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Towards integration of use case modelling and usage-based testing

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Abstract

This paper focuses on usage modelling as a basis for both requirements engineering (RE) and testing, and investigates the possibility of integrating the two disciplines of use case modelling (UCM) and statistical usage testing (SUT). The paper investigates the conceptual framework for each discipline, and discusses how they can be integrated to form a seamless transition from requirements models to test models for reliability certification. Two approaches for such an integration are identified: integration by model transformation and integration by model extension. The integration approaches are illustrated through an example, and advantages as well as disadvantages of each approach are discussed. Based on the fact that the two disciplines have models with common information and similar structure, it is argued that an integration may result in coordination benefits and reduced costs. Several areas of further research are identified. © 2009 Elsevier Science Inc. All rights reserved.

1. Introduction

Over the last decades, much effort has been devoted to software implementation issues. However, as complexity grows, software development needs more than just programming. Design paradigms, such as object orientation, have entered the scene claiming to provide robust architectures and reusable components. Recently, the focus of the software research and practice has also approached issues related to requirements specification and reliability certification.

This paper presents recent research related to both these areas. The basic idea behind the presented work is to combine and integrate two different approaches that focus on the modelling of usage:

- Use case modelling (UCM) (Jacobson et al., 1992) and
 - Statistical usage testing (SUT) (Mills et al., 1987).
- Both UCM and SUT address phenomena related to the modelling of anticipated system usage, although with different background and terminology. UCM focuses on requirements analysis and usage modelling as a tool for describing and understanding requirements, while SUT focuses on usage modelling to enable test case generation for reliability estimation and certification.

In a survey of industrial software projects (Wekkenhaupt et al., 1998), it is concluded that there is an industrial need to base system tests on use cases and scenarios. The studied projects, however, rarely satisfied this demand, as most projects lacked a systematic approach for defining test cases based on use cases.

UCM was introduced in the object-oriented paradigm (Jacobson et al., 1992) to complement traditional static object models with dynamic aspects. The work on UCM has in an object-oriented context primarily been focused on the transition from use case based requirements to high-level design, and how use cases can be used to find good object structures (Jacobson, 1995; Balz and Caselman, 1996).

SUT, on the other hand, has focused on how to create a usage model that allows for generation of test suites which resemble operational conditions, by capturing the dynamic behaviour of the anticipated users. SUT research has concentrated on how such a model can be made scalable (Runeson and Wohlin, 1992; Wohlin and Runeson, 1994), but the main focus has been on the usage model itself from a testing perspective and not on the process of creating it from a requirements perspective. Hence, we see the need to study the common denominator of UCM and SUT in the perspective of requirements engineering (RE), in search for an integrated framework for usage modelling.

There is an intimate relation between requirements specification and system validation; the major goal of

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OFFICE OF STUDENT INVOLVEMENT RISK MANAGEMENT COMPLIANCE FORM FALL 2014

Dear Student Organization President:

Attached you will find the Kutztown University Risk Management Policy and Compliance Form. All Greek-lettered student clubs/organizations are required to file compliance forms with Kutztown University.

This Policy is to be read by all active and new members. Upon reading the policy, each active and new member is to sign the appropriate compliance form. When completed, the compliance forms are to be returned to the Assistant Director **within three (3) days after the commencement of the new member orientation period in the Office of Student Involvement, 143 Malvern Student Union. All year groups to not taking a new member class/line this semester, the forms need to be turned in within 2 weeks of school beginning.**

The Policy is to be returned by the organization New Member Educator and posted (if possible) in a prominent place throughout the entire new member orientation period. Additional copies of the Policy and Compliance Forms are available in the Office of Student Union & Involvement Services, 143 Malvern Student Union, or can be obtained via the United Greek Council Group (UKUGC).

Thank you for your cooperation.

FRATERNAL INFORMATION AND PROGRAMMING GROUP GUIDELINES AND PROVISIONS

The Risk Management Policy of FIPG, Inc. includes the provisions, which follow and shall apply to all fraternity chapters and all levels of fraternity membership. At Kutztown University, all 5 member organizations of College Paracholanic Council, all six member organizations of Interfraternity Council, and three of five Multicultural Greek Council Groups are members of FIPG, meaning that all members will subscribe and follow the guidelines put forth by FIPG.

