Table 2. Comparison of results via the different algorithms

Data set	Algorithm 1		Algorithm 2		FCMM	
	Clustering accuracy (%)	Runtime (s)	Clustering accuracy (%)	Runtime (s)	Clustering accuracy (%)	Runtime (s)
Iris	91.49	8.342	91.22	9.234	92.16	8.34
Wine	70.43	14.432	70.71	13.832	72.15	13.725
Seed	89.70	9.232	89.52	8.342	90.46	8.282
Glass	60.70	18.345	62.45	17.532	63.12	17.425
Hayes-Roth	81.46	11.243	81.28	10.734	82.35	10.432
New-thyroid	79.98	11.344	79.01	10.232	80.28	10.109

5. CONCLUSIONS

The KMC may easily fall into the local optimum trap, if the initial cluster centers are not suitable. To solve the problem, this paper designs a novel algorithm, the FCMM, that optimizes the KMC in two aspects: the number of initial cluster centers, k, and the position of cluster centers. Our way to determine the k value can effectively reduce the impact of k on the clustering algorithm. In addition, the positions of cluster centers were updated through chaotic search, based on the FA-optimized KMC. The chaotic map weakens the impacts of initial clustering position on the clustering effect, and fully utilizes the global search ability and fast convergence of the FA, making it possible to avoid the local optimum trap and converge to global optimal solution rapidly. The clustering effect of the FCMM was compared with that of other clustering algorithms and tested on several UCI datasets. The results show that the FCMM can achieve fast convergence, accuracy clustering and avoid the local optimum trap, when it is applied to cluster a few amounts of data.

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