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Master Thesis

Visualisation of IoT Business Processes

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1 Abstract

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2 Summary

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3 Literature Review

IoT-driven Event Log Generation

The Internet of Things enables the digitization of the physical world through interconnected devices, thereby providing access to vast amounts of data that can be used to develop digital services in several application domains including Business Process Management (BPM). The data generated by sensing devices and smart objects allows for the continuous monitoring of the IoT devices and their surroundings, providing new opportunities for analysis and optimization of the processes performed in IoT environments, e.g., through process mining approaches [1].

Meroni et al. exploit in [2] the Internet of Things (IoT) Paradigm by equipping physical objects with sensing hardware and software, turning them into smart objects. As each smart object is referring to one of the physical artifacts involved, it will keep the owner of the artifact informed about the progression of its state and how the process is evolving.

Concept Drift

The phenomenon in which the statistical properties of a target domain change over time is considered concept drift [3]. Processes may change due to periodic/seasonal changes or due to changing conditions. Such changes impact processes and it is vital to detect and analyze them [4].

There are three challenges when dealing with concept drift [5]:

1. Change (Point) Detection: Detect that a process has changed. If so, identify the time periods at which changes have taken place.

2. Change Localization and Characterization: Once a point of change has been identified, the next step is to characterize the nature of change, and identify the region(s) of change (localization) in a process.

3. Unravel Process Evolution: Relate the previous discoveries to unravel the evolution of a process. This should lead to the discovery of the change process.

C. Zheng et al. suggest in [6] TPCDD (Tsinghua Process Concept Drift Detection) to extract relations from each trace and transform the event log into a relation matrix. Then, for each relation we observe its variation trend and detect candidate change points. Finally all candidate change points are clustered to get a final result.

Visualization of Compliance Violation

BPMN-Q queries can be used to express compliance rules regarding execution ordering of activities. For each query a set of anti pattern queries is automatically derived and checked against process models as well. When a violation occurs (an anti pattern finds a match), the violating part of the process is shown to the user [7].

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