

Mimesis

The Scapegoat Model

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Abstract—Genetic Algorithm has already been applied to several optimization problems. For several years this heuristic has also been utilised in the field of design, and has proved to enable efficient, and moreover, original, and thus, innovative, results.

Genetic Algorithms are usually based on two nature-inspired processes, mutation and recombination. Specifically, here, this work thus aspires to achieve innovation in a process of design evolution via the adoption of the format of an available, pre-existent cultural procedure: the scapegoating mechanism.

1. Back to roots

Why are human cultures permeated by *sense* and *order*? Cultures are symbolic systems possessing their unique codes. However, within these auto-integrated systems there always exist sense and social links, which posits the question of why cultures are always a vector of order, and not of chaos.

To answer such a complex question we must seek to identify the least common denominator of each culture. According to Girardian anthropology ^[1], in the earliest form of every cultural system there exists the universal ritual: that of 'sacrifice'.

How have human beings, mimetic animals, succeeded in co-habiting, considering that imitation engenders inherent rivalry and destructive violence? In effect, as mimesis results ultimately in universal conflict, the function of sacrifice is to replace the potentially multiple victims with a unique candidate: the 'scapegoat'.

In this procedure the 'scapegoat' becomes selected for sacrifice in order to purge social groups of their introspected violence. For this reason, 'scapegoats' are inevitably selected from a source as remote as possible from the selecting group.

The elimination, by the community in its entirety, acting in union, of the sacrificed individual both prevents any later revenge of the killing while breaking the circle of introspective violence which otherwise threatens the community. By these

means the act of the sacrifice permits a rupture in the sequence of violent action and thereby grants a form of salvation to the group by occasioning a *release* from *self-inflictive* violent action by its substitution with an alternate, variant form of, - equally, and therefore fulfilling, - violent spending. Effectively, the inherent necessity for violence is transferred to a subject other than that of the group itself: it is no longer inter-acted, reflexively, but expressed. Sacrifice thus constitutes a cathartic function for the group.

During the mimetic crisis, the convergence of desires leads to reciprocal hatred, meanwhile the object of desire becomes veiled. More effective than strong differences between members of the community, this undifferentiated situation tends to radicalize the conflict. Each member is convinced in its uniqueness, but all are focusing their wills on the same object. Moreover, it inclines to the standardisation of the entire community. When the crisis reaches its paroxysm, the lack of differentiation inside the community becomes absolute and leads to the elimination of the scapegoat and to reconciliation.

In the animal world, the mimetic conflict already exists, but animals have an instinctive inhibition which prevents interactive slaughter merely in response to mimetic rivalries. Ethologists emphasize the domination-pattern effect: animals will stop fighting as soon as dominance is established. According to Girard, man is at once the most mimetic animal, *and* the less able to cope with his own violence. Hence, man had to elaborate a cultural response: the scapegoating mechanism.

Girardian anthropology posits that communities were universally generated by a founding, collective murder: based on a scapegoating mechanism. During the mimetic crisis, the entire community adopts the same imitation of an accusatory gesture toward the scapegoat which unites it, recovering a naïve and magical peace. This experience is thus a lived, sacred experience. The community will then attempt its re-iteration, with further ritual sacrifices, analogous to the original. It initiates the religious institutions. As cultural institutions come from religions (Durkheim), so do cultures arise from sacrifice.

The origins of cultures seem enshrined within this mechanism. Therefore, we should consider the Girardian hypothesis: each cultural order has been predicated upon a scapegoating mechanism.

2. Modelling a scapegoating mechanism

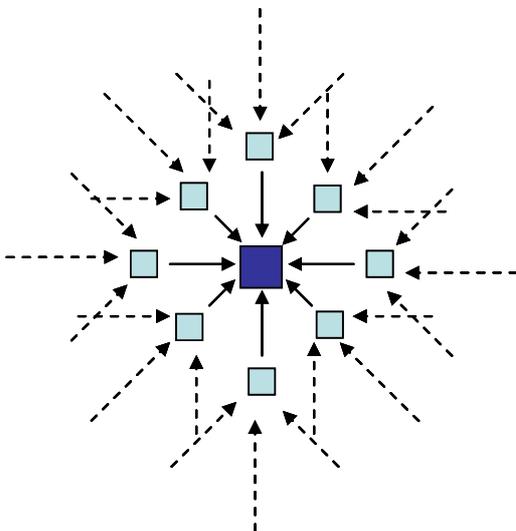
As we have described, in a community, the lack of differentiation within the community incites violence which is accumulated until an individual, who must be both inside the community and at the same time as remote from the community as possible, is discriminated to be designated as the scapegoat, and thus to be removed from the group.

