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A RELIABLE METHOD TO DETERMINE THE ILL-CONDITION FUNCTIONS USING STOCHASTIC ARITHMETIC

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Abstract. One of the important matters in numerical methods is to find ill-condition functions which have instability in some points. In this paper it has been explained a method to estimate the number of common significant digits between the values of $f(x)$ and $f(x+\delta)$ where $|\delta|$ is small enough. Then we develop this idea for $f(x,y)$ and $f(x+\delta, y+\epsilon)$ where $|\delta|$ and $|\epsilon|$ are small enough. It has been proved two theorems which express the relationship between these values and the condition number of the function f. It has been defined in [4], the condition number of one dimensional function $f(x)$ and in [3] the number of common significant digits between two real numbers . It has been developed these definitions for two dimensional function $f(x,y)$. It has been explained in [9,10,11], one can use the CESTAC[1] method which is a method based on stochastic arithmetic in order to find $f(x)$ numerically. It is used this method to rely and validate the results and implemented the numerical examples. In the numerical examples it has been considered the Rump's function and has been shown it is ill-condition based on the CESTAC method and a kind of perturbation method which has been explained in [1].

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