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Modelling terrestrial route networks to understand inter-polity interactions.

Attempts to understand the nature of the interplay between settlements at different locations have been made largely in the last decades, both from the perspective of social sciences, which analyze contemporary contexts, and in the field of the human past studies. In particular, in archaeology, one of the most important open challenges is to understand whether and how settlements located in a certain territory did organize at regional level. Such a question can in principle be addressed quantitatively by means of formal models, but what kind of data are suitable to be used when dealing with this class of issues? Here, we propose to analyse terrestrial transportation infrastructures (TTI), which we consider might encode the footprint of processes and interactions at regional scale. Indeed, pathways connecting human communities with each other were the output of a collective effort for the benefit of one or more of the parties involved. Therefore, they were directly related with inter-settlement (villages, towns and cities) interactions. We developed a baseline methodology to contrast hypotheses about the organization of a system of settlements, starting from a regional road map. Such a methodology consists of three fundamental ingredients: (1) a procedure for extracting relevant quantitative data from road maps; (2) a set of competing hypotheses about organisational aspects of road construction; (3) formal models translating such hypotheses into mechanisms for generating synthetic data to be compared against the empirical ones. In order to develop such a methodology, we adopted network science as a general framework. We regard this as a natural choice, given that we chose to focus on road networks because of the information embedded in their connectivity and functionality. Network science provides us both an analytical toolbox for the characterization of such aspects of transportation infrastructures and a conceptual framework for model building. Currently, our research focuses on three classes of case-studies from proto-, ancient and contemporary history. Our goal is to devise a family of flexible network models suitable to be applied to heterogeneous contexts.