

Visualization-based communities discovering in commuting networks : a case study

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Abstract. The division of a national territory is a mandatory process to analyse socio-economic dynamics. Commuting is then an important dimension to build such classification and weighted network analysis is adapted to study this phenomenon. We present in this paper a procedure to help users to identify hierarchical partitions of cities that capture commuters flows density. We enforce our method on a network which represents commuting in France (based on the 1999 national census). Our approach is based on a common technique improved by visual tools: highlight dense areas using a strength metric and extract clusters at different levels using the variation of a quality measure function.

1 Introduction

The definition of good spatial units is important for regional planning and geo-statistical analysis. Spatial network analysis based on different kinds of human interactions has been used in this context. A good example is the study of a telecommunication network in Great Britain by Ratti et al. (2010). Another interesting approach is the study of commuting (Gargiulo et al. (2011); Rouwendal and Nijkamp (2004)) which can be defined as the regular travel between place of residence and place of work. It is obviously related to the development of suburbs and commuter towns. A “Regionalization” of urban areas could not today be reasonably assessed without taking commuters flows into account. In this context, graph based methods have been used to visualize and study these flows (Patuelli et al. (2007)).

The work we present here is based on the result of the 1999 French national census on all the national territory without overseas departments. According to this census there were about 3 millions commuters in France who correspond to 12% of the total labor force. The network induced from these data contains about 36500 cities divided in 96 departments and 22 administrative regions (see Figure 1 for a map). The relations between the cities (network’s nodes) are built as follows : two cities A and B are linked by an arc (oriented edge) if there is at least one person living in A and working in B. This arc is then weighted by the number of commuters going from A to B.