



## MATCHING POINTS AND IDENTITY

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Recently introduced versions of the Borsuk-Ulam theorem (BUT) state that a feature on a  $n$ -manifold projects to two features with matching description onto a  $n+1$  manifold (Peters, 2016; Peters and Tozzi, 2016a, 2016b; Tozzi, 2016; Tozzi and Peters, 2016a, 2016b). Starting from this rather simple “abstract” claim, a fruitful general framework has been built, able to elucidate disparate “real” physical and biological phenomena, from quantum entanglement (Peters and Tozzi, 2016c), to brain activity (Peters et al., 2016, 2017; Tozzi and Peters, 2016a, 2016b, 2017), from gauge theories (Tozzi et al., 2017) to pre- big bang scenarios (Tozzi and Peters, 2016c). Summarizing this novel topological approach, we may state what follows: if you take into account projections among functional or real dimensions, you achieve a system of mappings that fit very well with experimental results and are able to assess countless systems in far-flung scientific branches.

One of the main concerns of such a topological approach to systems features is that it talks in rather general terms, leaving apart the peculiar features of individuals and of single physical and biological processes.

In order to tackle this issue, here we ask: what does it mean “matching description”? In a topological framework, matching descriptions are termed “descriptively near sets”, i.e., two (or more) features that lie on the same manifold, but that have no points in common. In a semantic matching framework, a matching description encompasses all information about the matching process.

Then we ask: has matching description anything to do with “identity”? In the “classical” BUT, the matching features are just points, therefore a point is equal to another, and we might easily state that the two points are “identical”. On the other hand, in the novel BUT variants, the matching features stand not just for simple topological points, but also for more complicated structures, such as shapes of space (spatial patterns), of shapes of time (temporal patterns), vectors or tensors, functions, or signals, thermodynamic parameters, movements, trajectories, or lexical structures (either syntactic or semantic), or general symmetries.

Therefore, we ask: are two matching features identical? Do they stand for the same feature, or for two different features with something in common? In order to solve the issue, we “steal” the Martin Heidegger's noteworthy account of the “principle of identity” (Heidegger, 1957), one of the three tenets of the classical logic.

The principle of identity states that  $A=A$ . The formula expresses, in its usual description, an equality of A and A. One A is equal to another A. A is therefore the same of A, because “identical” (from Greek and Latin) means: “the same”.

However, in another possible version, the formula  $A=A$  speaks of “equality”. A is A. It does not say that A is the same, but that every A is itself the same. Or, in other words, each thing itself is the same for itself with itself.

It can also be stated that matching description “belongs to” an identity. In this case, sameness is interpreted as a “belonging together”. This means that two interpretations are feasible: a) matching description is determined by an identity as a feature of that identity; b) identity is represented as a feature of matching description.

In “belonging together”, the word “together” means: to be assigned and placed into the order of a together, to be established in the unity of a manifold, to be combined into the unity of a system. Such assignement and placing occur thanks to connexions and mappings of the one with the other.

However, “belonging together” can also mean: the together is now determined by the belonging.

Therefore, the possibilities here are two: a) representing belonging in terms of the unit of together; b) experiencing this together in terms of belonging.

The issue b) leads us into the psychological standpoint of the observer. Indeed, “thinking” and matching description can also be thought as the same, so that thinking and matching description belong together in the same, and by virtue of the same. If we attempt to represent together of thinking and matching description as a coordination, we can establish and explain this coordination either in terms of thinking and matching description.

If thinking and matching description belong to each other, matching description belongs with thinking to an identity, whose active essence stems from that “letting belong together” which we call “mental representation”. Identity becomes, in this version, a functional property of the event of mental representation.

In sum, identity can be presupposed as a feature of the matching description, or as a spring that departs from matching description. In this second account, the principle of identity becomes a spring into the psychological origin of identity. We can therefore assess matching description and thinking in terms of that which joins the two, by virtue of the event of mental representation.

This brief note highlights that the concept of matching description displays the widest range of possible uses. In particular, matching description do not assess just “the same” thing, but also things that are “different”. This implementation makes the BUT and its variants not just the standpoint for a novel interpretation of almost all the biological and physical phenomena, but also a suitable tool in order to evaluate the slight (objective and subjective) differences that make our world an astonishing realm of rich heterogeneity.

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