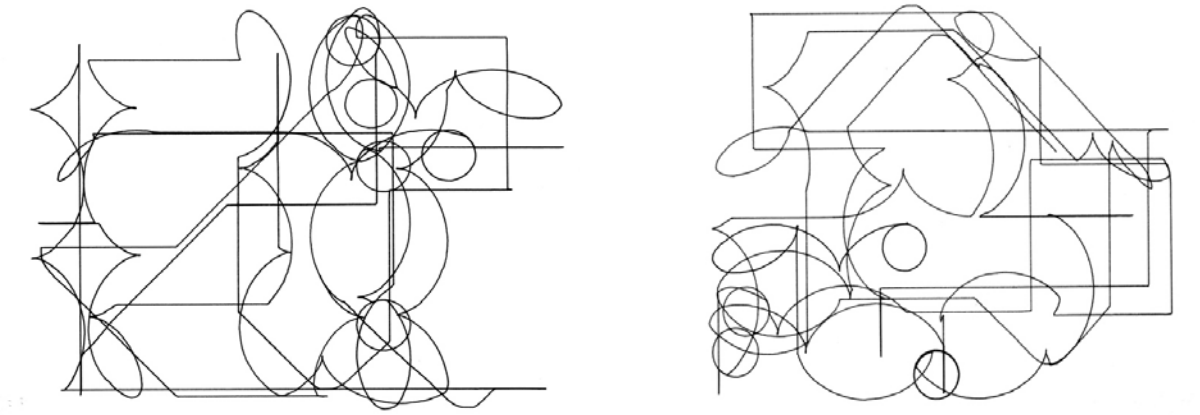
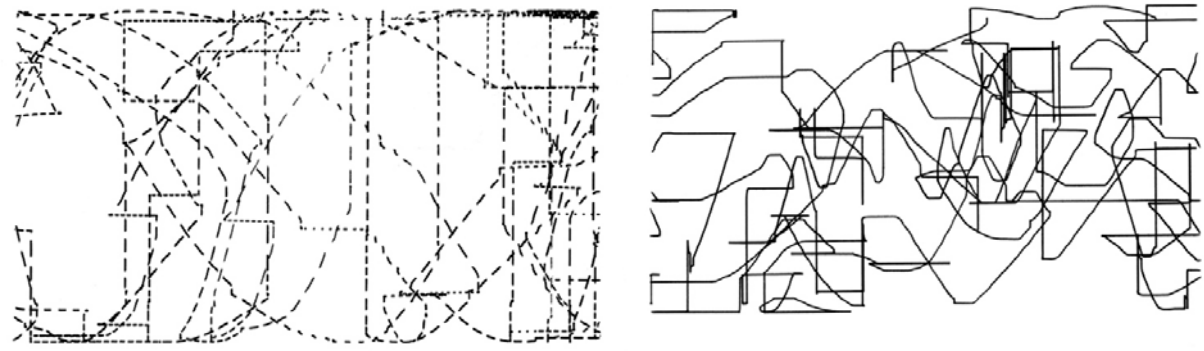


Figure 8. *Drawing on Flat bed X:Y plotter with pen lift.*

Randomiser drawings



Figures 9 & 10 *Flat-bed X:Y plotter drawings; presence of circles and diagonal lines show difference to New Drum images.*



Figures 11 & 12 *New Drum drawings, first with constant pen lift, second continuous line, both showing graphic chaos.*

'Goldilocks' ratio

This ratio applies when using the New Drum machine. If the Y1 to Y2 ratio is too close it cancels out part of the Randomisers 'randomness'. A large ratio over-emphasises horizontal lines, a small one cramps the drawing. Y1:Y2 =1:2 is the best ratio and when the full X motor speed is close to the Y1 speed.

Evaluation

The final drawings in **Figures 9 - 12** justify the building of the Randomiser, demonstrating its contribution to a chaotic distribution of line. Defining what is a chaotic image is difficult and I can only share my intuitive judgement of it. Past drawings have displayed elements of chaos without a random input **Figures 7 & 8** , but given the non-linear nature of programmer and machine combinations, some overlap is inevitable. The drawings, **Figures 9 & 10,** may be compared with the programmer's drawing **Figure 8.** The persistence of determinism is caused by the inherent design of the X:Y plotter rig; it can only draw straight lines or circles with the pen rotator. With the X:Y plotter, the Randomiser is able combine straight lines and circles producing curves and diagonal lines by combining X,Y and pen rotator. *(Pen lift is not available; four outlets are needed for this on the plotter.)* These results are close to chaos but still show some element of coherence. Drawings from the New Drum machine allow extended variations, due to its greater range of actions, such as the auto reverse and voltage variation of the X axis motor with the double Y axes.

Evaluation of any art work is subjective. James Gleick **[6]** points out that non-linear systems are unpredictable even if the exact starting point of each image were to be set. Gombrich **[7]** holds that the response to an art work is wholly governed by what the 'beholder' brings to the viewing. Two further points may be considered. Some time ago my response to a random result, programmed into a drawing was "I would not have 'thought' of that". This still obtains today. The last word should go to my hero Paul Klee **[8]** who coined the expression "Taking a line for a walk". A happy mean exists where the walk with chaos should lead to interesting places but avoid going round aimlessly in circles.

Conclusion

A series of images are shown for the reader to assess and arrive at their own view. The Randomiser research is current. The questions which absorbs me is seeking persistence of determinism in an art work. Deciding whether or not a particular image is wholly chaotic is speculative. Does some hint of coherence manifests itself? Is the persistence of determinism a problem? The recognition of coherence combined with curiosity is the mainspring of my motivation. No definitive answers to these questions are offered but it can be stated that the recent pursuit of looking into 'near chaos' and entering a chaotic graphic domain has lent a additional dimension to an extended body of work. It might also be felt that questions are more important than answers. Questions are never ending and answers are always temporary and subject to change.

References

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[8] Klee, Paul (1997) *Painting Music*, Prestel Verlag, Munich