Notes on the Synthesis of Context

A novel approach to model context in software engineering

A thesis submitted for the degree of
Doctor of Philosophy
of
The Australian National University

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Feb 2011
I declare that the work in this thesis is entirely my own and that to the best of my knowledge it does not contain any materials previously published or written by another person except where otherwise indicated.

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25 Feb 2011
Acknowledgements

I wish to thank my supervisor, Clive Boughton, for his continuous support and guidance throughout the long process of producing my thesis. He kept a genuine interest in the topic that I have chosen for my research, even when the work appeared to be esoteric at times. My thanks also goes to Elisa Baniassad, my supervisor and chair of panel, for her advice and constructive feedback on the presentation of my work. Although she had joined my panel in the last year of my candidature, she gave me valuable advice on methodology and style, which helped to improve the quality of my work.

Since the start of my candidature I had the privilege to engage with many people, in valuable discussions about my topic and other related areas of research. Shayne Flint, as a member of my supervisory panel, had helped me shape my thinking about software modelling and system thinking. His work and our discussions during my early years of candidature, have been a source knowledge and inspiration. Len Bass for his constructive feedback, who I met in early 2009, during my visit to the National Information and Communications Australia (NICTA) in Sydney. Stephen Mellor, who on few occasions, provided me with valuable comments on specific aspects of my work. Richard Gabriel who provided me with valuable feedback on my application of the work of Christopher Alexander to my research. Thanks also goes to all the anonymous reviewers who provided me with valuable feedback on parts of my thesis that I submitted for publication.

Thanks goes to my fellow grad students, Agung Fatwanto, Normi Abu Bakar, Zoe Brain, Alvin Teh, and Luke Nguyen-Hoan; who have shown true friendship and support. Hassan Almari for the interesting discussions on software engineering and almost everything else. Special thanks goes also to my office mate and friend Srinivas Chemboli. He has always been a strong believer in my work, and contributed to the development of my approach by providing new areas of application that I did not explore.

I wish to acknowledge my sponsor King Abdulaziz City for Science and Technology (KACST) for allowing me to pursue my interest in research. Special thanks to Prince Turki Al Saud, Vice President for Research Institutes, who supported my scholarship at the time when he was the Director of the Space Research Institute, and for his continuous support since. Mohammed Almajed, Director of the National Satellite Technology Program, for his friendship and support. Thanks also goes to the Saudi Arabian Embassy and Cultural Mission, for providing logistical support for my scholarship. Ambassador Hassan Nazer and Cultural Attache Ali Albishri, have always shown support both personally and
through their team. Fahad Alotaibi and Abdulaziz Bin Taleb, from the Cultural Mission, both have been good friends, and have administered my scholarship with the help of their team, to provide me with academic advice throughout the process of completing my thesis.

Finally, I like to thank my family. My parents who inspired me, and provided invaluable advice when I needed. My son Abdualziz, too young to fully understand why his daddy spends most of his time busy with work, spending long hours at the office. I’m sure the day will come when he will realise that all I have done was because I love him. Sharing all of this with me was my wife, Wala'a. She has been always there for me when I needed her, she ensured that I have the time and freedom to complete my dissertation, doing whatever she could to help me meet my deadlines. Without her I would not have been able to make it. My love to you all.
Abstract

Context is often considered as a source for system change and variation. But the term ‘context’ has been typically used to mean the act of setting boundaries and setting system scope in software engineering. In this thesis, I challenge this view by suggesting that context should be applied to imply system variation on all levels of software (system) development. It constitutes as a more complex phenomena of how the system interacts with the world. The suggested alternative approach synthesises context in terms of influence and perception through context states.

Context states are represented by a sixteen context state matrix, I refer to as The Context Dynamics Matrix (CDM). Context states are the result of two dimensions of context, perception on the x-axis, and influence on the y-axis. Analysts may identify context of a system using the CDM when they identify the influence that an element exerts and assign their perception of how they identified the influence. Each of the influence and perception dimensions is modelled using one model. First, the force model of influence, which identifies four levels of influence that an element may apply, each level showing a different implication on variation. Second, the knowledge model for perception, which shows five sources of knowledge about the influence. Accordingly, an analyst may describe the context of a system by matching the level of influence with the level of perception to obtain the context state of a given system element. A context state may imply a high or low level of variability, and a high or low level of perception. The use of context states is independent from any modelling view of a system that either describes functionality or system structure.

Because context states describe the context of a system independently from the level or view in which they are described, it is possible to map the context states to enrich the description of a given view. Accordingly, I show how to map a context state to a functional description of a system by assigning a context state to Data Flow Diagram (DFD) element. Each process and data flow is assigned a context state that enriches its description of the system, in terms of levels of variation that the system’s context may imply.

A proof-of-concept is provided to demonstrate how to apply context states to the analysis of the requirements of a system from industry. The results of the study show the viability of using context states to describe the context of systems, and support the argument to experiment further to evaluate the effectiveness of context states in areas of system development not covered by my research.
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