Ashvini: Emergence, Life and Civilization

Sai Venkatesh

In earlier articles, it was elaborated on how the Vedic Spirituality encompasses the highest wisdom, especially in terms of science. (Refer http://vixra.org/abs/1808.0528 and http://vixra.org/abs/1808.0371).

Central to this discussion was a Theory of Everything which could explain all observed facets of nature - quantum field theory, general relativity, big bang, cosmology, and much more. This theory was explained on the equivalence between quantum bits and chaotic signals, and the E8 mathematical structure which determines symmetry and relations between 8 fundamental charges, which could explain all 248 fundamental particles and the 4 fundamental forces.

Particularly we saw how the 11 Rudras represent the stages and epochs of the universe. In summary, this started with the perfectly symmetric E8 structure in a non physical informational space formed by 3 chaotic signal qubits. These, in their 8 states, entangle to form a composite signal of 240 entangled states. This is the Universal wavefunction, and the big bang is brought about by making the Higgs weight non zero, introducing asymmetry. This symmetry breaking created the universe with a big bang, a singularity of initial size determined by the Planck length. The infinite density and Imbalance between zero kinetic and non zero potential energies leads to inflation, with the universe rapidly expanding. Each created space time encompasses the inherent cosmological constant also called dark energy. This ensures the universe stays flat in curvature, as well as accelerates inflation due to negative pressure. Local inhomogeneities are then caused by quantum fluctuations which make certain weights of the composite field non zero in certain space time instants. This leads to creation of particles in various successive epochs finally leading to creation of matter. This begins first by creating axions, candidates of dark matter which interact only with gravity, followed by subatomic particles coalescing to form ionized plasma, later forming the first atoms of gases. This is followed by liquid and solid matter, while also giving birth to stars and galaxies. Our understanding of this created matter and its various states and interactions culminates in the periodic table of elements. Eventually, the creation is of the solar system, with its planets and ultimately earth, which supports life.

In this article, we continue in this direction, starting with the basic questions, what is life? And how is it created?

Without an iota of doubt, all of the creations and matter in the universe are incomplete and useless without life. By common scientific consensus, life is understood to be derived from matter, that is capable to self sustenance and signaling, two key abilities that distinguish life from non life. It is understood that atleast all of the present life on earth originates from the RNA, a complex chain of hydrocarbons and nucleotides which were brought about from early substances like hydrogen cyanide.

Self sustenance determines physical existence of an organism maintaining appropriate homeostasis. Complementary to this is signaling, the processing of information from one's surroundings, pertaining to nutrition, sources of threat and danger, and interaction with other organisms.

These two aspects determine the fundamental dichotomy of physical and intellectual, which broadly determines human life even today- brain and brawn. It is this dichotomy that is represented in the Vedas by the 2 Ashvini Devas - Nasatya and Dasra, who with their consorts Jyoti and Mayindri represent the brains and the brawns respectively. Along with the 11 Rudras, the 8 Vasus and the 12 Adityas, they make up the 33 Deities.

These represent the trio of Shaktis - Jnana, Iccha and Kriya. In particular, the Vasus represent the 8 Charges, which is the E8 in information space, which is Jnana. The Rudras outline the creation and expansion of universe following the big bang - emergent from the expansive power arising from Divine Will.

Having created the right conditions such as solar system, comes the role of Kriya - life which utilizes the resources, ultimately returning things back to primordial state of non existence through consumption, decay and death.

Thus, with the solar system and earth created, with the right conditions conducive, the first life is formed by RNA and similar biochemicals. These structures have the right elements and right proportions to not only grow and sustain themselves, but to respond to stimuli and store or process information within their structures.

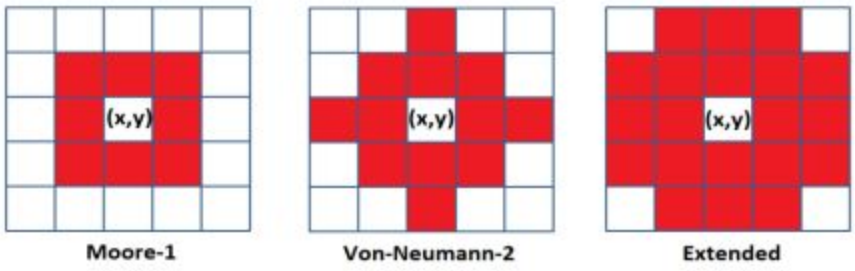
On an abstract level, one can try to understand and study life using the premises of sustenance and signaling within and influenced by a neighborhood. The most prominent step taken in this direction was the Game of Life or GoL by Conway. This is in essence a two-dimensional Grid, where a “dead” cell is born, or a “live” cell survives only when a certain number of its neighbors are alive, so that neither overcrowding nor undercrowding occurs. This idea was a breakthrough giving birth to a new kind of science, that of cellular automata and emergent patterns. Also, from the GoL various interesting patterns such as still-life, oscillators, gliders, guns etc have been observed and studied. Also, it has been shown that the GoL is Turing Complete ie it can be used and appropriately programmed to perform any desired computation.

