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Convergence Investigation of Some Types of Multidimensional Continued Fractions

We investigate multidimensional continued fractions (MCFs) of the following types: a branched continued fraction with N branches (BCF)

$$b_0 + D_{k=1}^{\infty} \sum_{i_k=1}^{N} \frac{a_{i_k}}{b_{i_k}},$$

a two-dimensional continued fraction (TDCF)

$$D_{i=0}^{\infty} \frac{a_{ii}}{\Phi_i},\ \Phi_i = b_{ii} + D_{j=1}^{\infty} \frac{a_{i+j,i}}{b_{i+j,i}} + D_{j=1}^{\infty} \frac{a_{i,i+j}}{b_{i,i+j}}$$

and the branched continued fraction with unequal variables

$$b_0 + D_{k=1}^{\infty} \sum_{i_k=1}^{i_{k-1}} \frac{a_{i_k}}{b_{i_k}}.$$

For such types of MCFs multidimensional analogues of well known convergence criteria for continued fractions, in particular: Worpitzky, Śleszyńsky-Pringsheim, Van Vleck, parabola theorems have been obtained. There is some specificity in the theorem wording for the each type of the MCF. Under some additional conditions on the fraction elements truncation error bounds have been also established.