TECHNISCHE UNIVERSITÄT WIEN
Institut für Computergraphik und Algorithmen
Arbeitsbereich für Computergraphik

OESTERREICHISCHE COMPUTER GESELLSCHAFT
AUSTRIAN COMPUTER SOCIETY

laden gemeinsam zum

GASTVORTRAG

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"A metric approach to shape comparison via multidimensional persistence. "

Abstract:

In this talk we motivate the central role of the so-called natural pseudo-distance in multidimensional persistent topology, and present some new results concerning the computation of lower bounds for this pseudo-distance. We start noting that, however shape can be defined, it is based on stable perceptions made by observers, at least in an empirical setting. This dependence on the observers follows from the large subjectivity we experience in shape comparison, while stability is requested by the fact that human judgements focus on persistent properties of the real world, while non-persistent properties are usually interpreted as noise.

In order to express stability in a mathematical setting we need to model the set of observations as a topological space T, while the observer's perception can often be seen as a function φ taking each observation $t \in T$ to a vector in IR^n. This function φ describes t from the point of view of the observer. When two pairs (T_1, φ_1), (T_2, φ_2) are chosen for "comparable perceptions", it is natural to consider the functional Θ taking each homeomorphism $h : T_1 \to T_2$ to the L_∞ -norm of the function $\varphi_1 - \varphi_2 \circ h$. This functional represents the "cost" of the matching between perceptions induced by h. The lower this cost, the better the matching between the two perceptions is. The natural pseudo-distanced between the pairs (T_1, φ_1), (T_2, φ_2) is just the infimum of this cost $\Theta(h)$, varying h.

Lower bounds for d can be obtained by computing multidimensional size functions, size homotopy groups and persistent homology groups for the pairs (T_1, φ_1), (T_2, φ_2). The search for better lower bounds motivates the last part of this talk, where we illustrate a new pseudo-distance between multidimensional persistent homology groups with torsion.

Biography:

Patrizio Frosini received the Ph.D. degree in Mathematics from the University of Florence in 1991. Since 1993, he has been a researcher in the Faculty of Engineering at the University of Bologna. He is a member of the Advanced Research Center on Electronic Systems for Information and Communication Technologies at the University of Bologna. His research interests mainly concern the applications of Geometry to Shape Comparison.

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