The GoL appropriately describes primitive life, one that sustains itself within the environment on the delicate balance between overpopulated resource scarcity and underpopulated loneliness. This describes very well the sustenance aspect of life.

To include the signaling aspect also, one must consider two grids, a life grid which if essentially the grid proposed by Conway, and a sense grid indicating the perception capability of the corresponding cell in the life grid.

Thus, in the Sense Enhanced Game of Life (SEGoL), two grids, L representing the Life Grid and S, representing the Sense Grid, both of size MxM (M=50) are defined. All-pervading throughout the entire grid, “consciousness” is seen as the property that enables each cell, alive or dead, in both the sense and life grids to be aware of its existence depending on the neighborhood cell values. Three kinds of neighborhoods are defined as follows and illustrated below, all of them defined with respect to a cell denoted by x and y coordinates as (x,y).

1. Moore-1 Neighborhood: Immediate neighboring cells having a Chebyshev distance 1.
2. Von-Neumann-2 Neighborhood: Twelve cells are the set of cells with a Manhattan Distance of 2.
3. Extended Neighborhood: All 20 cells with Hamming Distances of 1, Sqrt(2), 2 and Sqrt(5).



Each cell in the life grid may have a value of either 0 black or 1 white, corresponding to dead and alive respectively. Each cell in the sense grid may have one of three values, 0 or black corresponding to touch, 0.5 or gray corresponding to sight and 1 or white corresponding to sound sense.

From an evolutionary standpoint, these three senses determine the way an organism receives and perceives information from various kinds of neighborhoods, subsequently leading to increased awareness about its own self, as well as potential sources of nourishment and danger around it. The other two fundamental senses, namely taste and smell, are related to the manner in which an organism moves towards or away from nourishing/detrimental objects, and the implementation of these senses is succinct in the neighborhood rules, where underpopulation and overpopulation on either side of an optimal neighbor count causes death. Time is represented in the cellular automata by discrete steps, where values of all cells in both grids are updated as per the defined rules. The rules are defined in the following manner, with A generically denoting the life and sense grids. All calculations, both life and sense, are done using the Moore, von Neumann and extended neighborhoods in touch, sight and sound cases respectively.

Touch value is the least developed value for a sense cell. In this state, a cell in A is only sensitive to its nearest neighbors (Moore-1 neighborhood), and has no way of

perceiving or being influenced by farther neighbors. L(x,y) lives if the number of alive Moore-1 neighbors are within a range F0. Failing this, a living cell dies, and a dead cell continues to be dead. This is because more than F0 alive neighbors correspond to overcrowding and resource scarcity, whereas lesser than F0 alive neighbors correspond to undercrowding and loneliness. S(x,y) "upgrades" to Sense of Sight, 0.5, if a certain range "a" of its neighbors have the value 0.5. Else, S(x,y) stays at 0.

Sight value is more developed than sense of touch, since a cell now also has the capacity to perceive by sight, a select set of farther neighbors (Von-Neumann-2) corresponding to the „line of sight". Here L(x,y) continues to live if a certain range F1 of its Von-Neumann-2 neighboring cells are alive. In the absence of this, a live cell dies, and a dead cell stays dead. S(x,y) may upgrade to Sense of Sound, 1, if a certain range "b" of its neighbors have the value 1, and may retain the Sense of Sight, 0.5, if a certain range "c" of its neighbors have the value 0.5. In the absence of the above two conditions, S(x,y) "downgrades" to Sense of Touch, 0.

