Modelling Missing Values for Audience Measurement in Outdoor Advertising Using GPS Data

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Abstract: GPS technology has made it possible to evaluate the performance of outdoor advertising campaigns in an objective manner. Given the GPS trajectories of a sample of test persons over several days, their passages with arbitrary poster campaigns can be calculated. However, inference is complicated by the early dropout of persons. Other than in most demonstrations of spatial data mining algorithms where the structure of the data sample is usually disregarded, poster performance measures such as reach and gross impressions evolve continuously over time and require non-intermittent observations. In this paper, we investigate the applicability of survival analysis to compensate for missing measurement days. We formalize the task of modeling the visit potential of geographic locations based on trajectory data as our variable of interest results from dispersed events in space-time. We perform experiments on the cities of Zurich and Bern simulating different dropout mechanisms and dropout rates and show the adequacy of the applied method. Our modeling technique is at present part of a business solution for the Swiss outdoor advertising branch and serves as pricing basis for the majority of Swiss poster locations.

1 Introduction

Research in the area of outdoor advertising has undergone a number of developments in the past ten years, many of which have been triggered by technological progress. First, the rapid development and commercialization of GPS technology permits a new form of audience calculation. Second, the advancement in digital processing software for geographical data is necessary to evaluate the obtained data. The innovative usage of new technologies is important to sustain the competitiveness of outdoor advertising in the advertising landscape. For example, in 2007 the Swiss outdoor advertising branch made up about 11% of the total advertisement net sales in Switzerland, generating about 663 million Swiss Franc (about 440 million Euro) [WEM08]. The pricing of poster sites is a critical business task and must be justified by objective performance measures. The two predominant indicators for poster performance are gross impressions and reach. They specify the total number of contacts of a population with a given poster campaign and the percentage of population that passes at least one poster of the campaign within a given period of time, respectively.