

## **Morphometric analysis of 3D soft-tissue for sexual dimorphism in human face**

### **ABSTRACT**

Sexual dimorphism in Homo-sapiens is a phenomenon of a direct product of evolution by natural selection where evolutionary forces acted separately on the sexes which brought about the differences in appearance between male and female such as in shape and size. Advances in morphometrics have skyrocketed the rate of research on sex differences in human and other species. However, the current challenges facing 3D in the acquisition of facial data such as lack of homology, insufficient landmarks to characterize the facial shape and complex computational process for facial point digitization require further study in the domain of sex dimorphism. This study investigates sexual dimorphism in the human face with the application of Automatic Homologous Multi-points Warping (AHMW) for 3D facial landmark by building a template mesh as a reference object which is thereby applied to each of the target mesh on Stirling/ESRC dataset containing 101 subjects (male = 47, female = 54). The semi-landmarks are subjected to sliding along tangents to the curves and surfaces until the bending energy between a template and a target form is minimal. Principal Component Analysis (PCA) is used for feature selection and the features are classified using Linear Discriminant Analysis (LDA) with an accuracy of 99.01 % which demonstrates that the method is robust.

**Keyword:** Sexual dimorphism; Facial landmark; 3D geometric morphometrics; Multi-point warping; LDA