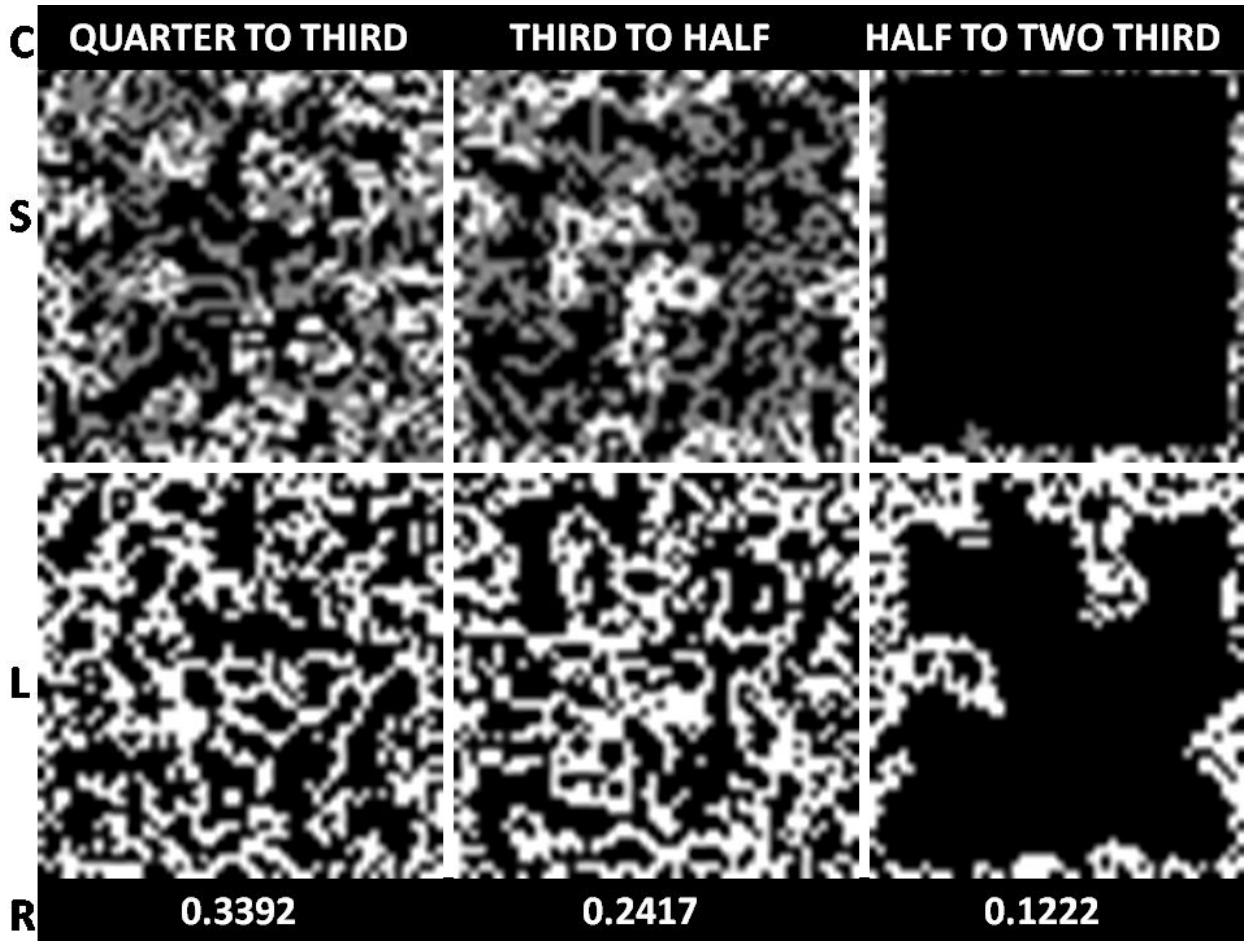
Sound transcends line of sight communication as well as physical contact, making it the most advanced state possible for S(x,y), with perception covering the entire extended neighborhood. L(x,y) lives if a certain range F2 of its extended neighboring cells are alive. In the absence of this, a live cell dies, and a dead cell stays dead. S(x,y) retains the Sense of Sound, 1, if a certain range "d" of its Moore-1 neighbors have the value 1. In the absence of the above condition, S(x,y) "downgrades" to Sense of Sight, 0.5.

Applying these rules during a time instant "i" determines L and S grids for the next instant "i+1". A random arrangement is used as the initial timestep for L and S. In all these rules, senses are retained by virtue of an optimal level of use among the neighbors, and senses downgrading due to fall in usage (being made vestigial) or due to practical ineffectiveness due to other cells also developing the sense, thus reducing competitive advantage.

