PREFACE

Computer Science is a fast growing field of research. Theoretical as well as experimental research in Computer Science have been performed by various Scientists and Engineers. Basically, Computer is a two-state device. Two states are represented by 0 and 1. In the new binary system logic 0 is replaced by logic -1 and +1 remains as it is. 0 indicates false or low and 1 indicates true or high. Here, we have made an attempt to study various arithmetic process like addition, subtraction and multiplication as well as digital signal processing like A/D, D/A, quantization, modulation and encoding in plus one (+1) and minus one (-1) binary system. The thesis contains four chapters.

The first chapter deals with the general introduction which contains brief history of different logic systems and different addition techniques like carry look ahead, Ling's addition, carry save addition, Carry select and conditional sum. It also contains different multiplication techniques like array multiplier, two's complement multiplier, serial multiplier, Fast serial and parallel multiplier. It also contains a brief discussion of quantization method, differential pulse code modulation, delta modulation and linear predictive coding.

The second chapter of thesis is divided into two parts. First part of the second chapter contains logic design of adders, hardware realisation of full adder, carry look ahead adder, Ling's adder, carry save and conditional sum adders in plus one and minus one binary system. Advantage and disadvantage of these adders have been indicated. Comparison of all these adders with the conventional binary (0,1) adders have been made.

The second part of the second chapter contains the details of logic design of sequential, parallel and array multipliers. Hardware realisation of these multipliers have been discussed. The main advantage of (+1,-1) binary system is that positive and negative numbers can be added and multiplied in a unified way. Half addition cannot be realised.
The third chapter deals with the study of analog to digital conversion, encoding and decoding of signal in (+1,-1) system. The circuit design of comparator method, successive approximation method and dual slope method of analog to digital conversion have been developed and described in detail. Positive and negative signals can be converted in digital form in the unified way. Extra hardware is not needed for negative analog signals. Although the logic circuit contains a little larger number of elements than conventional binary but it is simple and easy to realise.

Fourth chapter deals with different types of codes like differential pulse code modulation, delta and adaptive delta modulation and linear predictive coding in(+1,-1) binary system. It also contains quantizer, truncation and rounding and first and second order digital filter. DPCM, DM, ADM, and LPC can be well implemented in (+1,-1) system. The step size is twice in comparison of conventional binary. Truncation and rounding are equivalent where as truncation and rounding are different in (0,1) system. First and second order digital filter can be easily implemented in (+1,-1) system.

The (+1,-1) binary system is well suited for digital signal processing. The positive and the negative signals can be processed in a unified way. No extra bit is required for sign. The unification, simplicity and symmetry are the characteristics of this system.

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