Notice of the Final Oral Examination
for the Degree of Master of Science

of

JEREMY HO

BSc (University of Victoria, 2012)

“BXE2E: A Bidirectional Transformation Approach for Medical Record Exchange”

Department of Computer Science

Wednesday, April 12, 2017
12:00 P.M.
David Turpin Building
Room A137

Supervisory Committee:
Dr. Jens Webber, Department of Computer Science, University of Victoria (Co-Supervisor)
Dr. Morgen Price, Department of Computer Science, UVic (Co-Supervisor)

External Examiner:
Dr. Anthony Cleve, Department of Computer Science, University of Namur

Chair of Oral Examination:
Dr. Jillian Roberts, Department of Education Psychology & Leadership Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Modern health care systems are information dense and increasingly relying on computer-based information systems. Regrettably, many of these information systems behave only as an information repository, and the interoperability between different systems remains a challenge even with decades of investment in health information exchange standards. Medical records are complex data models and developing medical data import / export functions is difficult, prone to error and hard to maintain process. Bidirectional transformations (bx) theories have been developed within the last decade in the fields of software engineering, programming languages and databases as a mechanism for relating different data models and keeping them consistent with each other. Current bx theories and tools have been applied to hand-picked, small-size problems outside of the health care sector. However, we believe that medical record exchange is a promising industrial application case for applying bx theories and may resolve some of the interoperability challenges in this domain. We introduce BXE2E, a proof-of-concept framework which frames the medical record interoperability challenge as a bx problem and provides a real world application of bx theories. During our experiments, BXE2E was able to reliably import / export medical records correctly and with reasonable performance. By applying bx theories to the medical document exchange problem, we are able to demonstrate a method of reducing the difficulty of creating and maintaining such a system as well as reducing the number of errors that may result. The fundamental BXE2E design allows it to be easily integrated to other data systems that could benefit from bx theories.