In the Game of Life, Conway had developed rules such that a living cell sustains with 2 or 3 alive neighbors, and a dead cell is brought to life with 3 alive neighbors. These rules were very carefully and cautiously chosen to administer the right amount of chaos yet forbid explosive growth, dying out and other undesirable or unrealistic consequences. Over the years, these rules have become the subject of extensive study, and it has been observed that tweaking the numbers even by a slight amount leads to wipe-outs and non-life consequences - sustenance of life is extremely selective.

Considering that Conway's chosen neighborhood was the Moore-1, there were 8 neighborhood cells. The rules hover between 2 and 3 live neighbors, which correspond to a range between 25% ie 2 and 33% ie 3 of the total cells. This interval - between a fourth and a third, is crucial to sustaining life, anything on either side leading to overcrowding or loneliness. This is the inspiration for the Life and sense Grids devised in SEGoL.

With this basis, we now analyze various cases and their results. The Grid Size is 50x50, and timesteps run from 1 to 50, although in all cases, one is able to discern patterns and trends even by the 16th iteration, whose plots are shown. The rules are set by the above mentioned inspiration - for Moore neighborhoods a and F0 are set as [2,3], for Neumann, b, c and F1 are set as [3,4] and in extended case, d is set as [5,7]. In general configuration, one may write this as [¼,⅓] applicable to a,b,c,d,F0,F1 and F2. The average value of L grid at the end timestep gives the number of cells alive, or the Survival Rate R.

