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Dynamic system simulation of ships evacuation due to tsunami attack considering traffic density condition

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ABSTRACT

Disaster mitigation is considered as important role to prevent number of potential **loss** due to hazardous accident such as tsunami, which is not only causing the raise of free surface but also strong horizontal water movement in a bay. Thus, an appropriate countermeasure is required for ships because the ship may be forced to move unexpectedly. In order to prevent and minimize such huge disaster happened, all vessels in Osaka bay have to evacuate immediately and safely to shelter area before tsunami arrival. The evaluation of time evacuation in shelter area is shown. In this paper, the dynamic system simulation (DSS) of vessels is **carried** out in order to evaluate the possibilities of such evacuation scenario.

KEY WORDS: Dynamic system simulation (DSS), ship evacuation, tsunami and Geographic Information System (GIS)

INTRODUCTION

The great earthquake in Japan, which was occurred in Nankai, Tounankai was not only causing economical loss but also endangering for human life. This earthquake cause great tsunami, which also causing great impact in Osaka bay, where many ships, exists. The tsunami causes great horizontal movement and force, as result it is possible to drift many vessel inside port. The movement of vessel due to tsunami can destruct port facilities and endanger human life inside the vessel. All ships, which are inside port area and alongside the port, have to evacuate immediately to safe area in order to minimize the great disaster which may be occurred.
The focus area of research is located in Osaka Area, which is many ports existed, such as container terminal, Tempozan passenger terminal, General cargo port. In Tempozan passenger terminal, there are regularly many cruises coming in and out in that terminal. Moreover, each cruise carries many passengers. Therefore, it is very dangerous for passengers in case tsunami arrive in that terminal.
Firstly, it is described the traffic condition in Osaka bay and Osaka Port in order to know to the degree of traffic density around those areas. Secondly, it is described that time, elevation, and velocity of tsunami arrival in anchorage point by using tsunami simulation as time limitation of ship evacuation. Thirdly, ship evacuation assessment is conducted to evaluate the possibility of ship for avoiding tsunami attack.
The main purpose of this paper is to evaluate the possibility time of ship which is located in Osaka port to evacuate to anchorage area, which is considered safe area.

TRAFFIC CONDITION

In order to examine traffic density condition, the authors use AIS Receiver FA-30 for collecting of data, which is installed in Kobe University. This data is used to examine when the most crowd condition in Osaka bay and the number of vessels in Osaka Port.

Osaka Bay

Fig.1. shows traffic density of vessel around Osaka bay, which was recorded at October 14, 2006. It describes that the crowd peak of traffic condition was in the afternoon, which was at 12.00-16.00. Therefore, the authors use afternoon condition data for conducting ship evacuation assessment.

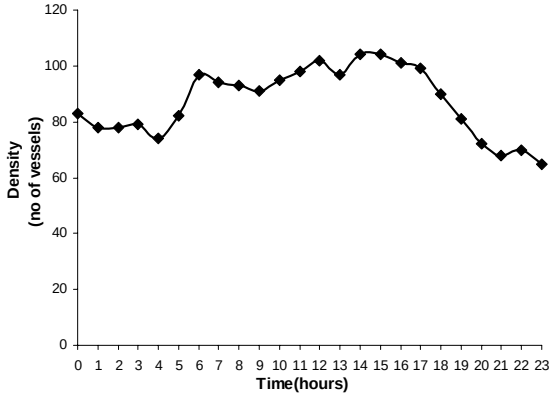

Fig. 1 Traffic density of vessel in Osaka bay