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APPLICATIONS OF SETS

Aditi Mehta , Vaishali Yadav
Student , Dronacharya College Of Engineering,Gurgaon

Abstract- **The objective of this paper is comprehensive study related to Set and its applications. The generality of set theory leads to few direct practical applications. Instead, precisely because of its generality, portions of the theory are used in developing the algebra of groups, rings, and fields, as well as, in developing a logical basis for calculus, geometry, and topology. These branches of mathematics are all applied extensively in the fields of physics, chemistry, biology, and electrical and computer engineering. Developed at the end of the 19th century, set theory is now a ubiquitous part of mathematics, and can be used as a foundation from which nearly all of mathematics can be derived.**

Index Terms- **algebra; geometry; calculus; topology.**

I. INTRODUCTION

While studying any subject or topic, the first question arises in a student mind that why we are studying this topic? Is it applicable or relevant in our real life or daily life situations also? Yes, "SET" theory is applicable in our real life situation also. As we know that "Set is a collection of distinct objects of same type or class of objects". The Objects of a set are called element or members of the set. Objects can be numbers, alphabets etc.

E.g., A = { 1,2,3,4,5}, here "A" is a set of numbers containing elements (1,2,3,4 and 5).

While talking about anything to make it short and prescribed we human being often speaks collection of things as a single entity life Indians, Solar system, Birds, Animals etc. We often classify objects, people and ideas according o some common properties. This makes it easier to talk things in general without repeating individual examples again and again.

II. HISTORY OF SET THEORY

Before starting with the applications of set theory, it is very important to know about its history. For knowing about application of any, topic, history of that topic is as much important as the knowledge of the boundaries of a farm to be cultivated. The History of set theory is little bit different from the of most other areas of mathematics. For most areas a long process can usually e traces in which ideas evolve until an ultimate flash of inspiration, often by a number of mathematicians almost simultaneously, produces a discovery of major importance.

Set Theory is the creation of only e person named "Georg Cantor". It was with Cantor's work however that set theory came to be put on a proper mathematical basis. Cantor's early work was in number theory and he published a no. of articles on this topic between 1867 and 1871. These, although of high quality, give no indication that they were written by a man about to change the whole course of mathematics. The modern study of set theory was initiated by Georg Cantor and Richard Dedekind in the 1870s.

III. APPLICATIONS

Set theory is applicable not only in one field or area. Because of its very general or abstract nature, set theory has many applications in other branches of mathematics e.g. Discrete structure, Data structure etc. In the branch called analysis of which differential and integral calculus are important parts, an understanding of limit points and what is meant by continuity of a function are based on set theory. The algebraic treatment of set operations leads to boolean algebra, in which the operations of intersection, union and difference are interpreted as corresponding to the logical operations "and", "or" and "not" respectively. Boolean algebra is used extensively in the design of digital electronic circuitry, such as that found in calculators and personal computers. Set theory provides the basis of topology, the study of sets together with the properties of various collections of subsets.

A. Real Life Applications

It is very interesting for you to know that if you are a non-mathematician and you are reading up on set theory, then also you can understand its applications very well and not only its applications, you can easily understand the idea or concept behind the creation of set theory by taking real life examples. Set theory starts very simple; it only examines one thing i.e. whether an object belongs, or does not belong to a set of objects whish has been described in some non-ambiguous way. Now coming back to real life examples of set, we have seen that in kitchen, Utensils are arranged in such a manner that plates are kept separately from the spoons. Another example is when we visit mobile showrooms; we observe that smart phones like Galaxy duos, Lumia etc. are separated from the simple mobiles. So there can be infinite examples of set in our day to day life.

B. Applicable in Other field

Nowadays even computer scientists describe their basic concept in the language of set theory. This is useful because when you specify an object set theoretically, there is no question what you are talking about you can unambiguously answer any question you might have about. Without precise definitions it is very difficult to do any serious mathematics. Set theory is seen as the foundation from which virtually all of mathematics can be derived. For examples, structures in abstract algebra, such as groups, fields and rings are sets closed under one or more operations.

Set theory is also a promising foundation system for much of mathematics. Since the publications of the first volume of Principia Mathematica, it has been claimed that most or even all mathematical theorems can be derived using an aptly designed set of axioms for set theory, augmented with many definitions, using first or second order logic. For e.g. properties of the natural and real umbers can derived within set theory, as each number system can be identified with a set of equivalence classes under a suitable equivalence relation whose field is some infinite set.

C. Practical Applications of Set theory

Not only in the fields of Data Structure, Topology, Mathematics etc, Set theories are relevant to real life situations also. The obvious relevance has to do with our natural ability of abstraction. We often speak of collection of things as a single entity, "the Detroit Lions", "the House of representatives", the army, the Rotary club, the Solar system. That is we often classify objects/people/ideas according to common shared properties this make it easier to talk about things "in general" without having to repeat individual instances over and over. But the other important relevance has to do with the fact that set membership also models a certain kind of way of thinking, that of logic dependence, to say "this implies that" is to say the set of the things for which "this" is true, is smaller (or contained in) the set of things for which "that" is true.

Only because of its applications, set theory exists. A major reason for set theory is that it makes the terminology of other forms of mathematics easier aside from that of course everyone "uses" set theory every-day, even if they don't know it or have never learned set theory. Humans can't help but categorize things and put them into 'Sets' – that's how we thing and that's what set theory is about.

CONCLUSION

From formulating logical foundation for geometry, calculus and topology to creating algebra revolving around field, rings and groups, applications of set theory are most commonly utilized in science and mathematics fields like biology, chemistry and physics as well as in computer and electrical engineering. So basically for gaining knowledge about any area or field of Discrete structure and mathematics, data structure, topology etc. it is very important to know about set theory because the concept of set theory cannot be neglected.

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