**DEFINITION**

Harmony Search was designed as a generalized optimization method for continuous, discrete, and constrained optimization and has been applied numerous types of optimization.

It was inspired by the observation that the aim of music is to search for a perfect state of harmony. This harmony in music is analogous to find the optimality in an optimization process. An optimal solution to an optimization problem should be the best solution available to the problem under the given objectives and limited by constraints.

Harmony Search is just such a successful example by transforming the qualitative improvisation process into some quantitative rules by idealization, and thus turning the beauty and harmony of music into an optimization procedure through search for a perfect harmony, namely, the Harmony Search (HS) or Harmony Search algorithm.

**APPLICATIONS**

* Optimization Benchmark
  + Optimization benchmarks for the hybridization of the HS method with other approaches are one principal application area. Different variants based on the HS have demonstrated their improvement and efficiency through various benchmark functions.
* Industry
  + Industry is a prominent area full of various multimodal, constrained, nonlinear, and dynamical optimization problems. The HS algorithm proposed by Saka determines the optimal steel section designations from the available British steel section table and implements the design constraints from BS5950.

**METHODS AS PART OF HARMONY SEARCH ALGORITHM**

1. The harmony memory considering rate (HMCR) controls the use of information from the harmony memory or the generation of a random pitch. As such, it controls the rate of convergence of the algorithm and is typically configured
2. The pitch adjustment rate controls the frequency of adjustment of pitches selected from harmony memory, typically configured. High values can result in the premature convergence of the search
3. Random

These three methods are the main parameters of the algorithm and play a vital role in the optimization process.

**PARAMETERS**

Also, there are several parameters that must be defined before the start of the optimization process.

1. Maximum number of cycles or iterations – is the basis for terminating the optimization process.
2. Harmony memory size – refers to the number of harmonies that will be stored in the harmony memory.
3. Number of decision variables – each harmony is composed of several decision variables.
4. Harmony Memory Consideration rate (raccept) – determines the rate at which decision variables in the harmony are considered as elements of the new harmony that will be created.
5. Pitch Adjustment Rate (rpa) - defines the probability for adjusting the values of decision variables copied from an existing harmony in the harmony memory by adding a certain value