Creative Design by Social Affiliation Based Interactive Evolutionary Computation

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Abstract

In this study we combine the Kotler and Trias De Bes (2003) at Lateral Marketing defined what is the creativity with the watt's Social Affiliation Network model to discover the chance (creative probability) and decreased the designing path length. Then, we based on the Social Affiliation Network to define the choosing mechanism as the selection in IEC, recombination mechanism as the crossover in IEC and the chance mechanism as the mutation for our Social Affiliation based IEC (SABIEC) model. Finally we applied this model for the cell phone design. After the empirical experiment we analyzed the interactive data found the choosing mechanism as we expected according to the Social distance to select the creative component and bought the effectively creative design. And the recombination mechanism according to the Co-member relationship quickly built the creative product as we expected it could bring the short-cut effect for us. This chance mechanism also worked as lateral transmitting phenomenon.

Keywords: lateral marketing, chance discovery, small-world, interactive evolutionary computation (IEC), social affiliation network

1. Introduction

In recent years what the creativity was, it was one of the hot researching topics, and the Kotler and Trias De Bes at 2003 in their lateral marketing[4] had already defined it. When the new need as creating purpose or the new environment was happened, then the product would be modified to suit it. It meant the laterally marketing was not only used in new marketing but also suited to make a good product for consumer. Unfortunately, the Kotler and Trias De Bes only propose the conceptual model, did not supply the operating model. Here we believed only the dynamic and interactive evolutionary model had a chance to combine the laterally transmitting with vertical transmitting in same process.

But for IEC[1] it has a fatiguing problem, and this problem as the problem of connecting any two points A and B. In Fig.1 the distance between A and B is 3, this is because the Social Affiliation Network[11] as a hierarchy structure, and we can define the social distance[13] as the layer's length on Fig.1. And this kind Social Affiliation Network for people, as that the people has his owned professional affiliation relationship, geometry affiliation relationship and other's affiliation relationship. Then the social distance between A and B is according these affiliation relationships to find the minimum distance. Like Watts[12] uses the minimum social distance to decide the searching direction in his experiment and find only about 5-7 searching times can arrive the target.

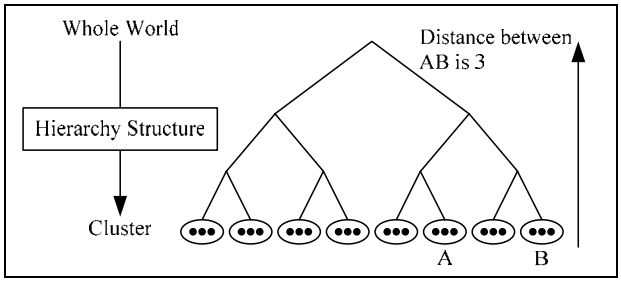


Fig. 1: one dimensional Social Affiliation Networks (Watts, 2003)

Here we believe that the interactive process is not only using the visible products to stimulate the designer understands what is his prefer product, but also let the designer has a chance to design a creative product for him. Therefore the system must supplies the choosing and recombining power for the designer, let him can try to do the laterally conceptual transmitting. And the creative designing problem becomes how to help the designer finds his wants conceptual value and

effectively helps him discovers the new creativity and recombines these concepts into the creative product. Therefore, in this study we believe that implement the Watt's Social Affiliation network into IEC[5,6,8,9,10] can rely on the designer's intention drives him understands whole key structure and chooses the important key term to builds the new creative product for him. And this process only need about 5-7 designing times to accomplish the product.

2. Methodology

2.1. The Chromosome Design

Before we design the chromosome, we collect all the cell phone on the market, and according to these samples designs the components of cell phone. The cell phone's chromosome is shown on table 1.

Table 1 the cell phone's chromosome

faceplate				handset				screen				function key				number key			
1	2	...	18	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

From table 1, because we integrate the same characteristic genes in same cluster to build the allele's clusters under each attribute and let the designer has a chance relies on his subjective value (social distance) to find the prefer cluster.[2,3,7]

2.2. The Choosing Mechanism (Selection)

Because the SABIEC model has two kinds of choosing mechanism, first relies on the designer's subjective value to estimates the product. As Fig.2, the first we calculates each cluster's score by Eq.1 (Fig.2a), and the result as Fig.2b, according to the cluster's score chooses the elitism cluster as a_{1j} cluster, here the a_{1j} is the C cluster. Finally we can build a social affiliation network in this generation as Fig.2c.

$$a_{1j} = \left(\frac{\sum_{k=1}^{g} SC_{jk(j=1..c)}}{\sum_{i=1}^{n} t_{ij(j=1..c)}}\right) \quad \text{..... (1)}$$

The n is the population size, the c is the number of cluster under the attribute, and the t is the cluster's presenting times on SABIEC and SC is the product's score.

