Summary of the 5th International Workshop on Requirements Engineering and Testing (RET 2018)

[Co-located with ICSE 2018]

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ABSTRACT
The RET (Requirements Engineering and Testing) workshop series provides a meeting point for researchers and practitioners from the two separate fields of Requirements Engineering (RE) and Testing. The goal is to improve the connection and alignment of these two areas through an exchange of ideas, challenges, practices, experiences and results. The long term aim is to build a community and a body of knowledge within the intersection of RE and Testing, i.e. RET. The 5th workshop was held in colocation with ICSE 2018 in Gothenburg, Sweden. The workshop continued in the same interactive vein as the predecessors. We introduced a new format for the presentations in which the paper authors had the opportunity to interact extensively with the audience. Each author was supported by a member of the organization committee to prepare either an extensive demo, collect more data in form of a questionnaire or perform a hands-on tutorial. We named this new format "X-ray session". In order to create an RET knowledge base, this cross-cutting area elicits contributions from both RE and Testing, and from both researchers and practitioners. A range of papers were presented from short positions papers to full research papers that cover connections between the two fields. The workshop attracted 27 participants and the positive feedback on the new format encourages us to organize the workshop the next year again.

Categories and Subject Descriptors
D.2.1 [**Requirements / Specifications**]; D.2.4 [**Software / Program Verification**]; D.2.5 [**Testing and Debugging**]

General Terms
Management, Documentation, Human Factors, Verification

Keywords
requirements engineering, testing, coordination, alignment

1. INTRODUCTION
The main objective of the RET workshop series is to explore, characterize and understand the interaction of Requirements Engineering (RE) and Testing, both in research and industry, and the challenges that result from this interaction. The workshop provides a forum for exchanging experiences, ideas and best practices to coordinate RE and testing. A primary goal of this exchange is to enable and provide incentives for research that crosses research areas and is relevant for industry. Towards this end, RET invites submissions exploring how to coordinate RE and Testing, including practices, artifacts, methods, techniques and tools. Submissions on softer aspects like the communication between roles in engineering processes are also welcome.

RET 2018 accepted technical papers with a maximum length of 8 pages presenting research results or industrial practices and experiences related to the coordination of RET, as well as position and tool papers with a maximum length of 4 pages introducing challenges, visions, positions or preliminary results within the scope of the workshop. Experience reports and papers on open challenges in industry were especially welcome.

RET 2018 accepted three technical papers, one position paper, and three tool papers. The workshop attracted 27 registrations and was visited by more than 20 active participants. The proceedings[1] and an image gallery[2] from the workshop are available online.

2. ORGANIZATION
The 5th International Workshop on Requirements Engineering and Testing (RET 2018) was held on June 2, 2018, and was colocated with the 40th International Conference on Software Engineering (ICSE 2018). The workshop was organized by Michael Unterkalmsteiner (Blekinge Institute of Technology) as general chair, Tingting Yu (University of Kentucky) and Gregory Gay (University of South Carolina) as program co-chairs, as well as, Elizabeth Bjarnason (Lund University), Markus Borg (RISE SICS AB) and Michael Felderer (University of Innsbruck) as co-chairs.

3. FORMAT
For the fifth edition of the workshop, we decided to increase the value for the participants by implementing a new presentation format. We called it X-ray sessions. The goal was to facilitate the conversation between workshop audience and presenters. At the end, we hoped that all participants would leave the workshop with the feeling (best case, even with evidence) that they had learned something new.

