

# Correlation Justification As An Approach to Generating New Ideas

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*Abstract:* - In this paper, as an extension of blending / composition approach to idea generation, we discuss the significance of frame-based correlation justification as a central framework for many idea generation issues, whose prime concern is to discover the possibility of enhancing the capabilities, or justifying the role or utility of a concept through justifying its correlation with the other concepts.

This correlation justification can lead to generation of texts or contents, which can be viewed as new ideas for the user. In the paper, an example is discussed that shows the application of correlation justification to the domain of computational Sciences.

*Key-Words:* - Idea generation, frame-based, correlation justification, concept composition, content determination, resonance effect, computational sciences.

## 1 Introduction

Generating new ideas is an area, which has recently found various applications in a variety of disciplines such as supporting R & D activities, generating content for pedagogical purposes, as well as developing sophisticated systems for solving environmental problems. A variety of approaches have been proposed showing how new ideas in a certain domain can be constructed on the basis of some previous or preexisting knowledge in other domains, mostly based on a sort of analogical mapping between the source and the target, whose prime concern is to carry over the previous knowledge of source into the target, in a way convincible with respect to its circumstances.

Some approaches have also been proposed, showing how new concepts are emerged as the product of a sort of blending or merging of the old concept. Within these approaches, conceptual blending or concept integration has been shown to be quite promising for justifying a variety of inferential activities in human systems.

It should however be noticed that, in many idea generation applications, one may want to know, how a concept can be employed to help another concept overcome or decrease its drawbacks, thus yielding a new idea, in terms of a composite concept, which can be satisfactory or beneficial in many aspects. Let say, blending the concepts to enhance their point of strength, is the foal issue of many idea generation applications. With respect to this, and as an extension of blending/merging approach to idea generation, in

this paper we discuss the significance of correlation justification as a central framework for many idea generation issues, whose prime concern is to discover the possibility of enhancing the capability of a concept through justifying its correlation with the other concepts. Obviously, the idea obtained in such a manner, itself can be viewed as a new concept, whose correlation can in turn be justified with respect to the other concepts. It is interesting to see that, due to a general apartness or distance between the participating concepts, the correlation justification process may be viewed to be creative, and it is therefore not illogical to think that, it may in the meantime be considered as an approach to creative idea generation as well.

## 2 Some Existing Approaches for Idea Generation

Different approaches for idea generation can be classified into five categories, from our viewpoint, as follows:

- **Concept Integration & Blending**  
Within this framework, traditional spaces associated with analogical or metaphoric mapping, the source and the target, combine via some structural mapping to produce another independent blended space that provides the local point for the resultant integration [1,2].
- **Integrated Model for Analogical Modeling**  
Within this model, creativity is interpreted as the search for some source analogue with which to re-

interpret a given target domain. Individual stage in it eliminates the influence of interactions between stages. Providing the inspiration or a further retrieval episode, will deliver an all-encompassing explanation about this model [3].

- **Interpretative Approach to Analogical Reasoning**  
Within this framework, the concepts in the target are first mapped onto some generic concepts in an intermediate space, and the results are then reinterpreted into appropriate concepts in the target. To step toward potential interpretation schemes, the concepts in the intermediate space should be selected as generic as possible, and should be able to show the major mental modes the reasoner may exhibit within the reasoning process. These mental modes include all categories with respect to human perception of the surrounding environment as well as emotions and ethics, whose significance has been clarified within the frame of reasoner's phenomenological experiences [4,5].
- **Case-Based & Analogical Approaches to Creative Software Design**  
There are some experiments on case-based retrieval of software designs through development of case-tools, which have intended to aid the software engineer in the design phase, to retrieve the relevant designs by using UML to represent the design knowledge. The main parts of the related case tools are CBR Engine, UML Editor, Knowledge base (case library, case indexes,...) and knowledge base manager [6]. Here, software design patterns are abstract solutions to problem categories, and they describe why, how, and when a pattern can be applied [7].
- **Concept Composition**  
In this approach, concepts are represented in terms of frames with specific attributes, and are composed to produce a composite concept within which application of a concept to the other for improving a concept's drawbacks, enhancing a concept's capabilities or justifying the role or utility of a concept in the other, is elaborated. An alternative for concept composition is content determination within which the values of the attributes in the composite concept are determined via linking the attributes' values in the initial concept [8]. Role of linguistic entities (actions, nouns, and conjunctions) and the interaction operators should therefore be observed in this respect. This approach has been applied to on-line provision of appropriate contents for pedagogical purposes [9].