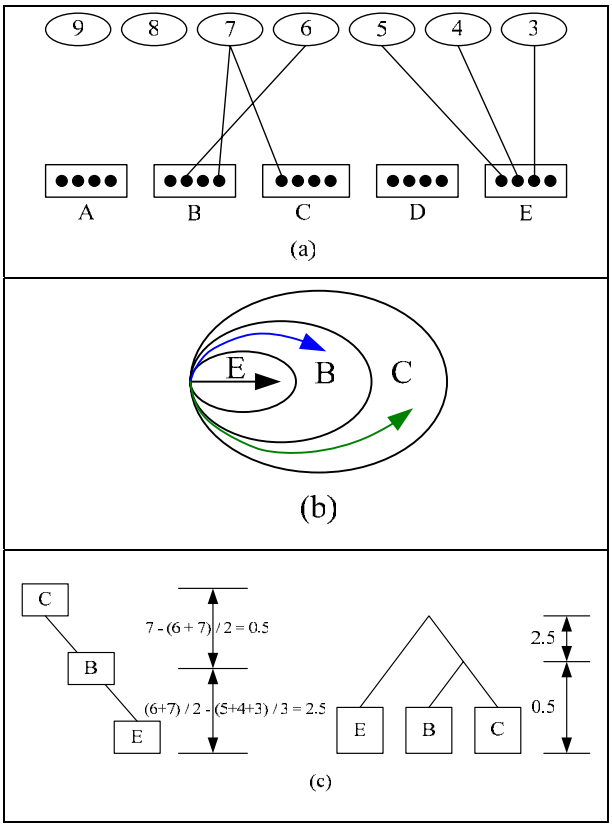


Fig. 2: (a)the relationship between the designer's subjective score and faceplate (b) according to Eq.1 calculate the a_{1j} and find the best cluster is C (c) the a_{1j} 's social affiliation network

Secondary choosing mechanism is: our system supplies the selecting component power for designer to pick up his preferable components, and according to Eq.2 discover the anchor b. But from here we also find the other social distance; it based on the times of picked up components by Eq. 3 calculates another social distance for find the prefer cluster (a_{2j}).

$$b_{ijk} = \frac{SA_{ijk}}{\sum_{i=1}^{n}\sum_{j=1}^{c}\sum_{k=1}^{g} SA_{ijk}} \quad \text{..... (2)}$$

$$b = set(b_{ijk})$$

$$a_{2j} = \left(\frac{\sum_{k=1}^{g} SA_{jk}}{\sum_{i=1}^{n}\sum_{j=1}^{c}\sum_{k=1}^{g} SA_{ijk}}\right) \quad \text{.....(3)}$$

The k is the number of allele in cluster, and the SA is the component's selected times.

2.3. The Recombination Mechanism (Crossover)

Passed through the choosing mechanism, the recombination mechanism can connect the elite cluster *a* with the anchor *b* to generate a creative cell phone (*ab*). But here we have two social distance the a_{1j} and a_{2j} , then the Eq. 4 is used to choose out the maximum social distance a_j.

$$a_j = \max(a_{1j}, a_{2j}) \quad \text{..... (4)}$$

The crossover is as the above choosing mechanism to select prefer a_j and $set(b_{ijk})$ then connect each other by Eq. 5. It also as Fig.3, the first column is the $set(b_{ijk})$, the second column is a_j and the third column is the results after the crossover mechanism.

$$SABIEC_{crossover} = a_j + set(b_{ijk}) \quad \text{..... (5)}$$

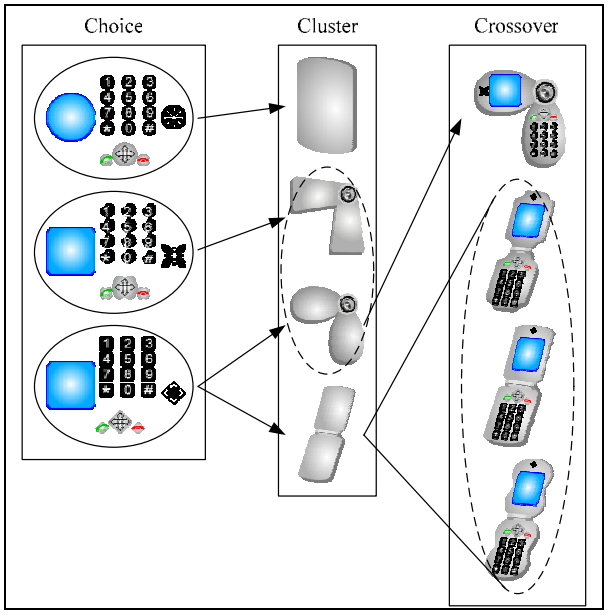


Fig. 3: the crossover is according to Eq.5

2.4. The chance mechanism (mutation)

But from Fig.2a we can find that some clusters (A, D) do not present on this generation, here we define these clusters (a_{new}) as the chance for the next generation. Because the designer can expands his designing space to these cluster as clusters A and D.

