Student Worksheet: Analyzing a Journal Article

Your name: Alexandra Almasan, Alexandru Stoica, Robert Corman, Andreea Gorgos
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Journal Article Title: A classification and comparison of model checking software architecture techniques by Pengcheng Zhang, Henry Muccini, Bixin Lia

Step 1. What is the purpose/hypothesis/aim/objective of the study?	
a. Write down the exact statement in which the authors describe what they were testing. (Hint: This information may be provided in the article as a purpose statement or as a hypothesis). Include quotation marks around the exact wording, and indicate page number(s).	"The goal of this paper is to investigate the state-of-the-art in model checking software architectures. For this purpose, we first define the main activities in a model checking software architecture process. Then, we define a classification and comparison framework and compare model checking software architecture techniques according to it." (page 1)
b. Now describe the purpose of the study (as you understand it) in your own words.	The purpose of the study is to enumerate, compare and classify model checking techniques (used to verify if the specification satisfies the desired architecture properties) applied to software architecture, based on a set of entities and attributes identified in the paper.
c. What was the "gap" in the research that the authors were trying to fill by doing their study?	The primary contributions of their paper are the formalization of a model checking software architecture problem, the identification of a set of classification entities and attributes, a survey of model checking techniques applied to software architecture, and a detailed comparison between those techniques.
Step 2. What is/are the major finding(s) of the study?	
a. Make some notes about the authors' major conclusions or findings as written in the article. Include quotation marks whenever you use their exact wording, and indicate page number(s).	The authors tried to identify the direction of development for model checking techniques on software architectures, using their classification and comparison framework. Their analysis concluded that the model checking SA techniques have evolved from purely theoretical studies to practical approaches with mature tool support and readable output. Recently introduced techniques make use of model-based notations and do not rely on architecture description languages (ADLs). Modern model checking procedures can verify complex and domain-specific software architectures.
b. Now write those conclusions (as you understand them) in your own words.	The authors believe that the focus in the industry is shifting from coding to modelling and that new model checking SA techniques should support automatic verification of SA specification against both system requirements and implementation. New model checking approaches should be able to check dynamic and service-oriented software architectures because most of our systems are dynamically evolving (components are removed or plugged in based on our system's requirements).

Step 3. How did the authors test their hypothesis?	
a. Briefly summarize the main steps or measurements that the authors used in their methods. Try to explain in your own words as much as possible.	The study tries to classify 17 model checking approaches for software architectures, using a comparison and classification framework (based on survey analysis) which focuses on two primary goals: - understanding the primary artifacts and activities used when model checking software architectures by measuring the attributes of macro-entities such as the input data (SA specification and properties), the model checking engine, and the input translation mechanism that connects the two components - understanding the associated qualities associated with each technique by measuring the usability, reliability, scalability and expressiveness of each engine output
b. Do the authors suggest any problems or limitations with their methodology? Do you see any problems or limitations with their methodology?	The authors did a poor job explaining why they selected the four qualities: usability, reliability, scalability, and expressiveness; out of all the other available quality factors such as maintainability, reusability, efficiency and others. All quality factors are evaluated using predefined attributes as metrics. The attributes originate from several unknown sources, such as previous unnamed papers, domain knowledge, and conformance to the survey goals.
c. How did the authors analyse their data? What test/s did they use?	The authors used survey analysis techniques, such as longitudinal surveys and closed-ended questions.
Step 4. How reliable are the results?	
a. Do the authors suggest any problems with the study that could lead to unreliable results?	No
Step 5. Based on your analysis, are the claims made in this journal article accurate?	
a. Do the conclusions made (about the results) by the author make sense to you? Are the conclusions too broad or too narrow based on what was actually done in the study?	The conclusions made by the authors make sense considering the presented comparations and classification framework of model checking techniques for software architectures. The study's evidence does not support the author's conclusion that our industry is shifting from coding to modelling, and that soon, model checking SA techniques would integrate with other software development activities.
b. Based on the accuracy of the methodology and the reliability of the results as described in Steps 3 and 4, do you think the conclusions can be believed?	Yes

Step 6. What is the importance of this scientific work?	
a. Write (in your own words) the significant contributions of the experimental work in this journal article as reported by the authors.	**The article offers two primary contributions: a classification and comparison framework for model checking SA techniques which allows us to evaluate future findings and an excellent presentation of 17 model checking approaches for software architectures from which we can identify the advantages and disadvantages of using them in the industry.** **The contributions are significant because it allows us to evaluate all the model checking techniques used for software architecture in the past two decades, and select the appropriate features for the future development of such techniques.**
b. Re-read your notes and explain why you think this is: • **a strong or weak scientific article** • **a strong or weak scientific study**	**Although some details, which we believe are essential, are omitted in the paper, such as:** **— justification for their selection of their set of evaluation attributes for each factor in their evaluation survey** **— justification for some of the answers provided as attributes in the second goal of their framework's parameters** **the study presents a robust classification system of all the proposed model checking techniques used on software architectures in the past two decades. Their work offers sharp clarity on the development direction of those techniques; and emphasises the primary features that should be taken into consideration when developing innovative model checking SA techniques.**