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MASTER

Pattern definition and compliance checking with personal event logs

how can compliance checking help to improve personal behavioral patterns?

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How can compliance checking help to improve
personal behavioral patterns?

Master's Thesis
Business Information Systems

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Abstract

With the upcoming possibilities to measure and analyze a great many different things, the idea of pervasive computing is gaining ground as well. More and more devices monitor their usage, saving the usage in a log. The movement towards quantified self uses this data to gain insight in the behavior of an individual by providing useful information. The next step is to use this information and construct personal feedback that enables the user to better use the product or to improve his/her personal habits.

Providing valid and constructive feedback means that improvable patterns need to be discovered. This thesis will not focus on the discovery of patterns, i.e. the search for dependencies between events, but only on how to define patterns and how to detect predefined patterns in a log by performing compliance checking. This thesis presents a framework that enables the compliance checking of an event log with patterns in order to find the occurrences of these patterns and anti-patterns. These patterns can be defined by using predefined building blocks which enables a larger audience to define or change specific pattern definitions. The result of the compliance check are violations which, if found, can trigger feedback.

A declarative approach for defining patterns is chosen due to the flexibility that it allows for. Every person is different and has his/her own behavior, which would make an imperative approach very complex. Even though much behavior is correct, some specific patterns can be improved. The building blocks that help define patterns consist of scopes and constraints, as is common in the field of computer science. The pattern is represented by a constraint that enforces a certain property, for example the existence of an event. These constraints have to hold only at specific moments in time, which is enforced by defining a scope, for example between two events. This framework and some of its limitations are discussed, after which a few extensions are proposed that enable a much larger field of patterns to be defined. An algorithm that can perform the compliance checking of a set of rules with an event log is also presented and discussed.

The framework is implemented on a mobile device and tested on eighteen test sets for one specific product. These test sets contain state information on an interval basis, which is first transformed to an event log. This transformation makes it possible to include extra information by concluding on previously seen findings, while decreasing the size with on average 95%. The visualization of the data by the application turned out to already be a great help for field experts by quickly providing an accurate overview on the personal situation. For this scenario also fourteen global patterns are found to be relevant, i.e. patterns that should hold for nearly all users. Eleven of these patterns are possible to formalize with the presented framework and therefor able to be used for compliance checking. The results of the compliance check are compared to the analyses of field experts. The found patterns are similar, however the resulting feedback is not always similar since the expert uses extra knowledge and combines found patterns.