

Application of Mixtures of von Mises-Fisher Model to Investigate the Statistical Characteristics of the Wind Direction Data

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Abstract: Wind direction has a substantial effect on the environment and human lives. Wind direction influences the dispersion of particulate matter in the air and affects the construction of engineering structures, such as towers, bridges, and tall buildings. In fact, knowledge of the wind direction and wind speed can be used to obtain information about the energy potential. This study investigates the characteristics of the wind regime involving the wind direction in Kudat, Malaysia using a mixture of von Mises-Fisher model (mvMF). The suitability of each mvMF was judged based on a graphical representation and goodness-of-fit statistics. In addition, the best-fit mvMF model was compared with the circular distribution based on nonnegative trigonometric sums to determine the best model. The results found that the mvMF model with components is the best model. Additionally, the circular density plots of the suitable model clearly show the dominant wind directions in the Kudat region.

Key-Words: Circular distribution based on nonnegative trigonometric sums, directional statistics; directional distribution, mixture of von Mises-Fisher distributions, wind direction modelling.