A community of agents as a tool to optimize industrial districts logistics

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Abstract

The aim of this paper is to find an optimal solution to operational planning of freight transportation in an industrial district. We propose a system architecture that drives agents – the industrial district firms - to cooperate in logistic field, to minimize transport and environmental costs. The idea is to achieve logistics optimization setting up a community made of district enterprises, preserving a satisfactory level of system efficiency and fairness. We address the situation in which a virtual coordinator helps the agents to reach an agreement. The objectives are: maximizing customers satisfaction, and minimizing the number of trucks needed. A fuzzy clustering (FCM), two Fuzzy Inference System (FIS) combined with a Genetic Algorithm (GA), and a greedy algorithm are thus proposed to achieve these objectives, and eventually an algorithm to solve the Travelling Salesman Problem is also used. The proposed framework can be used to provide real time solutions to logistics management problems, and negative environmental impacts.

Keywords: Logistics optimization; Industrial districts logistics; Inter-firms relationship; Fuzzy multi-agents systems.

1. Introduction

Pyke and Sengenberger (1992) describe the main characteristic of an Industrial District as “the existence of strong networks of (chiefly) small firms”. This “togetherness” implies a cultural homogeneity that gives rise to an atmosphere of cooperative and trusting behaviour in which economic action is regulated by implicit and explicit rules. Marshall (1925), the author of the original concept of the Industrial District, identified also a class of external economies obtained by individual firms from the increased pooling of common factors that include skilled human resources, specialized suppliers, and technological spillovers. Different models have been proposed to investigate inter-firm relationships in Industrial Districts, such as constellations of firms, flexible specialisation model, milieux innovateurs, firm networks, and clusters. Each model emphasises different and complementary aspects of

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