

## Words and Diophantine Approximation

Izumi NAKASHIMA Professor M.S. Email : nakasima@gifu-nct.ac.jp Research Fields Analytic Number Theory

Keywords

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Research Outline

## Research on words

A sequence of letters is called a word. A word is relate to Diophantine approximation.

A number of subwords with length n is called complexity p(n). If a word is periodic then complexity is bounded. The Sturmian words is the non periodic words which have least complexity p(n)=n+1.

The Kolakoski sequence is a sequence which satisfies the condition that the sequence of its runlengths is equal to itself.

Kolakoski sequence {1,2}

The frequency of 1 in Kolakoski sequence  $\{1,2\}$  is conjectured 0.5. And the complexity of Kolakoski

sequence {1,2} is conjectured  $p(n) \sim \frac{\log 3}{\log(3/2)}$ .

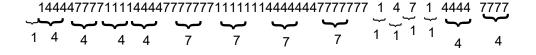
Kolaloski sequence  $\{1,3\}$  is the word

1	333	111	333	31	3	13	33	111	333	
~			$\sim$						$\sim$	
1	3	3	3	1	1	1	3	3	3	

The frequency of 1 in Kolakoski sequence  $\{1,3\}$  is a root of a equation

 $4x^{3}-14x^{2}+15x-4=0$ 

I prove the complexity of Kolakoski sequence  $\{1,3\}$ p(n)=2n+2 for large n. I define a restricted complexity p\_odd(n) and p\_even(n), and satisfies p\_odd(n)=p\_even(n)=n+1 for Kolakoski sequence  $\{1,3\}$ . Kolakoski sequence  $\{1,3\}$  is similar to Sturmian words.



This word is Kolakoski sequence  $\{1,4,7\}$ . The frequency of 1 is a root of cubic equation

 $36x^{3}-84x^{2}+60x-11=0$ .