GBKMeans: A Genetic Based K-Means Applied to the Capacitated Planning of Reading Units

Authors : Anderson S. Fonseca, Italo F. S. Da Silva, Robert D. A. Santos, Mayara G. Da Silva, Pedro H. C. Vieira, Antonio M. S. Sobrinho, Victor H. B. Lemos, Petterson S. Diniz, Anselmo C. Paiva, Eliana M. G. Monteiro

Abstract : In Brazil, the National Electric Energy Agency (ANEEL) establishes that electrical energy companies are responsible for measuring and billing their customers. Among these regulations, it's defined that a company must bill your customers within 27-33 days. If a relocation or a change of period is required, the consumer must be notified in writing, in advance of a billing period. To make it easier to organize a workday's measurements, these companies create a reading plan. These plans consist of grouping customers into reading groups, which are visited by an employee responsible for measuring consumption and billing. The creation process of a plan efficiently and optimally is a capacitated clustering problem with constraints related to homogeneity and compactness, that is, the employee's working load and the geographic formation of the consuming unit. This process is a work done manually by several experts who have experience in the geographic formation of the region, which takes a large number of days to complete the final planning, and because it's human activity, there is no guarantee of finding the best optimization for planning. In this paper, the GBKMeans method presents a technique based on K-Means and genetic algorithms for creating a capacitated cluster that respects the constraints established in an efficient and balanced manner, that minimizes the cost of relocating consumer units and the time required for final planning creation. The results obtained by the presented method are compared with the current planning of a real city, showing an improvement of 54.71% in the standard deviation of working load and 11.97% in the compactness of the groups.

 ${\bf Keywords:} \ {\rm capacitated\ clustering,\ k-means,\ genetic\ algorithm,\ districting\ problems}$

Conference Title : ICEFP 2019 : International Conference on Energy Forecasting and Planning **Conference Location :** Paris, France

Conference Dates : October 29-30, 2019

1