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A Critical Assessment of Biomimetic Building Envelopes: Moving from Nature to Architecture

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Abstract

The building envelope is critical in regulating energy exchanges between the internal and external environments. Several studies on technological solutions for responsive and intelligent envelopes have been conducted in recent years. The goal of this paper is to look into climate-adaptive building envelopes and related biomimetic solutions, as well as provide a critical review of the current state of the art. Various adaptive envelope examples are analysed and compared to biomimetic envelope examples. This paper demonstrates the potential of nature's vast database to provide solutions that can be implemented in architecture to achieve sustainable, energy-efficient, and adaptable design solutions. Following an initial critical examination of nature's adaptation strategies, a methodological approach has been developed. Beginning with the definition of the context and the relative abiotic factors, the bio-AM identifies the critical phases for transferring plant functions to building technologies, employing adaptive materials capable of self-activation in response to environmental factors, potentially emulating plant adaptation in technological solutions for the future of sustainable buildings.

Keywords: Building; Architecture; Bio-adaptive model

Introduction

Our daily lives are becoming increasingly reliant on various software applications and autonomous systems, ranging from transportation1 to healthcare2. However, in recent years, many people have been severely impacted by software bugs (for example, hundreds of people died in a plane crash caused by a software glitch3), as well as security vulnerabilities in software services (such as the ransomware attack on energy sector4). Furthermore, regulatory inspections of software internal functions by government authorities are increasing due to various concerns such as hidden unethical business practises, data privacy, and human values (racial bias). These are some of the outside challenges that a software project may face. To keep up with rapidly evolving technologies and requirements, the software industry may require additional time and manpower (cost) for regular development activities, late-life-cycle change, and continuous integration glitches5. [1, 2].

Design evaluation

Many studies have focused on software architectural change detection and classification (ACDC) in order to develop automated tools for the aforementioned applications. Various properties are extracted from the textual description and source code of the change tasks during detection and classification (such as commits). Researchers are investigating those properties using machine learning, natural language processing, and non-traditional techniques to create supportive tools.

To study architectural change, ground truth architecture at a given point in time (or a version) is extracted, and architectural element modifications are detected. Several studies propose change metrics for detecting architectural change instances to that end [3].

Our evidence analysis reveals a lack of lightweight techniques capable of processing hundreds of thousands of change revisions of a code base contained in a single release without human intervention or longer delays. We also anticipate that no single approach will be the best fit for detecting change instances because the deployment of an approach for a specific scenario is dependent on the types of architecture (and its views) and abstraction levels that the development team focuses on. ARCADE is the most promising architectural change analysis tool that employs several popular change detection metrics [4,5].

MoJo, MoJoFM, and A2A are all examples of MoJo. We also recognise that in order to effectively deploy detection techniques in the design review process, efficient techniques for capturing the design decision associativity8 of the changed elements are required. However, one of the major issues in architectural change classification that remains unresolved is when a committed change task contains tangled changes (when multiple unrelated issues, such as new feature addition and bug fixing, are implemented in a single commit). Wang and colleagues (2019b). [6, 7].

Conclusion

We present our investigation of existing architectural (both prescriptive and descriptive) change detection and classification techniques in this paper. Throughout the investigation, we compare the claims made by the authors of those studies based on a variety of factors that must be considered when working with architecture-centric software development. We discovered that the majority of existing techniques require either manual intervention or input generation tools that are often inefficient to process. [8, 9, 10].

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Declaration of interest statement

The authors declare no conflict of interest.

References

1. Deisseroth K, Mark JS (2013) Engineering approaches to illuminating brain structure and dynamics. Neuron 80: 568-577.
2. Liu J, Wu L, Ting C (2020) Investigation on the Polymer Drawing Model of the Centrifugal Spinning. Recent Pat Nanotechnol 14: 21-26.
3. Salma M, Michael SD (2019) Chondroinductive Peptides: Drawing Inspirations from Cell-Matrix Interactions. Tissue Eng Part B Rev 25: 249-257.
4. Edward JH, Fredrik H, Peter CL, Guy H, Steven S, et al. (2018) Chasing the 6-sigma: Drawing lessons from the cockpit culture. J Thorac Cardiovasc Surg 155: 690-696.
5. Cuong CV, Jooyong K (2021) Waterproof, thin, high-performance pressure sensors-hand drawing for underwater wearable applications. Sci Technol Adv Mater 22: 718-728.
6. Masoud M (2019) Exploring and Exploiting Tissue Engineering Through the Design of Multifunctional Therapeutic Systems. Curr Stem Cell Res Ther 14: 80-82.
7. Sunderland ME (2019) Using Student Engagement to Relocate Ethics to the Core of the Engineering Curriculum. Sci Eng Ethics 25: 1771-1788.
8. Jeffrey DW, Brady RTR, Myra AF (2018) Task preparation as a mnemonic: The benefits of drawing (and not drawing). Psychon Bull Rev 25: 2365-2372.
9. Justin S, Paolo G, Colleen M (2014) The responsibilities of engineers. Sci Eng Ethics 20: 519-538.
10. Kathrin MC, Blandford A, Sheikh A (2017) Drawing on human factors engineering to evaluate the effectiveness of health information technology. J R Soc Med 110: 309-315.