
On the Stress Function of Asymmetric von Mises Scaling

Kojiro Shojima

The National Center for University Entrance Examinations
2-19-23 Komaba, Meguro-ku, Tokyo 153-8501, Japan
shojima@rd.dnc.ac.jp

Abstract. Asymmetric von Mises Scaling (AMISESCAL; Shojima, 2011) is an asymmetric multidimensional scaling that is used for analyzing an asymmetric proximity data matrix. It can express an asymmetric relationship by using a von Mises (vM) distribution in directional statistics (Mardia, & Jupp, 2000). Consider an example of analyzing data for a sociometric matrix; if Persons A and B like each other, their coordinate estimates in a multidimensional space are located close to each other. Further, if Person C likes Person D but Person D does not like Person C, their coordinates are estimated to be located away from each other, and the mean direction parameter of the vM distribution associated with Person C looks towards the coordinate of Person D.

The objective of this study was to improve the stress function of AMISESCAL proposed by Shojima (2011). This was done as follows. First, a function to prevent the degeneration of coordinate estimates was added to the stress function. Second, a function to penalize the stress function in the case that the mean direction parameter of the vM distribution of each element looks towards where there is no one-sided relation was added to the stress function. We confirmed that addition of these two functions to the stress function improved the readability of the map after AMISESCAL analysis.

References

- MARDIA, K. V. & JUPP, P. E. (2000): Directional Statistics. John Wiley and Sons.
SHOJIMA, K. (2011): Asymmetric von Mises scaling. Paper presented in the proceedings of the 39th annual meeting of the Behaviormetric Society of Japan, Okayama University of Science, pp.261-262.

Keywords

ASYMMETRIC MULTIDIMENSIONAL SCALING, DIRECTIONAL STATISTICS, VON MISES DISTRIBUTION