Mirror-ball-based seeing in multi-layered evaluation I.

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Abstract: The evaluation of objects based on parallel existing (multi-layered) evaluation criteria without needing subjective/arbitrary weights for the different attributes among them is a neglected topic in the science since ever. The paper presents in the Part I. a parallel derivation of the anti-discriminative algorithm of the similarity analysis. Paper II. will demonstrate a case study with a real database and with real combinatorial calculations leading to the mirror-ball-effect where the role of each object concerning each other object can be visualized and measured.

Keyboard: parallel and/or chained similarity analyses, anti-discriminative approach, antagonisms, combinatorics, partial comparing

# Introduction

The topic of the multi-layered evaluation will have 2 new papers. The Part I (this article) derives the problem as such. The problem, why we need (why it is possible) to define a lot of different point of view for evaluations where the objects could have identical partial results (layers) or it can be that one object is never better (called from now on as stalking horse) than one or more other object(s) – or vice versa (c.f. king-objects), or there are circular/irrational preferences/relations like A>B and B>C and C>A. The Part II demonstrate a combinatorial analysis called as a mirror-ball where different object(s) will be excluded from the analyses in order to see the impact of the excluded object(s) concerning the basic situation having yet all objects in the evaluation.

Partial analyses can be seen here: (Starting point = <https://miau.my-x.hu/miau/273/Naiv_optimalizalt_verziok2.docx>). Details: <https://miau.my-x.hu/miau/273/naiv_optimalizalt_verziok2.xlsx>

The ELO-rating system “*was originally invented as an improved chess-rating system over the previously used Harkness system, but is also used as a rating system in association football, American football, basketball*” (see <https://en.wikipedia.org/wiki/Elo_rating_system>).

Parallel, there could have been the anti-discriminative question (as a kind of quality/risk management approach): Might we see a lot of chess masters (objects) having the same evaluation value (based on the result of random matches between partial/different set of players). But this question seems to be as a “bastard” for the science as such…

Andor Dobó developed the JOKER software (<https://miau.my-x.hu/miau2009/index.php3?x=e0&string=joker>) for reconstructing object-attribute-matrix-cells if one row and one column do not have any lacking positions.

The similarity analysis (COCO = component-based comparison for objectivity – see: <https://miau.my-x.hu/msc/v12.xlsx>) was originally invented for detecting price/performance anomalies (c.f. <https://miau.my-x.hu/miau/196/My-X%20Team_A5%20fuzet_EN_jav.pdf>).

# Derivation of the existence of a mirror-ball-effect

The derivation means an alternative way of the COCO-method should be derived based on pairwise comparisons and their statistics. As we will see, the COCO-method can be approach with quasi arbitrary close – but the aggregation of stalking horse effects and king-position seems to be naïve in the parallel technique (it means – not optimized). The optimized way (of stalking horses and kings in case of each object) leads to a massive different situation as before based on the simple addition of frequencies.

Parallel, the reproduction of the COCO-result based on pairwise comparisons do not let visualize the object-to-object impacts where the existence or the exclusion of an object which other objects do affect.

The not optimized analyses do not have the possibility to use function symmetries for validity checks for objects and/or models.

Details: <https://miau.my-x.hu/miau/277/mirror_ball.xlsx>

(Important to declare: The Part I and Part II do not concern the parallel problem presented in the starting-point-paper where the basic scores are transformed to a parallel OAM where a term of GOOD is an other one as here and now with different object-exclusions. The exclusion of object(s) could be enforced in case of the parallel GOODNESS-OAM. Therefore there are two different approaches: the attribute-oriented one (see starting-point-paper) and the attribute-oriented one (see mirror-ball-approach).

## OAM

The OAM (Fig.1) may be interpreted not only in a context-free but also in a context-depended way:

* There are objects (Students): V1,…,V12
* There are tasks (competition/exam-situation): task1-2-3-4-5 and extra awards
* There are scores (the more the better)
* There is an anti-discriminative virtual dependent variable (Y0)
* There is a naïve aggregation: SUM of the scores for each object
* There is a set of ranking values based on the naïve solution
* There are COCO-models (direct and inverse) leading to full validity in case of each object and to the proof: the objects can not be evaluated with the same evaluation constant value (1000)



Fig.1: The basic raw and ranked data with direct and inverse views (source: own presentation)

## Basic models and validity



Fig.2: The basic models with direct and inverse views (source: own presentation)

Fig.2 presents the direct and the inverse model leading to symmetric results based on symmetric inputs. Naïve solutions do not have this seemingly technical possibility to check the quality of inputs, especially the most instable object(s).

