NLP-Based Optimization of the Location of Explosive Facilities Obtaining Minimum Domino Effect

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Accidents enhanced by the domino effect in chemical, petrochemical and energy plants are generally more serious and catastrophic than any other accidents. But it is difficult to examine the true factor and aftermath of the accident because the whole domino effect is influenced by many nonlinear factors. The immediate causes of the domino effect are the peak overpressure, flying objects, and flame; nonlinearity is inherent in all these causes. However, still it is believed that a systematic mathematical approach can minimize the risk of the incidence of the domino effect. This study considered the cases where there are n-explosive facilities of different size and capability, in the given facility site of arbitrary shape. Based on the optimization result obtained from nonlinear programming (NLP), the proposed method suggests the exact locations of each facility that can minimize the domino effect. Probable risk for the determined locations of the facilities is also examined through Monte Carlo simulations for domino events.