Then, a model ought to be capable of providing a ranking of individuals according to the importance of the differences distinguishing them and the other members of the community. It should also take into account the fact that the more undifferentiated an individual, the more violent he is likely to become.

In our approach, let the community be represented as a set of n individuals. Inside this community, every individual is related with p other members of the group. The set of relations among the community is represented by the m matrix:

$$m_{i,j} = \begin{cases} 1 & \text{if } j \text{ is related to } i \\ 0 & \text{otherwise} \end{cases}$$

The number of relations for every individual is set to p . Then, every line of m is set randomly at the beginning of the simulation: every member is 'known' from other p individuals, but this relation may be not reciprocal. So m may be not symmetric.

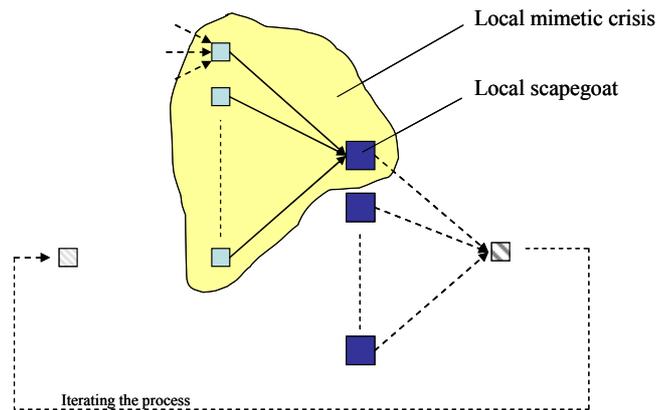


At the beginning of the mimetic crisis, every individual may become the scapegoat as we are unable to evaluate their level of violence and differentiation. In our approach, to obtain more

information about the community, every individual is initially the center of a virtual, local, mimetic crisis. At the end of that local crisis, by evaluating its intensity, we are able to quantify the degree of difference between each local scapegoat and the other p members to whom he is 'known'.

But, as we said, the more undifferentiated an individual is, then the more violent he likely to be. It must apply in every local crisis in which he is involved in our simulation. So we must iterate this process. Initially, each member has an identical potential of violence and of differentiation. As the first step, n local crisis infects the n members of the community. Then, with the evaluation of the potential of violence for every individual, we are able to estimate how differentiated an individual is. Then we simulate ' n ' new local mimetic crises, taking into account the degree of differentiation of the individuals were inside their local group subsequent to the previous step. It grants us a revised level of violence for everyone, and by extension, of self-differentiation.

As we repeat this process we get a convergent value for the level of differentiation of every individual.



Let $d(u, u_i)$ the level of differentiation between individual u and individual u_i . Let $f(n, u)$ the level of differentiation for individual u at the beginning of the n^{th} local mimetic crisis.

We assume that f may be described as:

$$f(n, u) = \sum_{i=0}^{n-1} m_{u, u_i} \cdot d(u, u_i) \cdot \frac{1}{f(n-1, u_i)}$$

$$f(0, u) = 1 \quad \forall u$$

With d defined as a distance function.

It means for individual u_i that if u is 'known' from him, then the more u_i is lacking differentiation and the more he is different from u , the more he will transfer violence on u . With summing the contribution of every individual related to u , we have an estimation of the level of differentiation of u : the more violence u receives from others, the more u is differentiated from them.

Looking at what's happening to the whole community, let U_k defined by :

$$U_k = (f(k, u_j))_{0 \leq j \leq n-1}$$

Then, there is a recurrence relation between U_{k+1} and U_k :

$$U_{k+1} = F(U_k)$$

So, if our process is convergent, it converges towards a fixed point X for function F . Nevertheless, F doesn't seem a contracting function, at least at first sight, and it may not be easy to prove that U_k is convergent.

Fortunately, in our experiment $k \rightarrow f(2k, u)$ and $k \rightarrow f(2k+1, u)$ are always convergent. So our process is convergent and may give us a ranking of every individual inside the community based on their difference from others.