Each paper presentation had an allotted time between 30 (short paper) and 45 minutes (full paper). Presenters were coached by

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[1] http://conferences.computer.org/icse-w/2018/index.html#!/toc/12

[2] http://ret.cs.lth.se/18

a mentor (a member of the RET 2018 organization committee). The content of each session consisted of:

1. 10-15 minutes paper presentation (as in regular conferences)

2. 15-25 minutes X-ray, consisting of one or more of the following activities (this is not an exhaustive list):

   - provide a demo of the presented tool / approach
   - explain and demonstrate pitfalls in the presented analysis / technique
   - include the audience to do a quick tutorial / exercise
   - use polling to get input from the audience (use e.g. directpoll.com)
   - gather data from the audience as data points for future studies
   - pilot ideas with the audience / use their expertise
   - demonstrate / discuss what has happened since the study presented in the paper had been written up. New developments? Unforeseen obstacles? New ideas?
   - elaborate how the study presented in the paper contribute to RET

3. 5 minutes discussion/questions

The preparation of the X-ray session required additional effort from both the authors and the organizers, which was however well invested, as illustrated next.

3.1 Feedback from the participants

To gauge the effectiveness of the X-ray session format to induce interaction among workshop participants and attendants, and to solicit improvement suggestions, we conducted a survey during the last session of the workshop. We collected 13 responses via an online survey form. The raw data is also available online[3].

Demographics. The majority of workshop participants were employed by a university (62%), followed by an equal share privately employed (15%) and employed by a combination of private and governmental institutions (15%). Finally, some participants were solely employed by a governmental institution (8%). Roughly half of the participants attended the workshop for the first time (46%), followed by 2nd time visitors (23%) and some of the organizers who attended all workshop instances (15%). Almost half of the attendants (46%) researches / works on the interplay of requirements engineering and testing, followed by a large share (31%) focusing on testing with requirements engineering at the periphery and a minority (15%) that focuses solely on requirements engineering.

RET challenges. We asked the participants to describe a particular RET challenge they are interested in. Looking at the responses, we identified several common themes. More and more software products contain elements and features that build upon machine learning technology. As software engineers we need also to verify and validate the models that drive those features (even continuously if feedback mechanisms are used). Much research has gone into code verification (unit, integration, system testing),

but there is a lack of research on verifying and validating machine learning models against requirements. Connected to this theme is the question when a product is sufficiently tested. Even if full requirements coverage could be achieved, the stated requirements might be inadequate or simply wrong. Finally, there is an open question on how to assess testing quality (both from an artefact and process perspective). While there is some research done in this area, more empirical work grounded in industry is needed.

X-ray session format. We asked the participants to compare the new format with traditional conference or workshop sessions. Almost all participants agreed that X-ray sessions are more instructive for the audience. Some motivations reported by the respondents include:

- extended examples and demos helped explain concepts
- keeps the workshop vivid and is source to provide good feedback to authors
- the studies and contributions became more tangible
- gives more insight and opportunity for discussion
- in this type of session it is feasible to know/analyze the opinion of the attendants
- technology transfer between academia and industry

However, it was also noted that more care should be put on designing the surveys / interactive parts of the session to provide a clear takeaway for the audience. Regarding audience engagement, the respondents reported:

- that they felt more involved than in standard workshops
- that the quality of the session depends heavily on the presenter and material
- that the session are less formal and more comfortable for discussion
- that the structure of the session forces the authors/mentors to plan for engagement. The average presentation thus was better than what is normal.
- that the format induced questions and interactions

However, it was also noted that group exercises would probably have been more productive/informative.

Improvement suggestions. Even though each X-ray session was allocated more time (30-45 minutes) than traditional workshop presentations, a common feedback was to allow for even more time, as the prepared activities were perceived as useful and informative. A good suggestion was also to allocate time, not according to the length of the paper but based on the session proposal developed by the author and the mentor. A common wish was also to give quick feedback and a preliminary analysis of surveys that were conducted during the sessions in the closing session. Further suggestions were:

- provide more hands-on exercises

[3]https://drive.google.com/open?id=
1IsbdgIByUxGux8aeUSs4BVZr2_G6YVzo

- motivate attendants to write questions on cards and use them to moderate the discussion

- group discussions rather than surveys

- add some interactivity to all paper presentations. Something, however small, to go beyond tool demos

- including a live demo in each presentation

The organization committee will use this input to refine the next iteration of the X-ray session format.

