

Dynamics Analysis for Multiple Robot vehicle of Deep-Seabed Mining System using DIMS

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Abstract

Since the resource of the deep sea has known, the deep sea mining system development research and experimental study began mainly with the developed world. Due to the innovative development of the computer, numerical simulation analysis has been used in various engineering problems. Dynamics analysis for integrated mining system is very important technology element in order to mining in deep seabed. Especially, the dynamic analysis for tracked vehicles driving on the soft soil ground is very important. Deep-seabed integrated simulation toolkit is developed previous study. It is enable many deep-sea model elements at the same time in one environment. Tracked vehicle is used here has too many degree of freedom. So it needs too much time to solve the degree of freedom. Therefore it has a limit in the "integrated model analysis".

In this paper introduce numerical modeling techniques for the single body soil contact. It can reduce the consumed analysis time. The tracked vehicle system which is applied "single body soil contact", under several conditions it is carried out to verify proposed method. Furthermore, we through this simulation will perform applying multiple robot vehicles for deep-seabed mining system.

Deep-seabed integrated mining system consists of many sub system. As shown in Figure 1, there are vessel, buffer system, lifting pipes, flexible pipe and tracked system. These sub systems are applied hydraulic force. Added mass, drag force, buoyancy force, current velocity and soil contact force.

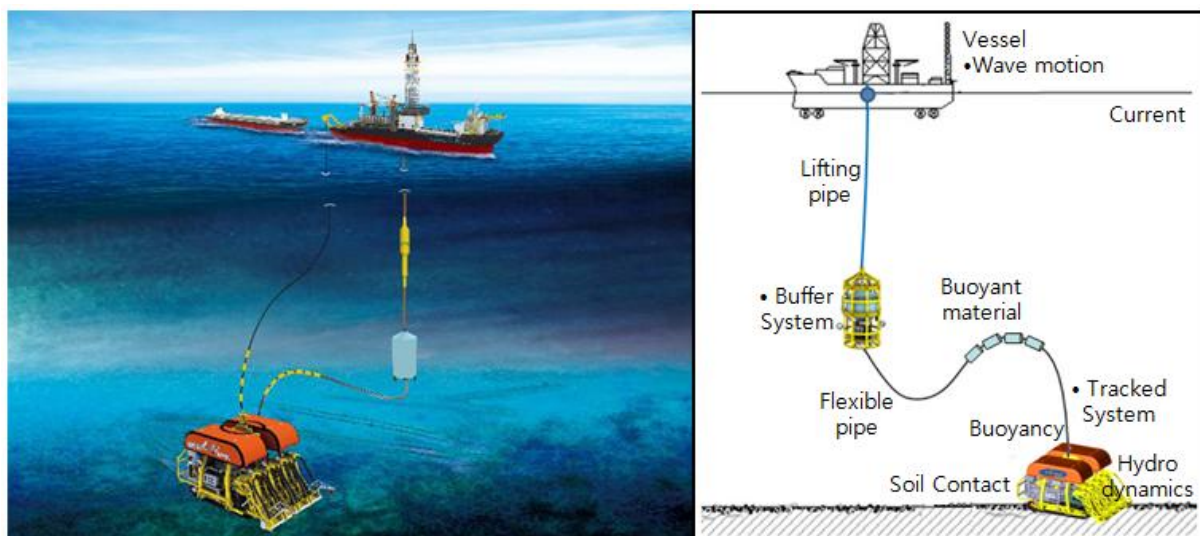


Figure 1: Deep-seabed integrated mining system and composition.

To verify the single body soil contact, one of driving condition is applied as shown in table 1. It is steering scenario of 4-row tracked vehicle.

Table 1: Track velocity of steering scenarios of dynamic analysis.

Time	3rd-row	1st-row	2nd-row	4th-row
0~5	0	0	0	0
5~15	0.127	0.127	0.127	0.127
15~20	0.127	0.127	0.127	0.127
20~25	0.127	0.1585	0.187	0.2125
25~	0.127	0.1585	0.187	0.2125

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