

# **ABSTRACT**

New Safety Analysis Method as a Combination of STAMP & FTA

(STAMP と FTA を組み合わせた新しい安全性解析手法) Upvinder Singh

Upvinder SINGH

47-186146

Department of Advanced Energy

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Advisor: Project Professor Takeshi MIZUMA

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The safety evaluation method used for railway industries, i.e. FTA has limitations concerning time-delay hazard and completeness of fault tree and missing of hazardous events. STAMP has the capability of covering all the risks, including time-delay hazards. However, it cannot do the quantitative analysis, and that makes it not compliant to international standard IEC 62278 and EN 50126, which require qualitative and quantitative analysis of all safety-critical systems.

This study proposes a new method as a combination of STAMP and FTA, in which STAMP is used for qualitative analysis and fault tree is constructed taking the input from the STAMP table. FTA quantitative analysis is applied in the last. Both methods compensate for the limitations of each other, and the proposed method covers all kind of hazards, including the time-delay hazard. The procedure of the proposed method ensures the completeness of fault tree without skipping any hazardous event. Also, its quantitative analysis capabilities make it compliant to international standard. Moreover, its defined procedure makes it easier to analyse complex systems. This study covers the application of the proposed method on two target systems from the railway signalling industry.

Application of the proposed method on both the target system successfully demonstrated the superiority of the proposed method over the conventional method as both qualitatively and quantitatively. The case studies confirmed that the proposed method made the complete hazard prediction by covering all the hazards identified by the traditional method along with time-delay hazard. The result comparison from both methods showed that the proposed method could predict a higher number of hazard event than the conventional method. Also, the occurrence probability of the top hazard was higher in the case of the proposed method.