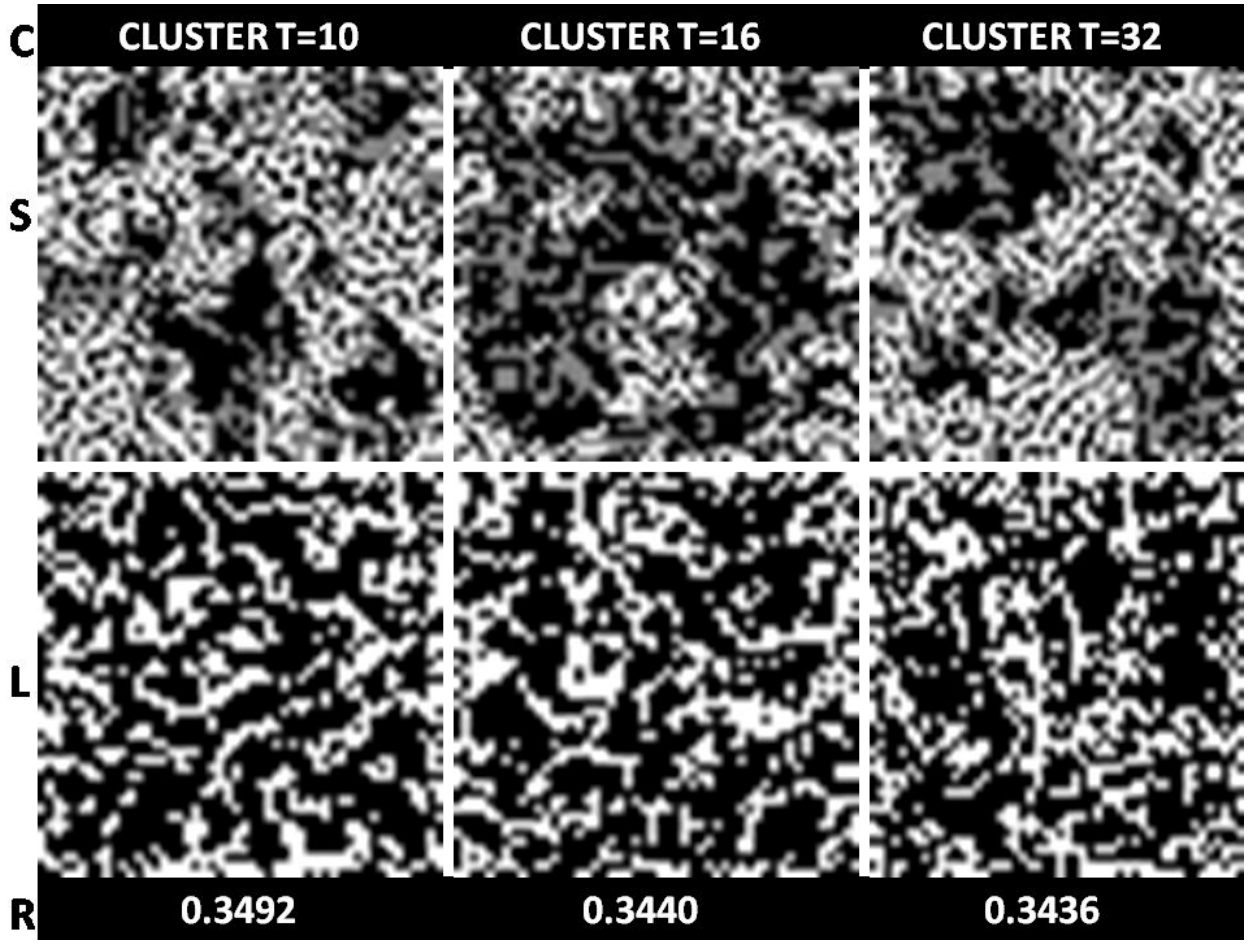


For this configuration, one can note a decent survival of 33%, and there are slight signs of pattern formation in S Grid. Next, the rule is modified so as to raise the interval to [⅓,½], for all variables. Though survival drops to 24%, one can see interesting isolations and patterns for the sound sense, Raising the interval furthermore to [½,⅔], one sees a disastrous survival of 12%, mostly devoid of any sense but touch. This is a strong example of how overcrowding to values above 50% of neighborhood cannot describe any decent organization of life or civilization.

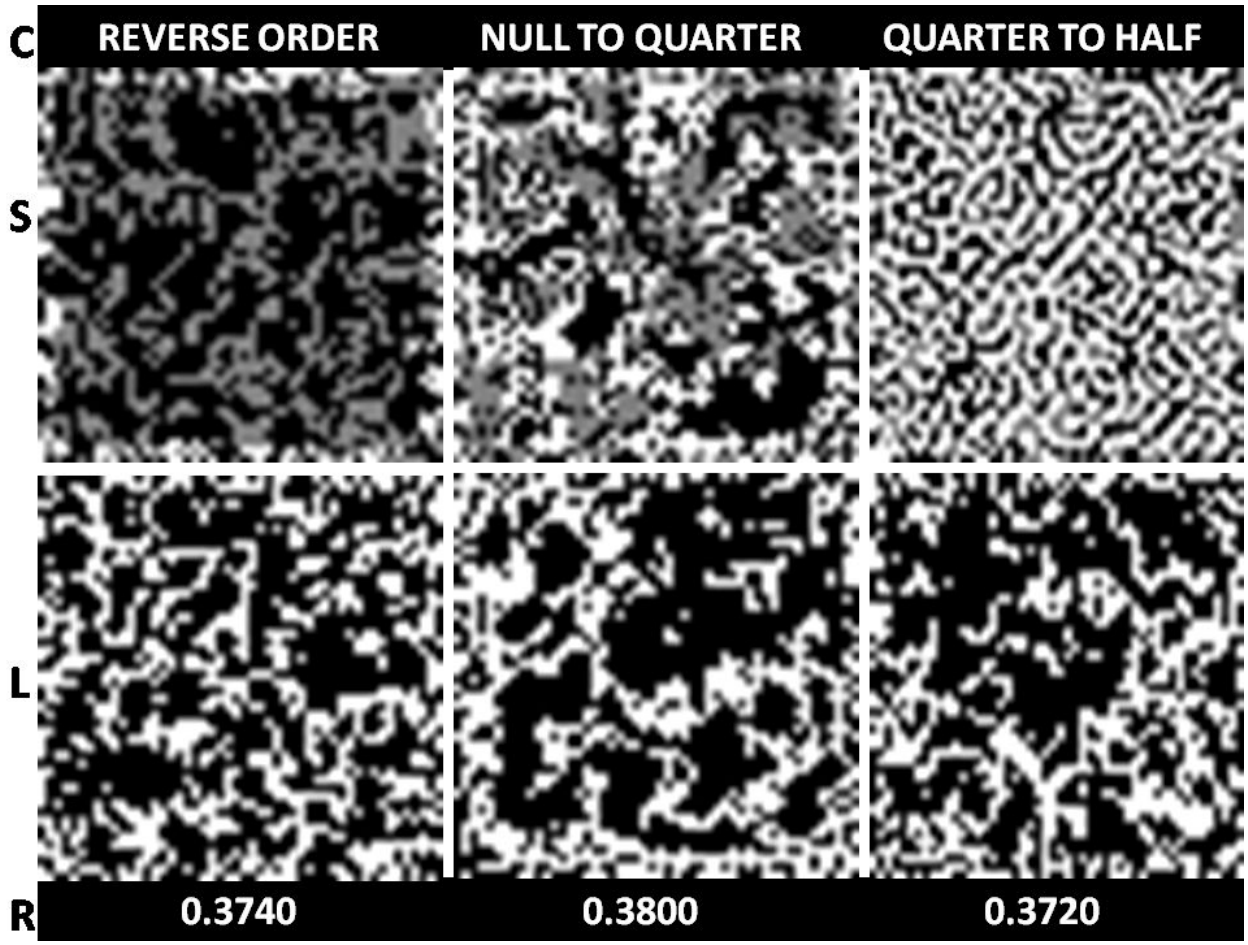
Next, the rule is modified so that all intervals are set to [¼,⅓] except the sound retention d, which is set to [⅓,½]. This setup is shown with L and S grids at various timesteps - 10,16 and

