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Rouaa Wannous, Jamal Malki, Alain Bouju, Cécile Vincent

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Trajectory ontology inference considering domain and temporal dimensions Application to marine mammals

Rouaa Wannous[a], Jamal Malki[a], Alain Bouju[a], Cécile Vincent[b]

[a]*Laboratoire L3i, Pôle Sciences & Technologie, Avenue Michel Crépeau, 17042 La Rochelle, France*
[b]*Centre d'Etudes Biologiques de Chizé, CNRS UMR 7372, 79360 Villiers-en-Bois, France*

Abstract

Capture devices rise large scale trajectory data from moving objects. These devices use different technologies like global navigation satellite system (GNSS), wireless communication, radio-frequency identification (RFID), and other sensors. Huge trajectory data are available today. In this paper, we use an ontological data modeling approach to build a trajectory ontology from such large data. To accomplish reasoning over trajectories, the ontology must consider mobile object, domain and other knowledge. In our approach, we suggest expressing this knowledge in the form of rules. To annotate data with these rules, we need an inference mechanism over trajectory ontology. Experiments over our model using domain and temporal rules address an inference computation complexity. This complexity has two important factors: time computations and space storage. In order to reduce the inference complexity, we proposed optimizations, such as domain constraints and temporal neighbor refinements. In this paper, we define a refinement specifically for the application domain. Then, we evaluate our contribution over real trajectory data. Finally, the results show the positive impact of the last refinement on reducing the complexity of the inference mechanism. This refinement reduces half of the time computation and then allow considering larger data sets.

Keywords: Trajectory ontology modeling, Ontology inference, Domain rules, Temporal rules, Data filter algorithm.

1. Introduction

Advances in information and communication technologies have encouraged collecting spatial, temporal and spatio-temporal data of moving objects [1]. The

Email addresses: rwannous@univ-lr.fr (Rouaa Wannous), jmalki@univ-lr.fr (Jamal Malki), abouju@univ-lr.fr (Alain Bouju), cvincent@univ-lr.fr (Cécile Vincent)