4. PROGRAM SUMMARY

The program of RET 2018 comprised of three thematic blocks. There were no traditional sessions with chairs as each paper had an assigned mentor from the organization committee that introduced the paper and supported the author during the X-ray session. Four of the seven sessions produced material (survey results, feedback summaries) that was prepared by the presenters after the workshop and is available online[4].

4.1 Testing efficiency

Borg mentored the session prepared by Tahvili on test execution scheduling. The position paper proposes to leverage on natural language processing techniques to identify semantic dependencies between manual test cases, expressed as similar preconditions, initial state or postconditions. The approach has been applied as a proof-of-concept to a set of test cases from the railway domain. As the session was presented remotely due to travel complications, the amount of interaction was limited to questions relating to the tool demo.

Unterkalmsteiner mentored the session prepared by Freudenstein and Juncker on the Specmate tool which uses cause-effect graphs to model requirements and automatically derive test cases that meet configurable coverage criteria. The presentation introduced the modelling approach, discussed the preliminary validation at an insurance company and demoed the tool. The X-ray session was dedicated at collecting feedback from the audience that would improve the tool. Suggestions were geared towards (a) enabling (semi-) automated generation of cause-effect diagrams from requirements, (b) considering also different forms of requirements, such as use cases and user stories as input, and (c) to allow for feeding back faults discovered in testing that stem from faulty requirements.

Unterkalmsteiner mentored the session prepared by Adlemo on the perceived importance of test case quality criteria. Adlemo used the input from Swedish software experts to rank quality criteria identified in literature. The top three criteria were repeatable, accurate and correct test cases, while the bottom three were independent, requirements covering and compact test cases. During the X-ray session, the ranking exercise was repeated with the workshop participants, which to a large degree matched the results from the paper.

4.2 Blurring the lines between requirements engineering and testing

Gay mentored the session prepared by Flemström on the interactive development of passive tests. The authors of the study conducted a case study at an automotive company in order to evaluate to what extent passive tests, and in particular guarded

assertions, can be used in an industrial setting. Furthermore, questions regarding the modelling approach (T-EARS) and interactive tool support were investigated. During the X-ray session, the guarded assertion approach was exemplified and the tool to interactively develop the assertions was demonstrated.

Yu mentored the session prepared by Granda Juca on functional requirements prioritization with early mutation testing. The basic idea of the approach is to determine the criticality of a requirement by evaluating its proneness to exhibit faults (mutants) that are not detected by testing the requirements model and the number of dependencies to other requirements. Granda Junca demonstrated the prototype tool in a video and conducted an online survey with the purpose of gathering first impressions regarding usability and usefulness of the tool.

4.3 Requirements quality impact on testing

Felderer mentored the session prepared by Beer on measuring and improving the testability of requirements using the goal-question-metric approach. Beer presented the case study in which the approach was developed and evaluated. The X-ray session consisted of a data collection exercise in which the participants proposed goals, questions and metrics targeted at requirements testability. In total, nine new goals with corresponding questions and metrics were identified during the workshop.

Unterkalmsteiner mentored the session prepared by Osman on automatically detecting ambiguous requirements specifications. Osman trained 9 models on a set of 180 requirements written in the Malay language, each labelled by the authors as ambiguous or not. The models identify certain terms as predictors for ambiguous requirements. The prototype, using a random tree classification model, was demonstrated during the session and feedback on potential improvements (analyze the verifiability of requirements, open the tool to other languages) were collected.

5. FUTURE

The fifth edition of the RET workshop was well-received and attracted a mix of participants from academia, research institutes, and industry. The new format with per paper mentors and X-ray sessions induced interactivity and a clear take-away value for both audience and presenters. Since the topic remains relevant, we plan to organize the workshop next year again. Our target for RET 2019 is to be co-located with the 41th International Software Engineering Engineering Conference (ICSE'19) in Montreal, Canada. If the workshop is accepted, the expected date for paper submissions is in February 2019.

6. ACKNOWLEDGMENTS

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[4]`http://ret.cs.lth.se/18/program/`

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