

# Unit-Distance Code Generator

Amreen Kaur  
 Integrated Sensor Systems  
 Indian Institute of Technology  
 Telangana, India  
 is21mtech14002@iith.ac.in

**Abstract**—This report explains the Mixed Signal Design of a Unit Distance Code Generator. The circuit is made using a 16-bit binary counter and a not gate, the constituents same as a Johnson Counter. It is used to prevent spurious output from electromechanical switches and to facilitate error correction in digital communications such as digital terrestrial television and some cable TV systems. Use of one of the many unit-distance codes can minimize errors at symbol transition points while converting analog quantities into digital ones.

**Index Terms**—Johnson Counter, Unit-distance Code, Mixed Signal Design,

## I. INTRODUCTION

After having seen the usage of a Unit Distance Code generator, let us look at the working of the same. It constitutes of two major parts- a 16-bit counter(Verilog Code) and a not gate(Spice Netlist).Let us look at the working of the Unit-distance Code Generator.

## II. PROPOSED DESIGN

### A. Johnson Counter Design

The Johnson Counter circuit can be shown as in Fig.-1.

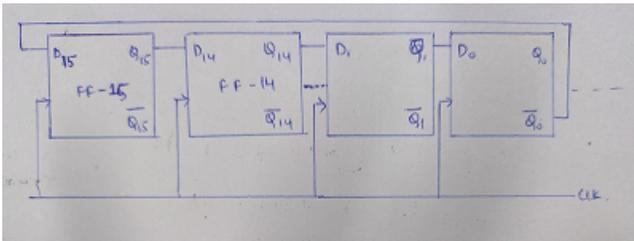


Fig. 1. Johnson Counter Circuit

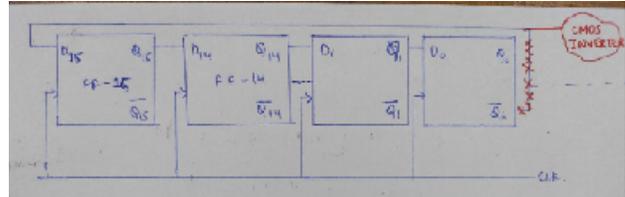


Fig. 2. Johnson Counter Circuit with CMOS Inverter

For the first 4 bits,

clk	Q <sub>3</sub>	Q <sub>2</sub>	Q <sub>1</sub>	Q <sub>0</sub>
0	0	0	0	0
1	1	0	0	0
2	1	1	0	0
3	1	1	1	0
4	1	1	1	1
5	0	1	1	1
6	0	0	1	1
7	0	0	0	1
8	0	0	0	0
9	1	0	0	0
10				
11				

Fig. 3. Truth Table for 4 LSB Bits

### B. Analog Circuit Incorporation

The output of the Johnson Counter instead of being taken from qbar of the lsb of the counter's flip flop, it is taken via a CMOS Inverter. The updated circuit along with the truth table are shown in Fig.-2 and Fig.-3. The truth table shows how the circuit works like a Unit Distance Code Generator.

## III. EXPECTED RESULTS

The waveform obtained shall be the same as of a Johnson Counter as shown in Fig.-4.

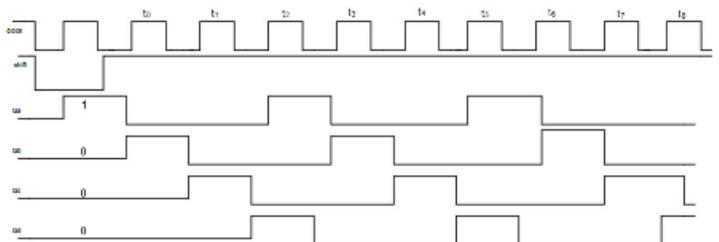


Fig. 4. Waveform for the Circuit