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Analyzing commercial through-traffic

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Abstract

The impact that commercial vehicles, especially freight, has on traffic is disproportionately large compared to the number of vehicles they represent. Instead of treating commercial vehicles and commercial through-traffic as background noise in our transport planning models, this paper aims to shed light on the characteristics of commercial through-traffic. We argue that if we better understand the activities and activity chains, we would be in a position to build better and more realistic models that, in turn, will assist in better decision-making. In this paper we analyzed the activity chains of through-traffic, drawing from a pool of more than 30000 commercial vehicles that were tracked for six months. The results of the analysis show on an hour-by-hour basis where vehicles enter the study area, the number of activities conducted within the area, and the point of departure. In the porously bounded economic hub of South Africa, the province of Gauteng, we show that the majority of vehicles come into and leave the province through the same arterial routes. We also find distinguishing characteristics between through-traffic originating from within, versus those that originate from outside the province. It is a novel contribution that investigates the activity chain characteristics in a disaggregated manner, and lays a new foundation to build better transportation models in which freight traffic is reflected more accurately in an urban environment. Understanding the disaggregate activity chain structures allows us to generate synthetic populations of commercial vehicles and model them in an agent-based setting, such as the Multi-Agent Transport Simulation (MATSim) toolkit.

Keywords: Commercial vehicles; through-traffic; activity chains

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1. Introduction

Road transportation is known to dominate freight transport by land [1]. This holds for South Africa too as it is, because of its ports infrastructure, very often the entry point into Africa, especially Southern Africa. Gauteng (Fig. 1) is South Africa's smallest province and the economic hub of the country: accounting for less than 2% of the country's land surface, yet representing more than 35% of the nation's Gross Domestic Product (GDP). Stated differently, the small land-locked province of Gauteng accounts for approximately 10% of the entire African continent's GDP.

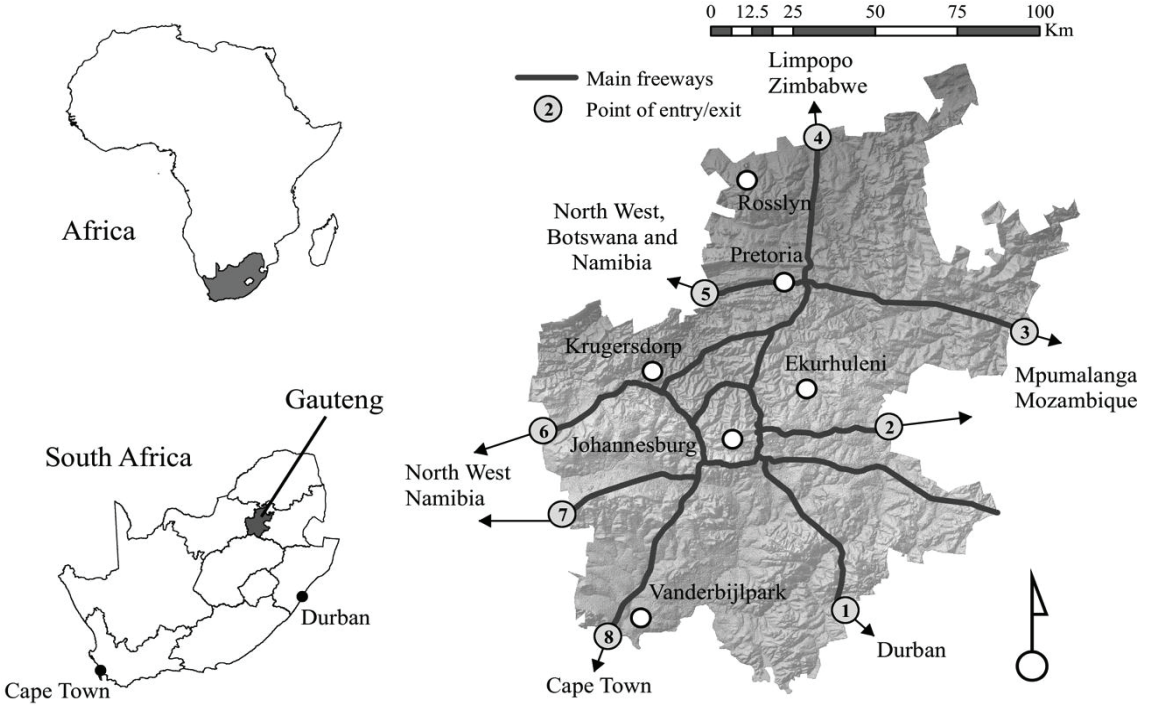

Fig. 1. The porously bounded province of Gauteng, South Africa

Road-based freight in South Africa is usually headed either to, or from Gauteng because of its economic significance. But Gauteng also acts as a gateway into Africa, so a large number of freight and commercial vehicles simply pass through the province. Al-Deek *et al*. [2] acknowledge that national and state-wide data regarding freight movement are often not specific enough to apply to small and unique regions, and are insufficient for detailed and disaggregate studies. This is also true for Gauteng, especially since road freight is deregulated, and very little data is available. In transport planning, through-traffic is often merely added as background noise, with very little understanding of where (let alone when and why) through-traffic vehicles crisscross the province.

The impact that through-traffic has on travel time is considered by Miyagawa [3] in designing and evaluating a hierarchical system of road networks. Our literature review identified no prior contributions analyzing the activity chain characteristics of through-traffic. To improve the modeling of transport, in