KMOPA. We know that hierarchical shape clustering algorithms are more rapidly than k-means shape clustering based on the results. It can be clarified by the results of HGoFP and KMGoFP or HOPA and KMOPA. We also know that the shape clustering using the GoFP is more rapidly than OPA. It can be clarified by the results of HGoFP and HOPA or KMGoFP and KMOPA.

IV. CONCLUSION

In the paper, we have discussed shape clustering by using Procrustes analysis. The Procrustes algorithms used in this paper were GoFP, GPA, and OPA. The shape clustering algorithms proposed in this research were HGoFP, KMGoFP, HOPA, and KMOPA. And then, the cluster validities used to evaluate the cluster results were Rand index, Jaccard coefficient, F-measure, and Purity. The clustering process of each algorithm was repeated 200 times to obtain the convergence of each algorithm's clustering quality. This research found that the results of all algorithms used are good enough in Rand index, F-measure, and Purity validities. In Jaccard coefficient, the good clustering results were only from HGoFP, HOPA, and HOPA, whereas the KMOPA algorithm got the low cluster quality. In the time complexity, the HGoFP process is the fastest. Based on the cluster validity used and the time complexity, the algorithms proposed in this paper particularly deserve to be proposed as a new algorithm to cluster the objects in the line drawing dataset. Then, the HGoFP is suggested clustering the objects in the dataset used.

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