

Investigation on the Singularities of Some Singular integrals

Zai You YAN

Summary

Abstract: In the boundary element method, treatment of all the possible singular integrals is very important for the correctness and accuracy of the solutions. Generally, the directional derivative of a weakly singular integral is computed by an integral in the sense of Cauchy principle value if the directional derivative of the weakly singular integral kernel is strongly singular or in the sense of Hadamard finite part integral if the the directional derivative of the weakly singular integral kernel is hypersingular. We will try to discover how the strongly singular and hypersingular integrals are generated and propose a method to avoid the appearance of such kind of strongly singular and hypersingular integrals. Here, using some examples, we will show that with an 'exact derivation' the directional derivative of a weakly singular integral will still be a weakly singular integral or a normal integral. That is none strongly or hypersingular integrals are generated in such a process. And therefore, Cauchy principle value and Hadamard finite part integral are not indispensable. The result will help us to form a new approach to overcome the so-called strongly and hypersingular integrals occurring in the boundary element method.

Keywords: weakly singular integral, Cauchy principle value, Hadamard finite part integral, boundary element method

