

Abstract

Analysis of movement data has applications in the field of computer vision and Geographic Information Science. Movement data analysis results in motion patterns that express spatial, temporal or spatio-temporal regularity in data. Activity recognition and behaviour analysis are important outcomes of movement data analysis. Recognition of patterns becomes challenging for issues like presence of multiple objects, temporal constraints, noise in input, hierarchical representation etc.

Formal grammars have been applied for pattern recognition in various domains. It is possible to express hierarchy in a motion pattern using formal grammars. Grammars provide a general method for recognition. For reasons of efficiency, it is desirable that regular and context-free grammars are used for representation and recognition. However, deterministic grammars have inherent limitations when issues like concurrency and noise arise. We have proposed a method of combining formal grammars with qualitative spatial reasoning for representation and recognition of motion patterns. It is possible to use regular grammars for recognition of motion patterns when qualitative spatial reasoning is combined.

A qualitative description language has been designed for addressing certain issues in motion pattern recognition. The proposed language based framework can represent patterns among multiple objects. Moreover, motion patterns can be constructed hierarchically and concurrency among sub-patterns can be expressed using language constructs. The language based framework is general in the sense that it can be used in different application domains.

The proposed language based framework can be applied in the domains of computer vision and GIScience. In GIScience, motion patterns defined in standard taxonomies can be represented using the proposed qualitative language. In the field of computer vision, motion patterns can be learned from real as well as synthetic data. It is also possible to represent patterns by writing programs in the proposed language. Recognition of motion patterns over input data stream can be done using finite state automata.