At the end of the process, the q most different individuals are designated as scapegoats and are removed from the community. To have a constant number of members for the community, they are replaced by q randomly generated individuals. It gives us a new generation for the community.

With repeating this experience, generation after generation, we managed to get our experimental results.

3. Experimental results

We did two sets of experiments.

- 1st experiment

Our distance function d is there defined by:

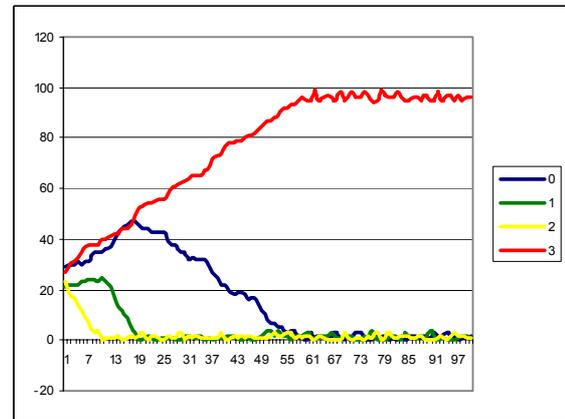
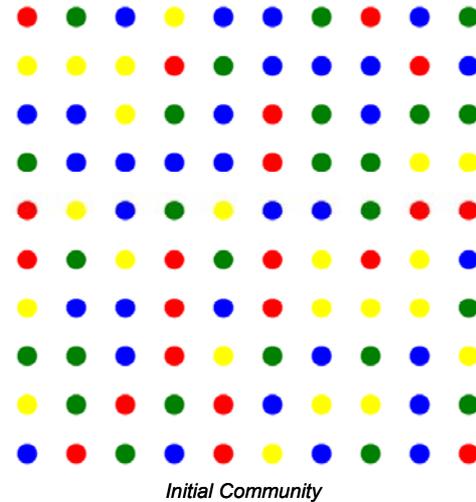
$$d(x, y) = \sum_k \delta(x_k, y_k)$$

With:

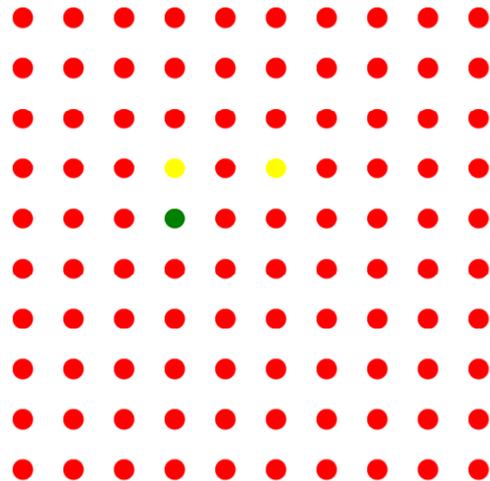
$$\begin{aligned} \delta(x_k, y_k) &= 1 \quad \text{if } x_k = y_k \\ \delta(x_k, y_k) &= 0 \quad \text{if } x_k \neq y_k \end{aligned}$$

There, the community was made of 100 individuals, all represented by a single value from 1 to 4. For an easier representation, we adopted a coloured circle to represent this character: 0 is blue colour, 1 is green, 2 is yellow and 3 is red. We used a community of 100 individuals. Every individual was related to 20 other members. At every round, 5 scapegoats were removed from the community using our model.

First generation (100 generations)



Removing using the scapegoat model



Final community using the scapegoat model

- 2nd experiment

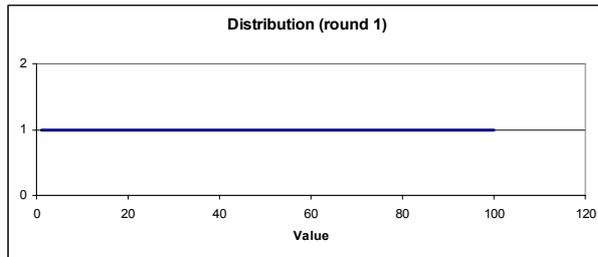
There, the community was made of 100 individuals, all represented by a single value from 1 to 100. Every individual was related to 20 other members.