### **3 The Proposed Framework of Correlation Justification**

#### **3.1 Basics**

By correlation justification, we mean how two concepts, and particularly those which are distant in their contents, can be related to each other in some way, providing a ground for perceiving their contribution to each other, and subsequently constituting a composite concept (based on these concepts) within the content of which this contribution is crystallized in a tangible way.

For example, suppose that we want to justify the correlation between the two concepts "Fuzzy" and "Clustering", which both are being popularly used in the area of computation sciences. Let the composite concepts to emerge within this process be labeled by (i) "Fuzzy Clustering" and (ii) "Clustering Fuzzy", depending on the direction of contribution. In the first composite, result is that, the ability of handling uncertainty in "Fuzzy" can help "Clustering" overcome its drawback in performing robust classifications in the cases where clusters cannot be defined in a way clear and distant from each other. Similarly, in the second composite, result is that, the ability of classification in "Clustering" can help "Fuzzy" overcome its drawback in having inefficient membership functions, which of course is quite an interesting idea. But the question is that how the process of correlation justification can be performed. With respect to this question, an alternative response is to let the major semantic ingredients in the content of the contributor be tested for the same ingredients, in the content of the contributor, and this process be continued until the stage where the contribution is justified. We call this process correlation justification through concept interaction. The other alternative is to determine from the beginning some justified explanations through using a set of operators, within which the contribution can be clearly perceived. We call this process correlation justification through concept interaction. For each alternative above, it would be essential for the concepts to be represented in such a manner that the above processes can be realized. Frame can be a suitable alternative in this regard [8]. The attributes selected for the frame of concepts should be such that, they can totally give a high coverage to (i) what the concept is expected to do ultimately, (ii) the other concepts (entities) on which the ongoing concept is based, (iii) the advantages and disadvantages of the ongoing concept with respect to different contexts, and soon. In our study, the following entities were realized to be appropriate: major concern, basic concept behind, advantages, disadvantages, super class, subclass, and instances.

### 3.2 Correlation Justification Through Concept Interaction

Suppose that concept A is to interact with concept B to see how it may be used to help the drawbacks with concept B be overcome. Here, both the concepts are represented in terms of frames including the attributes discussed in 3-1, and the values of the attribute “Noun-Type Entity” include the prime nouns used in the value of the attribute “Basic Concept Behind”. To help this come true, the value of the Major Concern of Concept A, as a frame, is to be checked for the attributes “Major Concern”, and “Related Noun-Type Entity”, and the corresponding values should themselves receive the same process, taking into account the reservation that the frame related to the value of the attribute “Noun-Type Entity”, should be checked for the attributes “Noun-Type Entity”, “Sub-Class” and “Instances”. In the meantime, concept B as a frame should be checked for the attributes “Basic Concept

Behind” and “Related Noun-Type Entity”, and the corresponding values themselves should be submitted to the same process, with the reservation that the frame related to the value of the attribute “Noun-Type Entity” should be checked for the attributes “Noun-Type Entity” and “Super Class”. The entire process, as discussed above, is continued until the stage where the two trends (one from concept A and the other from Concept B) cross each other at the same concept. We call such an effect, resonance between the two concepts. Obviously a variety of results, each explaining a separate contribution of concept A to concept B, can be obtained in this manner. Let say that resonance effect can take place between the two concepts in different ways. Once, the set of results was obtained, each can be translated into an appropriate syntax to represent the corresponding idea in a textual manner.