32. Survival is seen at around 34%. This case shows interesting patterns formed, particularly in the S grid, where the highest sense sound is beautifully clustered in certain regions.

In Conway's Game of Life, the key feature was sustenance of life, within a society - survival of the fittest. However, sense, from the concept of information, provides an additional dimension - intelligent organisms in a society leading to civilization. It is only through culture and civilization that man can fine tune life, and reach higher levels of perception, insight and thinking, which will ultimately lead to more achievements, both physical and intellectual, through technology, science, and ultimately lead to spiritual progress. Man is a social animal, and in no circumstance can live in complete isolation. The achievements of humanity have arisen directly out of societal interactions, where the thoughts and information of people are pooled together - this alone makes research and study possible by means of access to ancestral wisdom. In the SEGoL, one can understand such societal advancement by patterns of senses and perceptions clustering in certain regions - a sense of organization emergent from the rules of nature itself. This is a more important result than increase of R, since this is an indicator of Quality of Life and Civilization, and a low population of higher achievement is definitely light years ahead of high uncivilized survival, which would only see constant struggle rather than real advancement. This is survival of the smartest.

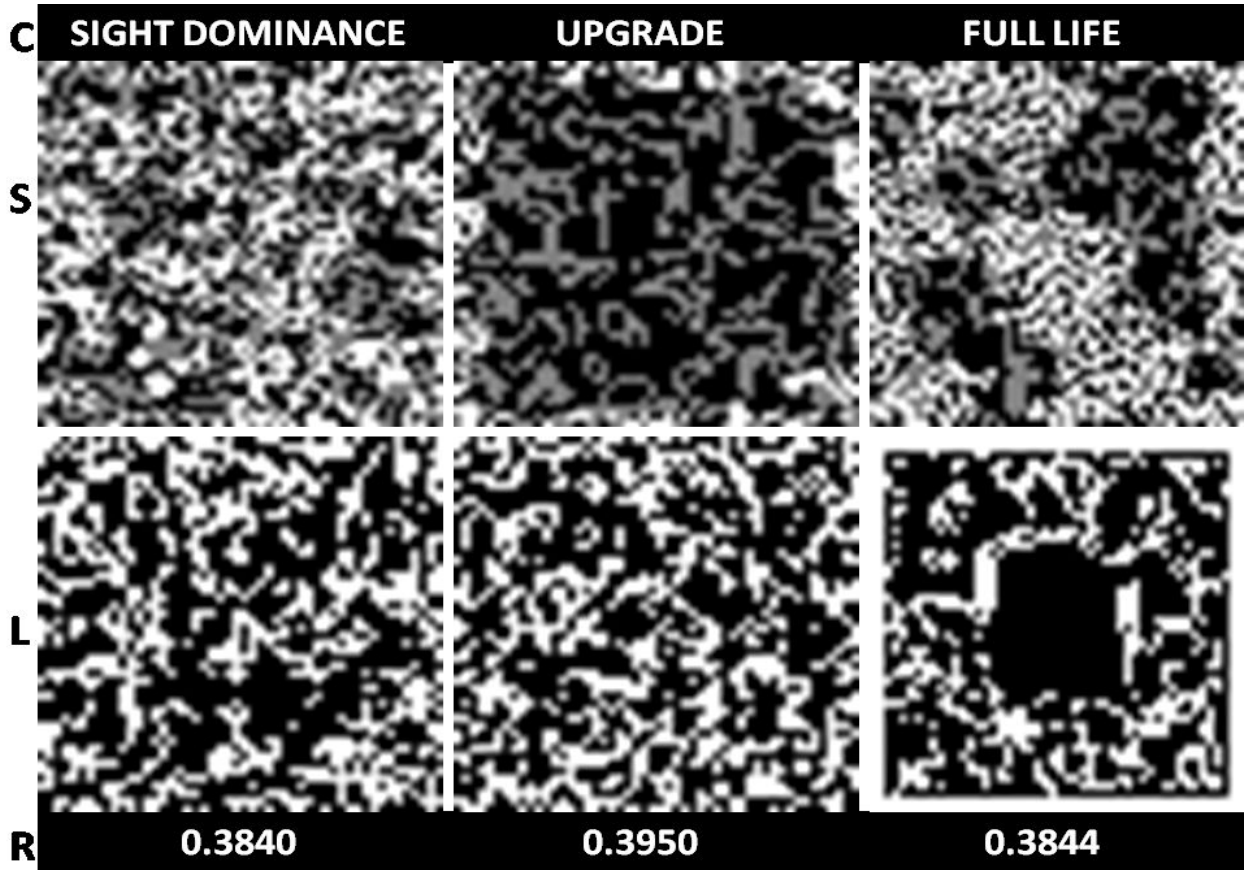


