



Quine McCluskey Method

By: W.V Quine & Edward J McCluskey

Presented By: Shahneel Siddiqui

Some facts about Quine McCluskey

- ▶ Developed in 1956
- ▶ Also known as Tabulation Method
- ▶ Used for Minimization of Boolean Functions
- ▶ Where Karnaugh Map could solve for upto 5 bits, Quine McClusky can solve for more than 5 bits.
- ▶ Has easy algorithm than Karnaugh, so it is efficient and can be easily implemented in computer algorithms.

Steps

► Four main Steps:

1. Generate Prime Implicants
2. Construct Prime Implicants Table
3. Reduce Prime Implicants
4. Solve Prime Implicants table

Example Problem

► $\Sigma (0,4,5,7,10,12,13,14,15)$

Step-1: Listing the Binary codes of each number.

| No | Binary |
|----|--------|
| 0 | 0000 |
| 4 | 0100 |
| 5 | 0101 |
| 7 | 0111 |
| 10 | 1010 |
| 12 | 1100 |
| 13 | 1101 |
| 14 | 1110 |
| 15 | 1111 |

Table:1

- ▶ Step-2: Listing Binary Numbers according to their number of 1's as in Table.2
- ▶ Step-3: Making Table of Duals from Table:2

Step:2

| | ABCD | |
|----|---------|---|
| 0 | 0 0 0 0 | X |
| 4 | 0 1 0 0 | X |
| 5 | 0 1 0 1 | X |
| 10 | 1 0 1 0 | X |
| 12 | 1 1 0 0 | X |
| 7 | 0 1 1 1 | X |
| 13 | 1 1 0 1 | X |
| 14 | 1 1 1 0 | X |
| 15 | 1 1 1 1 | X |

Table:2

Step:3

| | ABCD |
|-------|---------|
| 0.4 | 0 - 0 0 |
| 4.5 | 0 1 0 - |
| 4.12 | - 1 0 0 |
| 5.7 | 0 1 - 0 |
| 5.13 | - 1 0 1 |
| 10.14 | 1 - 1 0 |
| 12.13 | 1 1 0 - |
| 12.14 | 1 1 - 0 |
| 7.15 | - 1 1 1 |
| 13.15 | 1 1 - 1 |
| 14.15 | 1 1 1 - |

Table:3

► Step-4: Generating table of Quads from Table.3

| | ABCD | |
|-------|---------|-----------|
| 0.4 | 0 - 0 0 | PI |
| 4.5 | 0 1 0 - | X |
| 4.12 | - 1 0 0 | X |
| 5.7 | 0 1 - 0 | X |
| 5.13 | - 1 0 1 | X |
| 10.14 | 1 - 1 0 | PI |
| 12.13 | 1 1 0 - | X |
| 12.14 | 1 1 - 0 | X |
| 7.15 | - 1 1 1 | X |
| 13.15 | 1 1 - 1 | X |
| 14.15 | 1 1 1 - | X |

Table:3

| | ABCD | |
|-------------|-----------|-----------|
| 4.5-12.13 | - 1 0 - } | PI |
| 4.12-5.13 | - 1 0 - } | |
| 5.13-7.15 | - 1 - 1 } | PI |
| 5.7-13.15 | - 1 - 1 } | |
| 12.13-14.15 | 1 1 - - } | PI |
| 12.14-13.15 | 1 1 - - } | |

Table:4

► Step-5: Making table of Prime Implicants

?

| Prime Implicants | 0 | 4 | 5 | 7 | 10 | 12 | 13 | 14 | 15 |
|------------------|--------------|--------------|--------------|--------------|---------------|----|---------------|---------------|---------------|
| 0.4 | ✓ | ✓ | | | | | | | |
| 10.14 | | | | | ✓ | | | ✓ | |
| 4.5-12.13 | | ✓ | ✓ | | | ✓ | ✓ | | |
| 5.13-7.15 | | | ✓ | ✓ | | | ✓ | | ✓ |
| 12.13-14.15 | | | | | | ✓ | ✓ | ✓ | ✓ |

$$0.4 + 10.14 + 5.13-7.15 + 4.5-12.13$$

► Step-6: Generating SOP from Prime Implicants

$$0.4 + 10.14 + 5.13-7.15 + 4.5-12.13$$

Now Since

| PI | ABCD |
|-----------|---------|
| 0.4 | 0 - 0 0 |
| 10.14 | 1 - 1 0 |
| 5.13-7.15 | - 1 - 1 |
| 4.5-12.13 | - 1 0 - |

So the minimized SOP is: $A'C'D' + ACD' + BD + BC'$

This was all about
Quine McCluskey Method

Thank You for your time

Questions are very much Welcomed 😊