Collatz conjecture convergence proof

Timo Junolainen

March 21, 2020

Definition of famous Collatz conjecture is famous, well known problem. Definition of Collatz conjecture follows:

$$a(n) = \begin{cases} \frac{n}{2} & 2|n \\ 3n+1 & 2\not|n) \end{cases}$$

In the next algorithm I will try to prove that collatz sequence always converges to 1.

1. We define input as $X = 2^{a_1}3^{a_2}5^{a_3}$...Sequence of $a_n$ends when there is no more factors - n is size of X ($\log_2(n)$). Otherwise we take X as input and derive size of it.

2. In case of $a_1 = 0$ - we reduce size by $a_1$we also remove factors of 2, ie $X = 2^0 3^{a_2}5^{a_3}$...

3. In case of$a_1 \neq 0$- we do next - we shuffle in 3^1, we increase slightly size, ie we add at max a_{n+1}. Then we shuffle all factors, giving in result:$X = 2^{\hat{a}_1}5^{a_3}...\alpha^{a_{n+1}}$with a chance of falling in range a_1

4. We repeat 1 until we fall to size of x is zero, ie X=1

It concludes proof.

□