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A REVIEW OF INTRODUCTION TO Z-TRANSFORM AND ITS APPLICATION IN ENGINEERING FIELD

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ABSTRACT

This paper is to present some important examples of the z-transform relating to everyday science and mathematics. Even if z-transform techniques are well known to those allocating in digital signal processing also digital control theory and image processing, z-transform theory is usually excluded from the main watercourse university science and math curriculums at both the undergraduate and graduate levels. It has only been in the last few decades that interest in the z-transform has changed, mostly because of the fast development of integrated circuit technology and microprocessor architecture. Z-transform techniques is now become a major tool in electrical, computer, and Electronics & communication engineering. Since the z-transform has roots bottomless in complex variable theory, this recent leaning of popularity will, in the near future, certainly spread into many areas of university science and mathematics. The Z-TRANSFORM two types of z-transforms are usually defined, the direct z-transform and the one-sided z-transform. For convenient and compact representation of x(n).

Key words: *Z-Transform, Sequence X(n).*

I. INTRODUCTION

The modest clue now known as the Z-transform was known to Laplace, and it was re-introduced in 1947 by W. Hurewicz and others as a way to treat sampled-data control systems used with detector. It gives a controllable way to solve linear, constant-coefficient difference equations. It was future dubbed "the z-transform" by Ragazzini and Zadeh in the sampled-data control group at Columbia University in 1952.The improved Z-transform was then developed and interpreted by E Hurewicz.

The idea within the Z-transform is also called in mathematical literature as the method of generating functions which can be outlined back as early as 1730 when it was introduced by deMoivre in conjunction with probability theory. In terms of mathematical view the Z-transform can also be observed as a Laurent series where one views the sequence of numbers under consideration as the development of an analytic function.

The z transform is infrequent, in being named after a letter of the alphabet rather than a famed mathematician. The Fourier transform is named later on Baron Jean Baptiste Joseph Fourier (1768-1830); the Walsh-Hadamard transform named after J.L. Walsh (?) and Jacques Salomon Hadamard (1865-1963); we have not discussed the Laplace and Hilbert transforms yet, but we will (at least briefly), and they are named after Pierre-Simon de Laplace (1749-1827) and David Hilbert (1862-1943) respectively. Laplace transforms has long used in solving (continuous-time) linear constant-coefficient differential equations. According to p 420 of Contemporary Linear Systems (Strum and Kirk 1994),A method for solving linear, constant-coefficient difference equations by Laplace transforms was mainly introduced to graduate engineering students by Gardner and Barnes in the early 1940s. They may be used their procedure, which was based on jump functions, to ladder networks, transmission lines, and applications involving Bessel functions. This method is quite difficult and in a separate attempt to simplify matters, a transform of a sampled signal or sequence was defined in 1947 by W. Hurewicz which was then denoted by professor John R. Raggazini and including L.A. Zadeh, E.I. jury, R.E. Kalman, J.E. Bertram, B. Friedland, and G.F. Franklin in the year 1952 as a "z transform" by a sampled-data control group at Columbia University led

The Hurewicz equation is not expressed in the similar way as the z transform we have introduced -- it is one-sided,

and it is expressed as a function of the tasted data sequence f rather than the complex number z -- but the relationship is clear, and the applications were similar from the starting. So possibly the z transform should be called the "Hurewicz transform" -- but it is very late to change.

In several case, it is presumably not an accident that the z transform was invented at about the same time as digital computers

II. DEFINATION

The Z-transform defined as ,
If k is any positive integer, then Z-transform of Sequence f(k) is defined and denoted by
$Z(f(k))= \sum_0^\infty f(k).z^{-k}$

Where Z transform is linear transformation.

III. IMPORTANCE

Z transform is mainly used to convert discrete time domain signal into discrete frequency domain signal. It has inclusive range of applications in mathematics and digital signal processing. It is also used to analyze and process digital data.

In the study of the Laplace transform either in a Mathematics course for Engineers and Scientists or have applied it in, used for example, an analog control course you may memorized that

1. The Laplace transform definition includes an integral
2. Relating the Laplace transform to certain ordinary differential equations goes them into simpler algebraic equations.
3. Main Use of the Laplace transform increase the basic concept of the transfer function of a continuous (or analog) system.

The z-transform plays a parallel role for discrete systems, i.e. ones where sequences are tangled, to that played by the Laplace transform for systems where the basic variable t is continuous. Specifically:

1. The z-transform definition includes a summation
2. The z-transform is convert certain difference equations to algebraic equations
3. We can Use the z-transform for giving rise to the concept of the transfer function of discrete (or digital) systems.

IV. APPLICATION

Z-transform is used in so many applications of mathematics and signal processing. The lists of applications of z transform are:-

- -Used to analysis of digital filters.
- -Used for simulating the continuous systems.
- -Examine the linear discrete system.
- -Used to find frequency response.
- -Study of discrete signal.
- -It also Helps in system design and analysis also checks the systems stability.
- -For automatic controlling in telecommunication.
- -Improve the electrical and mechanical energy by providing dynamic nature of the system.

If we can see the main applications of z transform then we find that it is analysis tool that analyze the whole discrete time signals and systems and their related issues. If we talk the application areas of

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This transform wherever it is used, they are:-

- For Digital signal processing.
- -In Population science.
- -For Control theory.
- -Also in Digital signal processing

Z transform is used to convert discrete time domain signal into discrete frequency domain signal. It also having wide range of applications in mathematics and digital signal processing.

It is mostly used to analyze and process digital data. For example to examine JPEG images, MP3 and MP4 songs, ZIP files etc, we can make use of Z transform.

Various Applications of Z transform in digital signal processing are,

1. Used in system designing
2. Used to find out stability of a system
3. It is also Used to find frequency response of a signal
4. Analysis of linear discrete system
5. For designing digital filters

V. CONCLUSION

The paper consist of brief over view of Z-transform. A complete description ofZ-Transform was mentioned with the help of Equation and its application in fields of physical engineering.

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