Abstract: In many practical applications of structural reliability analysis, one is interested in knowing the sensitivity of the probability of failure to design parameters that enter the definition of the limit-state function. This information is required for example in reliability-based design optimization. Parameter sensitivities are obtained by FORM/SORM, in terms of the sensitivity of the respective probability approximation. However, in several cases FORM/SORM approximations are inaccurate or difficult to obtain. Hence, it is useful to obtain parameter sensitivities as a by-product of Monte Carlo methods. The derivative of the failure probability with respect to a parameter of the limit state function is given by a surface integral over the limit state surface. Application of Monte Carlo methods for the estimation of surface integrals is not straightforward. The surface integral can be computed applying sampling techniques that detect the failure surface, such as directional or line sampling. In this paper, we derive an approximation of the surface integral in terms of a domain integral. The domain integral can then be estimated through standard Monte Carlo or importance sampling simulation. A numerical example demonstrates the effectiveness
of the proposed approximation for estimation with an importance sampling method.

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