

ESTIMATION OF ADULT SKELETAL AGE-AT-DEATH USING THE SUGENO FUZZY INTEGRAL

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Abstract

Age-at-death estimation of an individual skeleton is important to forensic and biological anthropologists for identification and demographic analysis, but it has been shown that current aging methods are often unreliable because of skeletal variation and taphonomic factors. Due to this, it seems necessary to explore different ways to account for this inherent inaccuracy in the aging methods to produce better results when determining age-at-death. Multifactorial methods have been shown to produce better results when determining age-at-death than single indicator methods. However, multifactorial methods are difficult to use for single skeletons and they rarely provide the investigator with information about the reliability of the estimate. The goal of this research is to examine the validity of the Sugeno fuzzy integral for modeling age-at-death of an individual skeleton.

The Sugeno fuzzy integral is an information fusion technique that can handle uncertainty that is inherent in the aging methods. Since the age determination methods are not intended to be a rigid set of typological standards but rather describe modal age changes, uncertainty is inherent in skeletal age determination. The Sugeno fuzzy integral allows the use of as many age indicators available, the condition of the skeleton, and the accuracy of the skeletal age indicators to produce a more informed decision of age-at-death in an adult skeleton. This method is described and examples are presented using three commonly used aging methods on a known-age skeletal sample from the Terry Collection. The Sugeno integral uses multiple sources and types of information, does not require the use of a population, and produces graphical results.