In the “cluster configuration” and other configurations stated above - there is an important point to note. The variables b and c are both defined for a Neumann neighborhood, and both pertain to an S cell value of 0.5. It is possible that at the same time, both conditions of b and c are satisfied, raising a confusion over updating the value of S. In the simulation, preference is always given to sight retention c ahead of sight upgrading variable b. It is with this factor that one obtained the clustering earlier. The same conditions are defined but with preference given to b over c, and is plotted next. While survival increases, clustering is not to be seen. In fact, sense of sound dies out, leaving only sight and touch. This makes it very clear that preference must be given for sense retention over upgradation - a bird in the hand is worth two in the bush.



Next, all intervals are brought down to [0,¼]. Survival rate increases to 38%, whereas S tends to show distribution edging toward sight prominence, with no clustering. Further, all intervals are set to [¼,½], and while survival is at 37%, the S Grid shows interesting striation patterns.

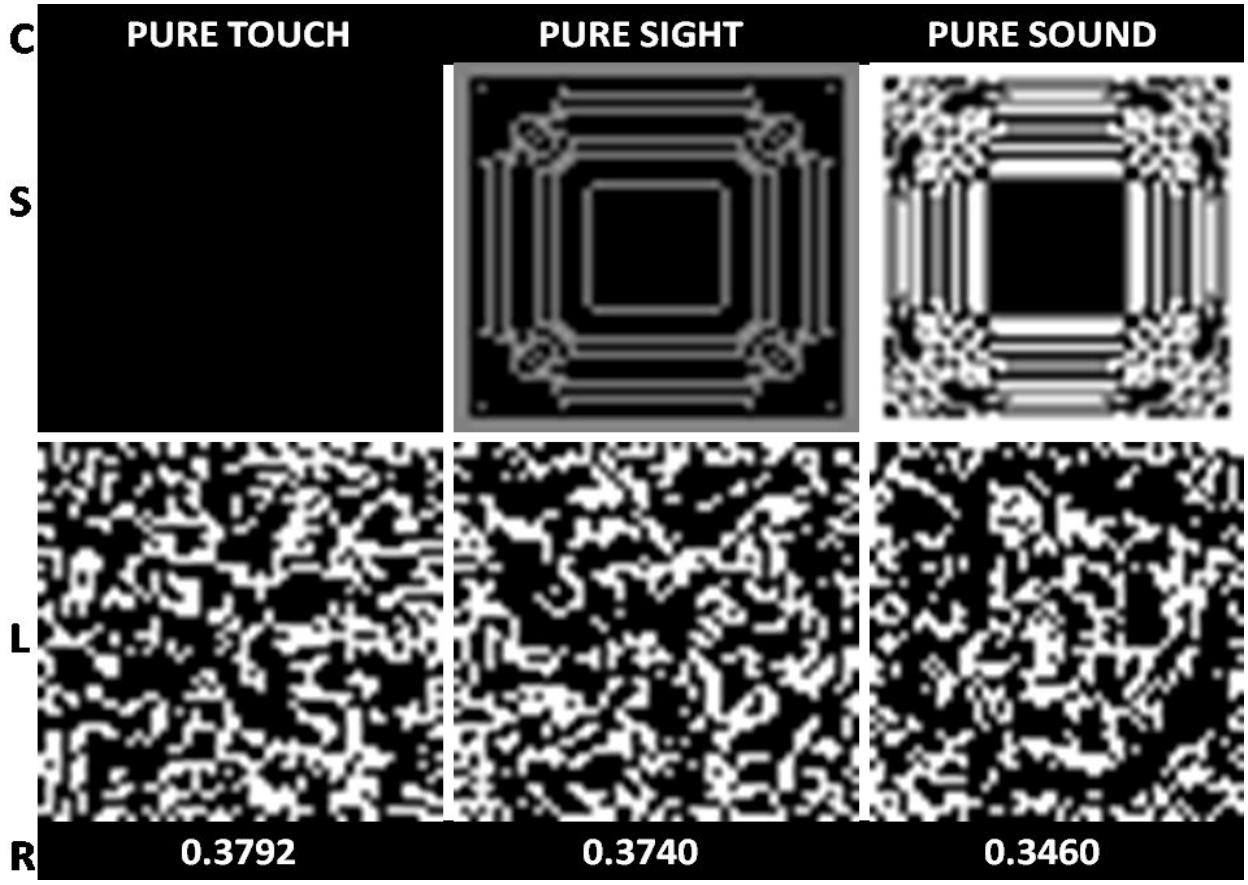
Thus, one can see that the interval [¼,⅓] alone shows signs of clustering and organization. Low ended intervals lack organization, whereas high ended intervals crossing 50% are a disaster to life. Learning from this, we now set [¼,⅓] for all variables, but with sight retention increased to [⅓,½]. Survival is at 38%, and very feeble patterns are seen in S grid.



