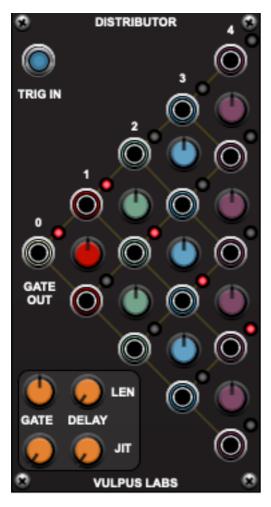Vulpus Labs

Distributor

Introduction

Distributor generates random gate signals following a binomial distribution, by propagating a trigger along a tree of branching pathways, in the manner of a Galton board.

At each branch or leaf of the tree a gate signal (up to 1s) is emitted if the trigger propagation reaches that point, and at each branch you can control the probability that the trigger will be propagated to the higher or lower branch. Propagation can be delayed by a controllable amount (up to 1s) with "jitter" applied to both the delay time and the gate time for further randomisation.

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Usage

Distributor has only one input, the **TRIG IN** jack in the top left. When a trigger signal (any signal crossing from 0v or lower to a positive value) is received, **GATE 0** - the "root" gate in the tree of gates - is immediately triggered.

The trigger is then propagated along the tree. From **GATE 0** it will either follow the "high" path to **GATE 1.1** (the first gate in row **1**) or the "low" path to **GATE 1.2** (the second gate in row **1**), with the probability that it will select the "high" or the "low" path being controlled by the red knob in between the two gate outputs.

It will then propagate along either the "high" or the "low" path to one of the gates in row **2**, with the probability controlled by the green knob to the right of whichever gate was triggered in row **1**. And so on, to row **4**.

The LEDs next to each gate output light up when that output is triggered. In the example shown, we can see that the path **0**, **1.1**, **2.2**, **3.3**, **4.4** has been randomly chosen.

If all the probability control knobs are set vertically, giving a "fair" 50% probability to both the "high" and the "low" path, then the middle gate **4.3** will be chosen most often (3 times out of 8) , followed by gates **4.2** and **4.4** (1 time each out of 4), with gates **4.1** and **4.5** as outliers (1 time each out of 16).

The knobs on the bottom left are **GATE LEN**, which controls the length of time for which a gate fires when triggered, **DELAY LEN**, which controls the delay before propagating a trigger to the next row, and **GATE JIT** and **DELAY JIT** which introduce random jitter into the gate and delay lengths. With **DELAY LEN** set to 0, an entire path from row **0** to row **4** is chosen and triggered instantaneously; with values higher than 0, the trigger visibly "travels" across the board.

Credits and Acknowledgements

Distributor was written by Dominic Fox in July 2023. It owes some inspiration to a program written by my father on a BBC Micro some time in the 1980s to illustrate the normal distribution using a digital Galton Board.

Thanks as always to the developers at Cherry Audio for their great products, especially Voltage Modular.