On non-integer based expansions of real numbers in a special form

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The research of non-integer based expansions of real numbers was started by A. Rényi and W. Parry ([3], [2]), a summary of the results of P. Erdős et al. in this field by G. Kallós can be find in [1]. The work of the aforementioned authors is about the expansions in the form:

\[ x = \sum_{n=1}^{\infty} \varepsilon_n \lambda^n, \]

where \(0 < \lambda < 1\) and \(\varepsilon_n \in \{0, 1, \ldots, \lceil \frac{1}{\lambda} \rceil \}\).

I. Kátai proposed the investigation of the expansions in the form:

\[ x = \sum_{n=1}^{\infty} \varepsilon_n \lambda^n + \delta_n \omega_n, \]

where \(\omega_n\) is dependent of \(\lambda\) and \(n\), one can choose values for \(\varepsilon_n\)s, but the values of \(\delta_n\)s are determined by an opponent. This talk is about what numbers can be represented this way in the cases \(\omega_n = a\lambda^n\) and \(\omega_n = (a\lambda)^n\).

References