Chapter 3

Scenarios in Event Bushes:
A Formal Proposal

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ABSTRACT

This chapter presents a further step of the formalization of the event bush method by means of graphs and graph homomorphisms. First, the authors revise an analysis of the structure of event bushes by means of bipartite structure graphs that are equipped with a multi-flow structure. They consider event bushes as a compact description of a set of alternative scenarios of directed changes of environments. They give a first formalization of the concept of scenario. A snapshot describes the state of an environment, which evolves in accordance with a given scenario at a certain moment in time. A sequence of snapshots describes how an environment may evolve over time. Cartoons are maximal sequences of snapshots. The authors discuss, define, and exemplify the concepts scenario, snapshot, and cartoon.

INTRODUCTION

Event bushes constitute a visual and semi-formal method to represent knowledge about real world phenomena. The event bush method has been developing over the years by applying it to a variety of areas besides the original motivating area of geoscience. For the original description of event bushes and examples, we refer the reader to (Pshenichny & Kanzheleva 2011, Wolter et al. 2018) and the literature referenced in these papers. Despite its many applications, the event bush method is still lacking a proper mathematical foundation, which also establishes a proper basis for designing and implementing computer-based tools. The development of such a proper mathematical foundation is the objective of our ongoing research. In (Wolter et al. 2018) we formalized the structure of event bushes by means of directed graphs and homomorphisms between directed graphs. The present paper addresses the dynamic aspects of the event bush method.

More precisely, we are going to discuss and to outline a formalization of the purpose of event bushes as proclaimed in (Pshenichny & Kanzheleva 2011):

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The event bush method addresses a particular yet very wide type of (geo) environment, that of directed alternative changes, which is likely to occur in many information domains.

By environment, we mean a part of the real world we are interested in to describe. This may be a volcano, a lake, a transport system in a town, a segment of market of pharmaceutical technologies, a computer game, or others. To answer the question “What is changing?” we have to introduce a concept of state of an environment and discuss in what way an event bush describes, at the same time, as well the possible states as the possible changes of the states of an environment. We have to identify the sources of alternatives of changes and we have to formulate the properties of an event bush ensuring directedness of changes.

The paper is organized as follows. In section “Structure of event bushes”, we give a revised description of the structure of event bushes by means of bipartite structure graphs that are equipped with a multiflow structure. We consider event bushes as a compact description of a set of alternative scenarios of directed changes of an environment. In section “Scenarios”, we discuss this viewpoint and outline a formalization of the concept of scenario. In section “Snapshots and cartoons” we discuss snapshots that describe the state of an environment, that evolves in accordance with a given scenario, at a certain moment in time. A sequence of snapshots describes how an environment evolves over time in accordance with a given

Figure 1. A sample event bush “Blocked transport”
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