## Deriving stalking horses and kings

Fig3 presents in case of 12 objects a combinatorial space of 144 (12\*12) pairwise comparisons where we are searching for:

* Kings: (an object is better or identical) compared to an other object concerning all attributes (ranked values)
* Stalking horses: (an object is worse or identical) compared to an other object concerning all attributes (ranked values)
* Sameness: technical or explorative status for fully identical objects
* Neither (of them): objects with different preferences (it means one object can be better and worse parallel compared to an other object)



(the next part of the figure begins with V7 vs V\* as second part of the combinatorial space)



Fig.3: Derived antagonisms (source: own presentation)

As it can be seen:

* There are sameness positions where really the same object is compared to itself…
* But there are other sameness positions: see V6 and V7
* The less performative objects have more and more stalking horse positions.
* The rel. good objects have more king-positions.
* The inverse comparisons (e.g. V1V12 vs. V12V1 should lead to inverse evaluations where kings and stalking horses are in inverse connections)

## Statistics of the pairwise comparisons

The green and red positions of the Fig3 can be interpreted as a kind of database (see cells with borders on the right side in the Fig3). A pivot-report in the Excel lead to Fig4 (on the left side and on the top):

### Arbitrary OAM



Fig.4: Arbitrary attributes/direction and their impacts (source: own presentation)

Fig4 support to understand, that

* The Sameness (S)
* And the Neither (N) positions can not have rational directions in an arbitrary way
* Because V11 vs V12 leads in the example to an unexpected/inverse antagonism…

Therefore, only the kings and the stalking horses can be integrated into a

* Naïve model – where the king-positions should have a positive sign and the stalking horse-positions a negative one before adding them.
* Optimized model – where the kings and stalking horses are used to prove whether an anti-discriminative situation is given… (see Fig5):



Fig.5: The naïve and optimized aggregation of stalking horses and kings (source: own presentation)

# Results

Fig5 demonstrates as follows:

* The differences between the optimized model and the naïve ranking (based only 2 attributes: kings and stalking horses) produce quasi the same ranking values.
* The differences between the basic COCO-model (see Fig1) and the statistics of the pairwise-comparisons (not relevant whether naïve or optimized) lead to little disturbing effects – in the middle of the ranking values.

# Conclusions

The mathematical background of the COCO methods was discussed before already from other point of views: e.g.:

* József Varga, Gyöngyi Bánkuti, Rita Kovács-Szamosi, “Analysis of the Turkish Islamic banking sector using CAMEL and Similarity Analysis methods”, Acta Oeconomica 70/2, 2020, <https://akjournals.com/view/journals/032/70/2/article-p275.xml>
* Gyöngyi Bánkuti, Similarity analysis, ERASMUS staff mobility presentation, 2018, <http://miau.my-x.hu/miau/237/eszek/COCO_Eszek_2018_04_24.ppt>
* Gyöngyi Bánkuti, “About the method of Component-based Object Comparison for Objectivity” Proceedings of the International Congress of Mathematicians Hyderabad, India, 2010, <https://miau.my-x.hu/miau2009/index.php3?x=e0&string=india.p>
* Pitlik Marcell: <https://miau.my-x.hu/miau/267/bme_tdk/TDK_PM_final.pdf>

The pairwise comparison was already involved into the interpretations:

* <https://miau.my-x.hu/miau2009/index.php3?x=e0&string=pair>
* <https://en.wikipedia.org/wiki/Electoral_system>

The naïve and optimized solutions could already produce close results before:

* <https://miau.my-x.hu/miau2009/index.php3?x=e0&string=cutting>
* <https://miau.my-x.hu/miau2009/index.php3?x=e0&string=szakaszo>

Here and know, the connection of a global COCO-optimization (<https://miau.my-x.hu/myx-free/>, <https://miau.my-x.hu/myx-free/coco/index.html>) could be derived in an approximative way based on the different types of antagonisms. This parallel way could also be used for the development of a new solver-generation.

Further interpretation possibilities can be expected in Part II where the raw data of Part I will be analysed in parallel models by excluding one or more kings/stalking horses. The partial results and their aggregation can be interpreted as a kind mirror-ball-effect (in a disco). Based on the partial results and their aggregation, there will be given new ways to define risk potentials of the objects. It means: who is the riskiest Student (with the most luck and/or random/guessed scores/solutions)?!

On the other hand, the resource-intensive optimization could be reduced based on kings and stalking horses and their naïve-aggregated statistics what is a new way for scaling anti-discriminative model calculations…

# Future challenges

The combinatorial/antagonism-driven alternative approach have to validate in future concerning the anti-discriminative constellations of the optimizations where the question is: when or how represent the antagonism-index the optimized equilibrium?[[1]](#footnote-1) (c.f. <https://miau.my-x.hu/miau/277/ann_anti-discriminative-potential_v1.xlsx>).

Parallel, the antagonism-oriented approach can be transformed into source code in different ways where some of them could be interpreted as a kind of parallel-processing-oriented alternatives (useful e.g., for HPC-learning materials: c.f. fully managed combinatorial space vs. exclusion of inverse pairs but simulating their statistical effects compared to parallel treads vs. computing needs for definition and integration of parallel processes).

# References

…s in the text…

1. The sheets of start3 and Y0\_scenarios of the file „mirror\_ball.xlsx” demonstrate that the lacks of kings and stalking horses are important but not enough to ensure an error-free optimization… Therefore, the quantity becomes quality through the optimization. [↑](#footnote-ref-1)