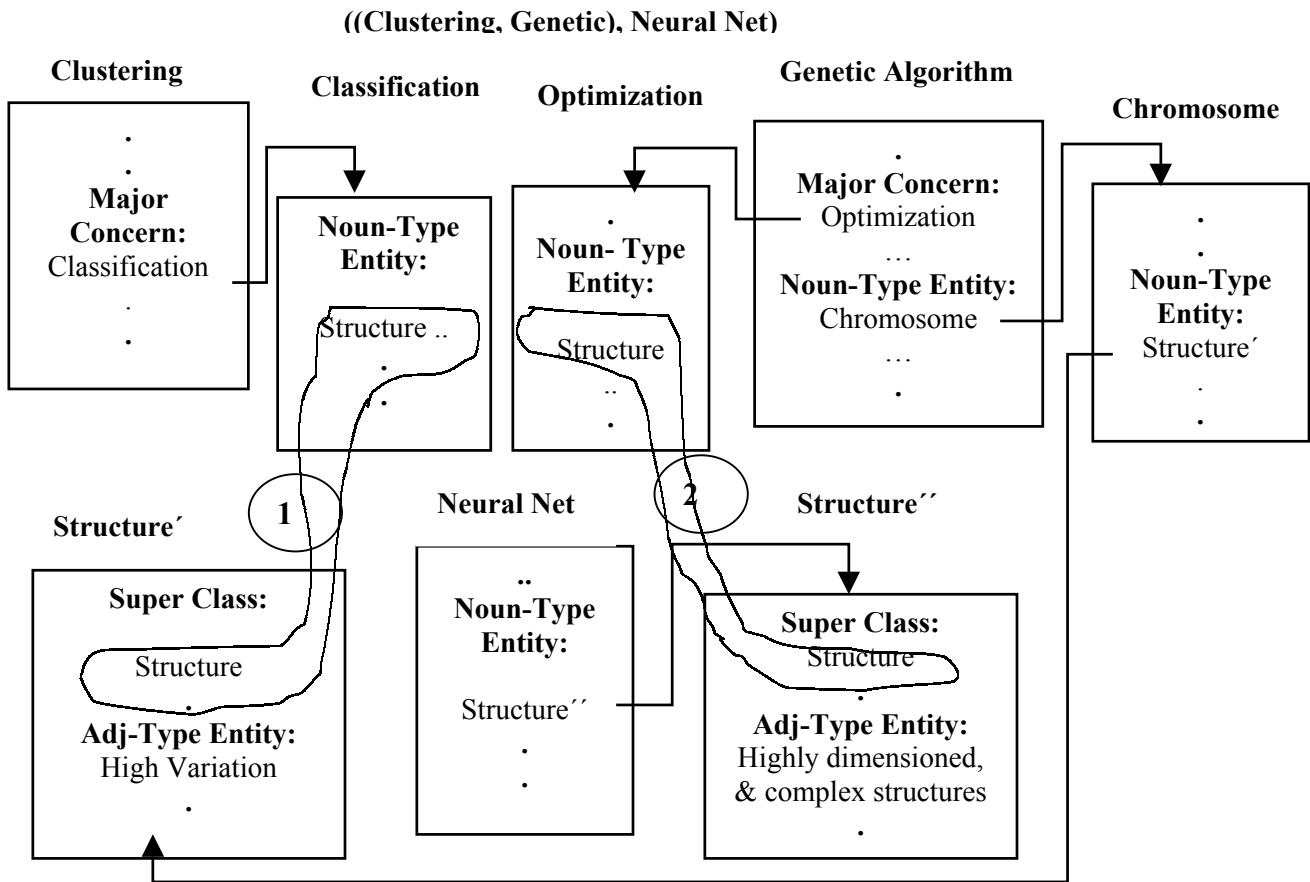


Fig.1 The entire process of interaction between three concepts of “Clustering”, “Genetic”, and “Neural Net”