Our distance function d was there defined by:

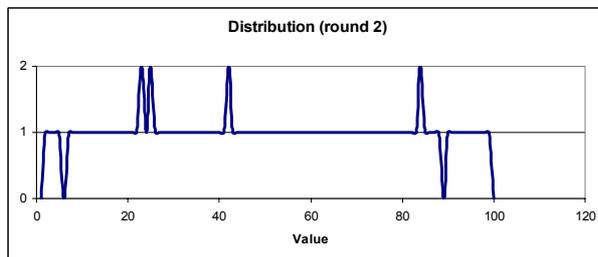
$$d(x, y) = |x - y|$$

At every round, 5 scapegoats were removed from the community using our model and replaced by randomly generated new individuals.

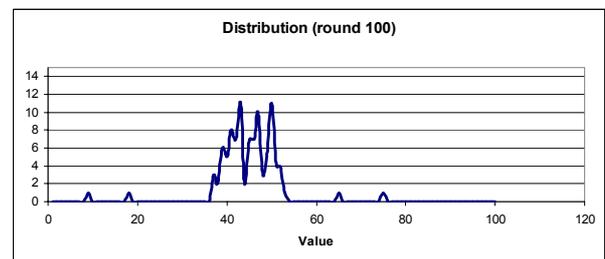
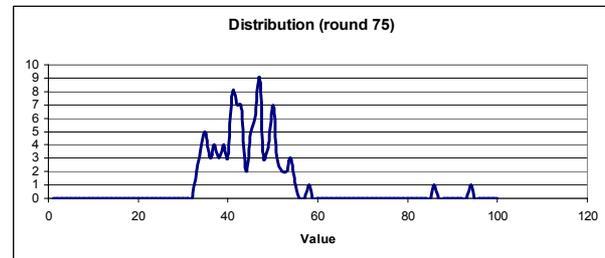
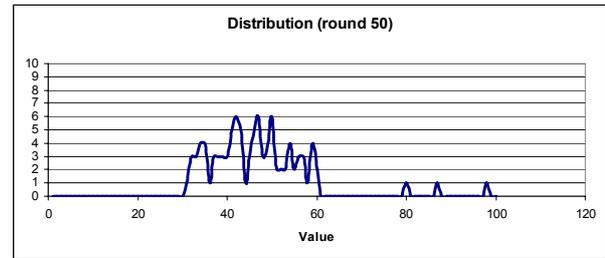
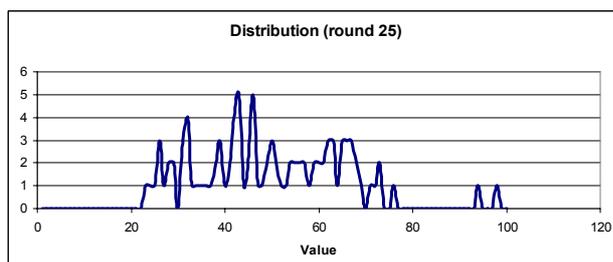
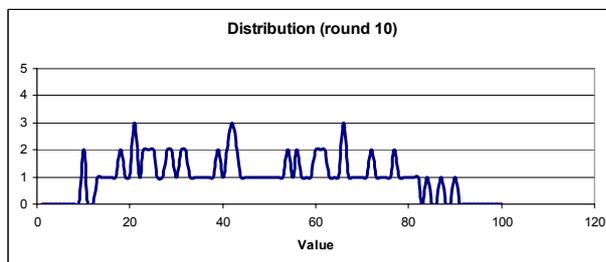
The first generation was based on an uniform distribution, that is to say that the i^{th} individual has i for value. For every value, from 1 to 100, there was only 1 individual with this value.



Then, 5 scapegoats were chosen by the community and replaced by 5 new individuals with random value. Here, for instance, one individual with the value 1 has been removed and, inside the new generation, there are now 0 individuals with the value 1. Meanwhile, a randomly generated individual with the value 42 was born, there are now 2 individuals with the value 42.



We repeated this process until the 100th generation.



4. Conclusion

Cultural evolution implies lots of conscious and unconscious processes inside the communities. The scapegoating mechanism may be the one which occurs initially. But there are lots of other ones which can be considered.

This model has been designed to be as simple as possible in order to be a didactic one, to illustrate the Girardian theory and to provide a new approach for genetic algorithms [2]. It could be ameliorated by using the other classical processes implied in genetic algorithm such as recombination or mutation.

References

- [1] R. Girard, "Things Hidden Since the Foundation of the World", 1978
- [2] J. Holland, "Adaptation in Natural and Artificial Systems", 1975