ALCOHOL AND DRUGS

1. The possession, sale, use or consumption of ALCOHOLIC BEVERAGES, while on chapter premises or during a fraternity event, in any situation sponsored or endorsed by the chapter, or at any event in which an observer would associate with the fraternity, shall be in compliance with any and all applicable laws of the state, province, county, city and institution of higher education, and shall comply with either the BYCOP or Third Party Vendor Guidelines.
2. No alcoholic beverages may be purchased through or with chapter funds nor may the purchase of same for members or guests be undertaken or coordinated by any member in the name of or on behalf of the chapter. The purchase or use of a bulk quantity or common source(s) of alcoholic beverages, for example, large kegs, or cases, is prohibited.
3. OPEN PARTIES, meaning those with unrestricted access by non-members of the fraternity, without specific invitation, where alcohol is present, are forbidden.
4. No members, collectively or individually, shall purchase for, serve to, or sell alcoholic beverages to any person 18 or younger (under legal drinking age).
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1. National fire protection association The authority on fire, electrical and building safety. STANDARDS OF MANEESH KUMAR REDDY PS NO 20092039 HCI-METROS 2. * * * * * Founded in 1896 c * * * * * NFPA is a global, nonprofit organization devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards. c * * * * * The association delivers information more than 300 consensus codes and standards, research, training, education, outreach and advocacy; and by partnering with others who share an interest in furthering the NFPA mission. c * * * * * NFPA 1, Fire Code c * * * * * NFPA 54, National Fuel Gas Code c * * * * * NFPA 70, National Electric Code. c * * * * * NFPA 85: Boiler and Combustion Systems Hazards Code c * * * * * NFPA 101, Life Safety Code etc c * * * * * There are various codes in NFPA. Some of them are 3. Standard for Fixed Guideway Transit and Passenger Rail Systems NFPA c * * * * * 130 4. This edition of NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems, was prepared by the Technical Committee on Fixed Guideway Transit and Passenger Rail Systems The Fixed Guideway Transit Systems Technical Committee was formed in 1975 and immediately began work on the development of NFPA 130. One of the primary concerns of the committee in the preparation of this document centered on the potential for entrapment and injury of large numbers of people who routinely utilize these mass transportation facilities. 5. * * * * * This standard shall cover life safety from fire and fire protection requirements for underground, surface, and elevated fixed guideway transit and passenger rail systems, including but not limited to stations, train ways, emergency ventilation systems, vehicles, emergency procedures, communications, control systems, and vehicle storage areas. * * * * * The purpose of this standard shall be to establish minimum requirements that will provide a reasonable degree of safety from fire and its related hazards in Guideway transit and passenger rail system environments. S c o p e 6. N O T I N S c o p e Equipment requirements for following are not covered: c * * * * * Conventional freight systems c * * * * * Buses and trolley coaches c * * * * * Circus trains c * * * * * Tourist, scenic, historic, or excursion operations c * * * * * Shelter stops. APPLICATIONS This standard shall apply to new fixed guide way transit and passenger rail systems and to extensions of existing systems. 7. This code covers various chapters like c * * * * * Stations c * * * * * Train ways c * * * * * Emergency ventilation systems c * * * * * Vehicles c * * * * * Communication systems 8. IMPORTANT TERMINOLOGIES 1) Concourse: Intermediate Level Or Area Connecting A Station Platform To A Public Way Via Stairs , Escalators, Or Corridors. 2) Critical Velocity: The Minimum Steady-state Velocity Of The Ventilation Airflow Moving Towards The Fire Within A Tunnel Or Passageway That Is Required To Prevent Black Layering At The Fire Site. 3) Fire Load : c * * * * * Effective Fire Load : The Portion Of The Total Fire Load Under A Given Specific Fire Scenario Of A Certain Specific Fuel Pack Age That Would Be Expected To Be Released In A Design Fire Incident. c * * * * * Total Fire Load : The Total Heat Energy Of All Combustibles Available From The Constituent Materials Of A Certain Fuel Package. 9. 4) GUIDEWAY : That portion of transit or passenger rail line included within right of way fences, outside lines of curbs or shoulders, underground tunnels and stations, cut or fill slopes, ditches, channels, and waterways, and including all pertaining structures. 5) HEADWAY : The interval of time between the arrivals of consecutive trains at a platform in station. 6) OCCUPANCY : c * * * * * Incidental occupancies in stations : the use of the station by others who are neither transit system employees nor passengers. c * * * * * Non system occupancies in stations : an occupancy not under the control of the system operating authority. 10. 7) PASSAGER LOAD : c * * * * * Detraining load c * * * * * Ligament load load 8) Security point: a security point is one of the following a e e a closed fire that leads to a bullied or safe place outside the E o, train path, or venue, a point of no greater than the vehicle, enclosing or trainway, any other place approved. 9) Staff: A place designed for the proposal of loading and unloading tickets, including customer service and associated auxiliary spaces the same structure 11. Access Code for buildings and structures 101b, first published in 1999, was designed to address a subset of the themes of themselves covered by NFPA 101a @ , Life Safety Code @ , ie means of progress. N F P A 101 B 12. Transport Systems . . . 1. Fixed Guide Way Transit Systems-A Electrified Transport System Using a Fixed Guide form, operating on the right track for passenger mass movement within a metropolitan area, and consisting of its Fixed Fixed Fixed Guide Way Transit System Fixed Guide forms - A Fixed Guide Path System that is fully automated, no driver vehicles along an exclusive Right of the Way 3. Rail System - A System Passenger Transport that uses a path of rail guide, operating the right of the path to the passenger movement within a metropolitan area consisting of their rail guides. 13 . . Egress facilities. 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