## 4 Prospects of Correlation Justification

### 4.1 Hierarchical Organization of Novel Ideas

Correlation justification in the way discussed in this paper, has the capability to organize new ideas in a hierarchical manner. This means that, once an idea was generated through justifying the correlation between two concepts, the attributes' values belonging to the frames of major entities in this idea, themselves provide the opportunity for some new ideas to be generated. For instance, considering the fact that justifying the correlation between the 3 concepts "Clustering", "Genetic", and "Neural net", preserving the order from "Clustering" to "Genetic", and then from the resultant to "Neural Net", may first yield the idea that ... Clustering can be used for classifying the high variation structures of the chromosomes which are used in genetic algorithms as a means for optimization... (1<sup>st</sup> resonance), and then the idea that ...Clustering can be used for classifying the highly-dimensioned & complex structures optimized by genetic algorithm, such as those of a neural net...(2<sup>nd</sup> resonance) [10].

Ideas generated in this way themselves can be represented via the same frame structure holding appropriate attributes' values, based on the status of the corresponding resonance. The entire process of correlation justification for the 3 concepts discussed above is illustrated in Figure 1. as it is seen from the Figure, both resonances have occurred, at the value "structure' ", respectively belonging to the frames "structure", and "structure"" that in turn are the values of the Noun-Type Entity in Frames "Classification" and "optimization"[10]. It is seen that the ideas initiated through the above way will have the chance to be expanded to an approach or framework that can help the ideas be achieved. Correlation justification can therefore be regarded as a ground for building interactive decision support systems for innovating new frameworks or techniques as well.

### 4.2 Providing Pedagogical Contents for the Learners

A prime aspect in generating ideas through correlation justification is to supply learners with the contents regarding the way a concept can be applied to overcome the deficiencies (or enhance the strength points) of a mother concept. In the meantime it could be occasionally interesting for a learner to know what could be the roles/utilities of a concept respecting a certain application or utility domain. In both situations,

justifying the correlation between concept A (as the concept to be applied) and concept B (the concept for which the strength point is to be enhanced, or the concept regarding the application or utility domain) can yield a scenario through which the learner can get familiar with some new knowledge.

### 4.3 Anticipating Prospects for the Audience

Another aspect of idea generation with respect to content provision is providing contents that include prospects/impacts of employing or utilizing certain items within certain situations or with respect to certain goals or utility scopes. Now, considering correlation justification again as the core methodology for such sort of idea generation, the items under study can be considered as concept A, and the situations, or the goals or utility scopes can in the meantime be considered as concept B. Justifying the correlation between concept A and concept B will then lead to formation of a composite concept, which describes the prospect of such an employment or utilization. For instance supposing that concept A and concept B are "intelligent automation" and "auto-industry in developing countries" respectively, justifying the correlation between these two concepts will eventually guide us to the prospect of utilizing intelligent automation with respect to auto-industry in developing countries; an idea which can be quite interesting for those in the developing countries who are interested in deploying advanced technologies in their domestic industry. Of course, this does not mean that the idea formed in this way is necessarily true, since the background knowledge stored in the structure of the frames cannot be complete or exact enough to confirm such an anticipation. It however provides some sort of hint for the audience to observe the related idea in their decision in some way, or make them think of the related possibilities carefully, before taking specific position in their decision. In this way, one may think of correlation justification as a method for anticipating prospects, or in a broader sense, interpreting the particular situations in which certain items with certain background knowledge may co-exist. Taking this point into account, correlation justification can be generally viewed as an approach to interpretation of heterogeneous situations in which at-one-look non-correlated conceptual entities co-exist.

## 5 Concluding remarks

It was discussed in the paper that correlation justification can be used as a helpful means for generating new ideas on the way a concept can be applied to overcome the drawbacks, of another concept, or justify its role/utility regarding it.

In the meantime, it was pointed out that the basis for this process is resonance effect, through which partial texts can be generated for concept composition.

The point is that, based upon the status of resonance effect, different ideas can be generated. This is quite interesting, since an aspect of idea generation, particularly in its innovative or creative form, is to consider pluralism in the generated ideas.

As a future work, using soft computing techniques for handling the process of interaction between the concepts, is suggested.

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