PREFACE

Low-voltage low-power integrated circuits are of great interest for many applications that use batteries as power supply. There has been remarkable progress in the circuit implementation of current conveyors as a key element because of its low voltage, low power characteristics and wide dynamic operating range. Researchers are discovering that the current conveyor offers several advantages over the conventional operational amplifier. In present scenario current conveyors are replacing the conventional operational amplifier in various applications such as analog signal processing, active filters, and converters. Despite considerable improvement in current conveyor circuits, a better understanding of these circuits to use them at low voltage and wide band width for different application is required. This work outlines our findings in understanding and characterizing the differential voltage current conveyor for low voltage and wide band. The work is based on the CMOS implementation of Differential Voltage Current Conveyor (DVCC) and its’ modified version, a relatively new active element suited for differential signal processing. The proposed circuits are suitable for voltage mode. These all circuits are ideal for IC implementation. Each of the proposed circuits has been analyzed taking into account the effect of non-idealities of DVCC. All the proposed ideas and new circuits are verified through extensive PSPICE simulation for 0.5µ CMOS process model parameter, some work is also verified on Microcap 10. The Simulation results exhibit that the presented circuit designs offers practical alternative solution to use the CMOS DVCC in application circuits instead of the DVCC elements. The circuit provides high performance in terms of Low Voltage and current transferring, frequency response and linearity. In this investigation, the design and simulation of some novel differential voltage current conveyor circuits for low voltage and wide band have been under taken.

The thesis comprises of seven chapters and each of the chapters is introduced as follows:

Chapter 1: This chapter explores the concept of commitment, research background and problem, a framework based on background literature, it also deals with the study of fundamental concepts of analog integrated circuits and its design. Furthermore it also talks about current conveyors in brief.
Chapter 2: This chapter focuses on three major dimensions which consolidate the review of the theories. This chapter discusses about MOS devices, its structure along with its characteristics. MOS device model along with its different levels is also discussed in brief. This chapter additionally discusses the literature related to SPICE and lists few programmable parameters. Current mode circuits, Current conveyors and its generation is also described in detail.

Chapter 3: The chapter titled, “Differential Voltage Current Conveyor Low Voltage low Power Techniques”, deals with the Differential Voltage Current Conveyor, realization of second generation current conveyor. The main problem of this research work i.e. low voltage, low power and high bandwidth circuit is discussed in detail along with its advanced methods.

Chapter 4: This chapter covers all the relevant issues related to low voltage and wide band DVCC. It talks about low voltage current mirror and methods for improvement in Bandwidth. Furthermore a result of short study of CMOS based low voltage DVCC is discussed under different parameters.

Chapter 5: Design, study and analysis of Low Voltage Wide Band Differential Voltage Current Conveyor is done in this chapter. A Novel Design presents a new structure of DVCC for Low Voltage and Wide Band. The circuit is uniquely coded and consequently it gives some very good results. Furthermore some experimental result are shown and discussed.

Chapter 6: In this chapter we proposed a new circuit of DVCC, which is smaller and provides great results. The simulation results of this circuit are discussed in detail.

Chapter 7: Conclusion of the work is presented in this chapter. This chapter synthesizes the overall findings. As directed by the present research findings and background, several future research directions are also suggested.

We hope that this contribution would yield significant and technically useful information. I will realize much reward, if this work is regarded as a small contribution in this very advanced and useful field of analog design.

(Kamlesh Kumar Singh)