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Peer Review

Review of: "Advancing Autonomous Vehicle Safety: A Combined Fault Tree Analysis and Bayesian Network Approach"

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This paper proposes a fault analysis technique that integrates FTA and BN, which allows for dynamic updates in failure probabilities, enhancing the adaptability of risk assessment. However, this paper has the following issues.

1. Sec. 1 Introduction: This paper explains three major contributions, but they are too weak to be considered as creative research contributions. It is necessary to describe what studies were performed that are truly differentiated from the existing ones.

2. Several terms are used without explanation in the front part of this paper, and their meanings are understood only in the latter part. It is common to provide explanations when specific terms first appear (e.g., FIT, PF5, etc.)

3. Sec. 2 Related Work: Although this paper presents studies on FTA and FTA-BN, it should also include the explanation of ASIL and the survey of autonomous vehicle safety standards, additionally.

4. Sec. 3 Methodology: The fault tree, Bayesian network, and integration of these described in this section are not novel at all. They consist of simple explanations like textbooks. What is the methodology proposed in this study? Is it a methodology that is different from the existing ones?

5. Sec. 5.D: Perception failure events from PF1 to PF14 are presented, but there is no explanation of the basis for them. References should be cited, or the justification for the 14 cases should be explained.

6. In addition, the identification of various events for subsystem failures should be justified for their sources.

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7. The relationship between the sensor part and the perception part in Figure 2 is difficult to understand. The camera is clearly a means of detecting objects, but the relationship between GPS and IMU for detecting objects is not understood. It needs to be explained using the operation process of vehicles.

8. It is difficult to understand how the failure rate in Table 1 was calculated. If it is an arbitrarily assigned value, it is meaningless to use this value to identify which failure is critical or not.

9. It appears that events such as E1, E2, ... in Table 1 can be derived from the ISO 21448 standard. Various scenarios obtained through this standard need to be explained.

10. The fault trees in Fig. 3 and 4 were derived from Fig. 2, but it is difficult to understand how to develop the fault tree when considering the concept of actual behaviours of autonomous vehicles. In reality, Tesla's autonomous driving recognises objects using cameras.

11. What is the difference between the Bayesian network of Fig. 5 and Fig. 3? It is difficult to find the reasons why it is converted from FT to BN. So, sufficient information about the generated BN should be expressed.

12. Sec. 4.B: The Event E4 is evaluated as the most critical factor among the external system failure factors, which is determined by the failure rate presented in Table 1. How can this event be concluded as the most critical? Climate events such as black ice can cause more serious accidents. This justification needs to be further explained.

13. What is the difference between the graph in Fig. 6 and the failure rate in Table 1? Is there a special reason for showing the same content in a different form?

14. From the Conclusion, this paper said that the Bayesian network is applied to fault tree analysis, but it is difficult to identify any differences from the existing ones. In addition, the experimental results described in this paper can be obtained sufficiently without applying the Bayesian network.

15. This paper only uses the possibility of failure that can occur in a vehicle and generates a fault tree based on it. Even in these examples of failures, the driver's mistake is not considered as a type of failure. Such diverse considerations could provide an opportunity to enhance the originality of this paper.

This paper was written with the purpose of evaluating dynamic failure rates by converting fault trees into Bayesian networks, but it was developed in a way that did not reveal any advantage of utilising BN. It is necessary to consider what kind of failure rates can be calculated when an unexpected (Unseen) event occurs.

Declarations

Potential competing interests: No potential competing interests to declare.