

# Fatigue surface crack growth behavior in flat plate and out-of-plane gusset-welded joints under biaxial cyclic loads with different phases

Mizuki Morishita<sup>1</sup>, Koji Gotoh<sup>1</sup>, Yosuke Anai<sup>2</sup>, Shuichi Tsumura<sup>2</sup>, and Toshio Niwa<sup>2</sup>

<sup>1</sup>Kyushu University

<sup>2</sup>National Maritime Research Institute

May 5, 2020

## Abstract

In general, fatigue performance of welded structures are evaluated according to design codes based on theoretical and experimental investigations under uniaxial loading conditions. This study highlights the biaxial cyclic loading with different phases. The fracture mechanics approach toward fatigue life evaluation can obtain the fatigue crack growth history. This paper proposes a numerical simulation method for obtaining the fatigue crack propagation histories of a cracked plate subjected to biaxial loads with a phase difference for each loading component. The fatigue surface crack growth behavior of a flat plate and an out-of-plane gusset welded joint under biaxial cyclic loadings with different phases was investigated by extending the applicability of the proposed method to a through thickness crack. Comparisons between the measured crack evolution and the numerical simulation results were carried out to validate our fatigue crack growth simulation for flat plane and welded joints.

## Hosted file

FFEMS\_maintext\_Morishita.docx available at <https://authorea.com/users/299433/articles/428985-fatigue-surface-crack-growth-behavior-in-flat-plate-and-out-of-plane-gusset-welded-joints-under-biaxial-cyclic-loads-with-different-phases>

## Hosted file

FFEMS\_Fig\_Morishita.docx available at <https://authorea.com/users/299433/articles/428985-fatigue-surface-crack-growth-behavior-in-flat-plate-and-out-of-plane-gusset-welded-joints-under-biaxial-cyclic-loads-with-different-phases>

## Hosted file

FFEMS\_Table\_Morishita.docx available at <https://authorea.com/users/299433/articles/428985-fatigue-surface-crack-growth-behavior-in-flat-plate-and-out-of-plane-gusset-welded-joints-under-biaxial-cyclic-loads-with-different-phases>