$$SABIEC_{mutation} = a_{new} + set(b_{ijk}) \quad \text{..... (6)}$$

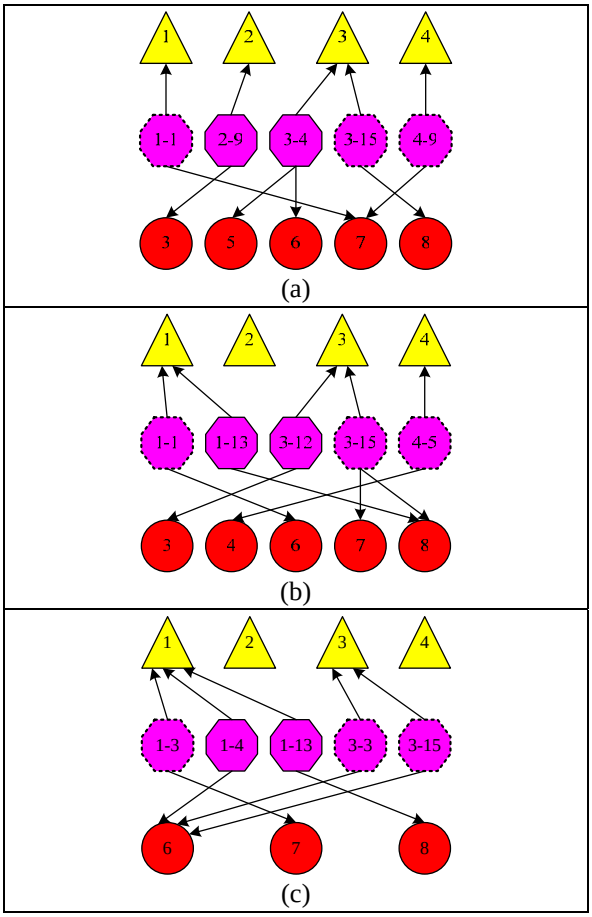
3. Experiments and Discussion

The purpose of this experiment was that recombined IEC with chance to guide the designer found his wanted creativity. Therefore, we developed a SABIEC system to help the designer created his favorite cell phone. And the chromosome was shown on table 1.

We had held one test fields for creative design; we invited the professors and college's students who are all in north Taiwan.

3.1. Experimental results and Discussion

Here, we followed interactive data to describe the designer how to interact with our system. The Fig.4a was the first generation on SABIEC, from Eq.1, Eq.3 and Eq.4 and table 2, we could find the 3's cluster was the best cluster and secondary cluster was 1's cluster. Then at crossover mechanism would let the new components was selected from same clusters as the 3's cluster and 1's cluster (Fig.4b). And this mechanism also could work very well on other generations and step by step increasing the product's value. In this interactive data we also could observe the new component was selected as the mutation, but it did not work as we expected it is a chance to build a creative product.



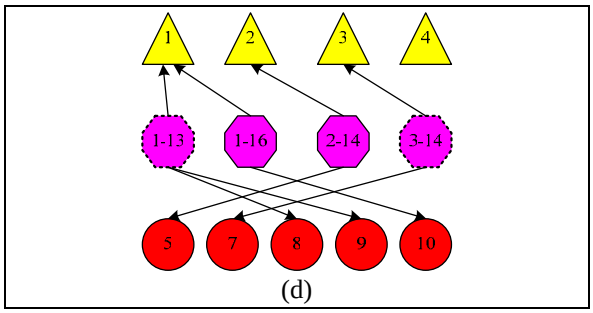


Fig. 4: the interactive dada vs operation of SABIEC

Table 2 the a_{1j} by Eq.1

generation	Cluster 1	Cluster 2	Cluster 3	Cluster 4
1	7	3	(8+5+6)/3=6.3	7
2	(6+8)/2=7	0	(8+7+3)/3=6	4
3	(6+7+8)/3=7	0	(6+6)/2=6	0
4	(8+9+10)/3=9	5	7	0

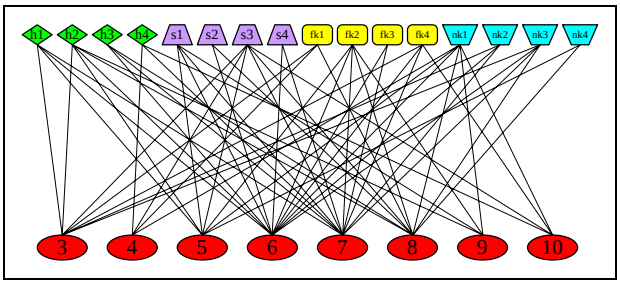


Fig. 5: the interactive dada and anchor *b*

4. Conclusion

How to increase the communicational ability between the designer and IEC is the effective method for creative design. In our SABIEC model the designer can under his social affiliation network chooses the components and recombines each other to build his prefer product. And from the interactive designing data we could find the social distance effectively helped the designer to decide his prefer designing direction. And the chance mechanism supplied the new cluster for designer to do the lateral transmitting as the Kotler and Trias De Bes (2003) said.

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