Abstract

Sex estimation is a challenging problem in both forensic anthropology and bioarchaeology. Sexual dimorphism is most noticeably displayed by the pelvis; however in instances when it is not preserved, sex is estimated by skull. There is a multitude of approaches that use the skull, however, their population specificity and variable sexual dimorphism oscillation reduces their effectiveness (Bruzek and Murail, 2006). We base our contribution on the study by Abdel Fatah et al. (2014) that estimates sex based on exocranial and endocranial surfaces with a high success rate of 97%.

Our approach uses anonymized CT scans of skulls from recent french population, from which the exocranial surface was segmented. On these surfaces, CPD-DCA (Dupej et al., 2014) was performed. We analyzed both form and shape (form after size normalization) of these surfaces in 104 skulls (53 males, 51 females) aged 18 to 92 years. The mean age was 58 years in females and 52.46 years in males. Classification was performed using support vector machines (SVM) with a radial kernel. Leave-one-out crossvalidation was also applied. The highest success rate (87.5 %) was achieved with the first 27 principal components of form. Classification of shape was less accurate by only 2 %. Even though our success rate was lower than that of Abdel Fatah et al. (2014), we believe our method is useful for sex estimation. Our success rate may have been reduced by the high age of studied specimens, considering the sexually dimorphic traits diminish with age (Wells et al., 2007). Another possible reason for the lower accuracy is the absence of endocranium in our model, because vault thickness is considered as highly dimorfic trait (Lynnerup et al, 2005, Ross et al., 2010, Abdel Fatah et al., 2014). On the other hand, disregarding endocranium makes our approach applicable to surface scans, as well.