Calculable Functions Encyclopedia Article

Calculable Functions

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Contents

Calculable Functions Encyclopedia Article.....1

Contents.....2

Calculable Functions.....3

Calculable Functions

Algorithms have become one of the basic concepts in mathematics as well as an important component of cybernetics and digital computer programming. Algorithms denote an exact procedure or set of rules used to solve a problem or complete a task. Some of our most familiar algorithms are the rules for elementary mathematics--addition, subtraction, multiplication and division.

In the 1930s, many mathematicians began to explore the solvability and unsolvability of algorithmic problems; particularly important in this area is the work done by Alonso Church. Born in 1903, Church was educated at Princeton University, where he later joined the staff as chairman of mathematics and philosophy. He remained at Princeton for forty years, and also held a similar position at the University of California. In 1936 Church was the first to establish proof that there were no algorithms for a class of quite elementary arithmetical questions. This provided the first precise definition of a calculable function, and the discovery contributed enormously to the development of computing algorithms.

The English mathematician Alan Turing (1912-1954) performed similar work as that of Church. Born in England, Turing studied mathematics at King's College in Cambridge. In 1936 Turing went to the United States for two years to work with Church on the theory of computation. During this time he developed a device known as the Turing machine, with which he helped prove the existence of undecidable mathematical statements. In 1937 Turing presented his results in a paper entitled On Computable Numbers. The paper represented the same theories reached earlier by Church, but Turing's results were obtained by an entirely different method; their combined theories are known as the Church-Turing thesis. Turing later returned to England to assist in the development of England's first electronic computer. In 1954 he died after taking poison at his home, although whether deliberately or by accident was never determined.