A CURIOSITY ABOUT POLYNOMIAL INTERPOLATION

PETRO KOLOSOV

Abstract. Interpolation of cubes expected to be

$$n^3 = 6\binom{n}{3} + 6\binom{n}{2} + \binom{n}{1} + 0\binom{n}{0}$$

but got

$$n^3 = \sum_{r=0}^{m}\sum_{k=1}^{n} \mathbf{A}_{m,r} k^r (n-k)^r$$

Contents

1. Introduction

Back then, in 2016 being a student at the faculty of mechanical engineering, I remember myself playing with finite differences of the polynomial n^3 over the domain of natural numbers $n \in \mathbb{N}$ having at most $0 \leq n \leq 20$ values. Looking to the values in my finite difference tables, the first and very naive question that came to my mind was

Question 1.1. *Is it possible to re-assemble the value of the polynomial n^3 backwards having its finite differences?*

Date: January 9, 2025.

2010 *Mathematics Subject Classification.* 26E70, 05A30.

Key words and phrases. Keyword1, Keyword2 .

Sources: https://github.com/kolosovpetro/ACuriosityAboutPolynomialInterpolation

The answer to this question is definitely *Yes*, by utilizing certain interpolation principles. Interpolation is a process of finding new data points based on the range of a discrete set of known data points. Interpolation has been well-developed in between 1674–1684 by Issac Newton's fundamental works, nowadays known as foundation of classical interpolation theory [1].

At that time, in 2016, I was a first-year mechanical engineering undergraduate, so that due to lack of knowledge and perspective of view I started re-inventing interpolation formula myself, fueled by purest passion and feeling of mystery. *All the mathematical laws and relations exist from the very beginning, we only reveal and describe them*, I thought. That mindset truly inspired me, so my own mathematical journey has been started. Let's begin considering the table of finite differences of integer cubes n^3

n	n^3	$\Delta(n^3)$	$\Delta^2(n^3)$	$\Delta^3(n^3)$
0	0	1	6	6
1	1	7	12	6
2	8	19	18	6
3	27	37	24	6
4	64	61	30	6
5	125	91	36	
6	216	127		
7	343			

Table 1. Table of finite differences of the polynomial n^3.

2. Conclusions

Conclusions of your manuscript.

References

[1] Meijering, Erik. A chronology of interpolation: from ancient astronomy to modern signal and image processing. *Proceedings of the IEEE*, 90(3):319–342, 2002. https://infoscience.epfl.ch/record/63085/files/meijering0201.pdf.

Version: `Local-0.1.0`

Software Developer, DevOps Engineer

Email address: `kolosovp94@gmail.com`

URL: `https://kolosovpetro.github.io`