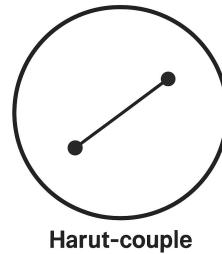


Basic definitions

Harut-element is a fundamental unit of the model. You may think of it as a simple black dot.



Harut-couple is a pair of two Harut-elements.



Harut-system is a set that may consist of Harut-elements and Harut-couples.

Notation

The Harut-element is denoted by the letter 'h'.

The Harut-couple is denoted by the letter 'H'.

The Harut-system is denoted using curly braces.

Classification of Harut-systems

Harut-systems can be *stable* or *unstable*.

Stable Harut-system is a system that consists of only Harut-couples. It is denoted as (H, \dots) .

Unstable Harut-system is a system in which there is one Harut-element. It is denoted as (H, \dots, h) .

Fundamental principles

1. A Harut-element tends to form a pair with another Harut-element.
2. A stable Harut-system tends to split into two equal parts.

Examples:

$$(h, h) = (H)$$

$$(H, H) = (H) (H)$$

$$(H, H, H) = (H, H, h, h) = (H, h) (H, h)$$

Harut-system dimension

It is the number of Harut-couples in the system. It is denoted as $(H, \dots)_N$, where N represents the dimension of the system.

Mutation

A mutation is any change in a Harut-system. By change, we mean that elements may be added to or removed from the system. The system may also be divided into equal parts, or parts may be repeated.

Mutations may have a stabilizing or destabilizing effect on the system.

Examples:

$$(H, \dots, h)_N + (h) = (H, \dots)_N + (h, h) = (H, \dots)_N + (H) = (H, \dots)_{N+1}$$

$$3 \times (H, \dots, h)_N = (H, \dots, h)_N + (H, \dots, h)_N + (H, \dots, h)_N = (H, \dots)_{3N} + (h, h) + (h) = (H, \dots)_{3N} + (H) + (h) = (H, \dots, h)_{3N+1}$$

$$3 \times (H, \dots, h)_N + (h) = (H, \dots, h)_{3N+1} + (h) = (H, \dots)_{3N+1} + (h, h) = (H, \dots)_{3N+2}$$

Decomposability

Decomposability is the property of a stable Harut-system to be divided into an equal number of smaller systems without breaking its stability.

This property is denoted as $^m(H, \dots)_N$, where m indicates the number of equal parts into which the system can be decomposed while preserving stability.

Any decomposable stable Harut-system is denoted by the letter S (e.g. 2S – 2-decomposable stable Harut-system)

Harut-mutation

We will refer to a mutation of the form $3 \times ({}^2S, h) + h$ as a Harut-mutation.

Theorem: The Harut-mutation is stabilizing; however, if applied recursively to a Harut-system requiring stabilization, the system degenerates.

Proof: We will describe the chain of system stabilization and division in accordance with the fundamental principles of Harut-system lifecycle.

$$\begin{aligned} {}^2(H, \dots, h)_N &\rightarrow (\text{stabilization}) 3 \times {}^2(H, \dots, h)_N + (h) \rightarrow {}^2(H, \dots, h)_N + {}^2(H, \dots, h)_N + {}^2(H, \dots, h)_N + (h) \rightarrow \\ &{}^2(H, \dots)_N + {}^2(H, \dots)_N + {}^2(H, \dots)_N + (h, h, h, h) \rightarrow {}^2(H, \dots)_N + {}^2(H, \dots)_N + {}^2(H, \dots)_N + (H, H) \rightarrow (\text{division}) \\ &{}^2(H, \dots)_N + {}^2(H, \dots)_{N/2} + H \rightarrow (H, \dots)_{N+N/2+1} \end{aligned}$$

After stabilization and division, the Harut-system ${}^2(H, \dots, h)_N$ mutates into $(H, \dots)_{N+N/2+1}$. Since the Harut-system initially had the 2-decomposable property, we cannot guarantee that the system still possesses this property. We are sure, though, that it is still stable.

Therefore, in accordance with the fundamental principles, the Harut-system must divide into two equal parts; however, after division, it may break down into two stable systems or two unstable ones.

$$(H, \dots)_{N+N/2+1} \rightarrow (H, \dots)_{(N+N/2+1)/2}$$

Or

$$(H, \dots)_{N+N/2+1} \rightarrow (H, \dots, h)_{[(N+N/2+1)/2]}$$

After all mutations, the rank of the system will stably be $[(N + N / 2 + 1) / 2]$ and, in the longest mutation scenario, will enter the life cycle of $N \rightarrow [(N + N / 2 + 1) / 2]$

We will prove that the recursive function converges.

$$N = [(N + N / 2 + 1) / 2]$$

Proof using the deviation from the fixed point method. The stationary point is $L = 2$.

Let's consider the difference $D_i = N_i - 2$.

$$N_{i+1} - 2 = [(3N_i + 2) / 4] - 2 = [(3N_i + 2 - 8) / 4] = [(3N_i - 6) / 4] = [3(N_i - 2) / 4] = [3D_i / 4]$$

$$D_{i+1} = [3D_i / 4], D_i > 0 \Rightarrow D_{i+1} < D_i$$

The Collatz Conjecture

The Collatz Conjecture states that if you take any positive integer n and apply the following rules repeatedly, you will eventually reach the number 1.

The rules are:

If n is even, divide it by 2

If n is odd, multiply it by 3 and add 1

Let us draw an analogy between numbers and Harut-systems.

The Harutyunyan Conjecture

Conjecture: the Collatz Conjecture degenerates if its sequence eventually reaches any odd number n where $n - 1$ is a multiple of 4 or even enough for the sequence to eventually reach a multiple of 4.