In the next configuration, the sense upgrade variables a and b are set to [⅓,½] whereas all others remain at [¼,⅓]. Survival increases to 39%, but at the expense of information capability, since sound sense is close to vanished.

Thus, from all these observations, one zeroes in on the “Golden Rule”: the ratio of [¼,⅓] for all variables except [⅓,½] for d - this is the best case where clustering and organization are observed. One can understand this case better by providing non-random initial setup. First, a setup of 100% life, with all L values as 1, is used as initial L Grid for Golden Rule. Even in this case, one can see that life settles down to an R of 38%, showing an interesting “void” in the center. In S grid clustering occurs as usual. It is interesting to note that the S grid operates fairly independent of L grid, and even dead L cells can be seen with various S values. This is possible because a person’s information and intellectual output survives even after physical death - through legacy, books, works etc. Thus, a dead L Cell does not necessarily mean a dead S cell.

Finally, the Golden Rule is studied in the triple cases of Pure Touch, Pure Sight and Pure Sound, by setting at initial timestamp, every cell in S to 0, 0.5 and 1 respectively. Survival rates of the three are in the 34-37% range, but the S grids show very interesting patterns of organization. However, the downside to this is that in each case, the other two senses become non existent, except in the pure sound case.



Thus, one understands that it is necessary for all three senses to exist in some proportion, in the initial timestep, to ensure that civilization forms. As per the Vedas, the five senses are created alongside the five Bhutas or elements of nature. They start with Akasha and end with Prithvi, and the five senses are created in that order - sound first, then sight and then touch. While Pure touch or sight cannot give rise to sound, pure sound does indeed give rise to all 3 S values - this proves and confirms the order of creation from Akasha to Prithvi and not vice versa.

From the above discussions, interesting conclusions can be drawn. First, it is interesting to see life as an emergent phenomenon from biochemicals capable of self-sustenance and signaling, and based on neighbors in a society, as described by Conway's Game of Life. Second, the consideration of Information as Sense brings an emergent new dimension of civilization to the society. This is heavily dependent on the neighborhood rules, which create appropriate conducive conditions for sustenance of life. It is observed that variables within the neighborhood normalized intervals of [¼,⅓] are most conducive to sustaining life and growing into civilizations, particularly if the highest sense ie sound retention is placed in [⅓,½]. Such civilization is seen by clustering of senses in certain regions, organizing the society and pooling together information to lead to collective advancement. In Vedic context, it is seen that the Ashvini Devas represent the Life and Sense Grids, and thus the biological processes of life, evolution, civilization and culture.