3-Input Majority Function

Problem Description

A majority function is a Boolean function that is true when more than half of its inputs are true. This document illustrates the design of a 3-input majority function.

1. Truth Table

Inputs			Output
x	y	z	f
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

2. Boolean Expression

The Sum-of-Products (SOP) expression derived from the truth table is: $f = x'yz + xy'z + xyz' + xyz$

This can be simplified using Boolean algebra: $f = yz(x' + x) + xz(y' + y) + xy(z' + z)$ $f = yz + xz + xy$

The simplified expression is: $f = xy + yz + xz$

3. Circuit Diagram

The logic circuit for the simplified expression $f = xy + yz + xz$.

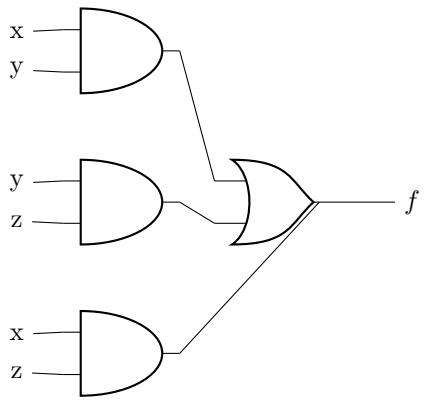

Figure 1: Circuit for the 3-input majority function.