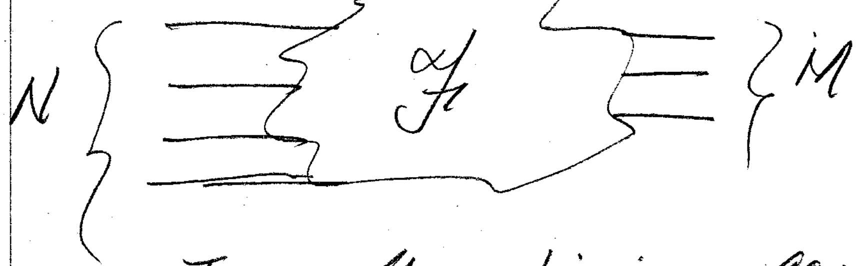
Basic Concepts of Switching Theory

(2-7) - Foundation for optimization of multiple output functions



- To really optimize, consider $\mathcal{F}$ as a whole. Considering the M outputs as independent will result in sub-optimal soln.

- After covering the concepts, will first focus on optimizing for only one output variable, so some concepts will not be used until later
- Draw pictures to help understand.

- Pictures (representations) of boolean function $\mathcal{F}$
  - Truth table
  - Mapping of sets
  - Mapping of Input Boolean space to output space
  - Cubes, ON-SET

(2-7) — (2-20)

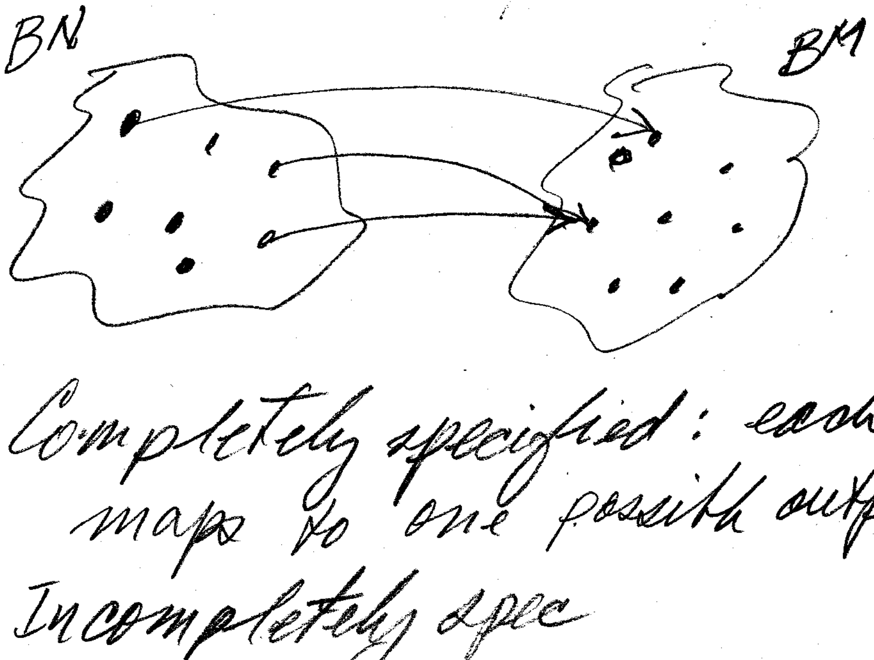
Truth Table

IN				$\mathcal{F}$			
A_0	A_1	$\cdots$	A_N	F_0	F_1	$\cdots$	F_M
0	0	$\cdots$	0	1	0	$\cdots$	1

2^N rows

Max 2^M unique values

Boolean Function $\mathcal{F}$ as a mapping of sets



- Completely specified: each input maps to one possible output value
- Incompletely spec
  Some inputs can map to any output
- Why ever have $M > N$?
  Parity ex.

IN		P
00 ⋯ 0	00 ⋯ 0	0
		1
		0
11 ⋯ 11	11 ⋯ 1	1

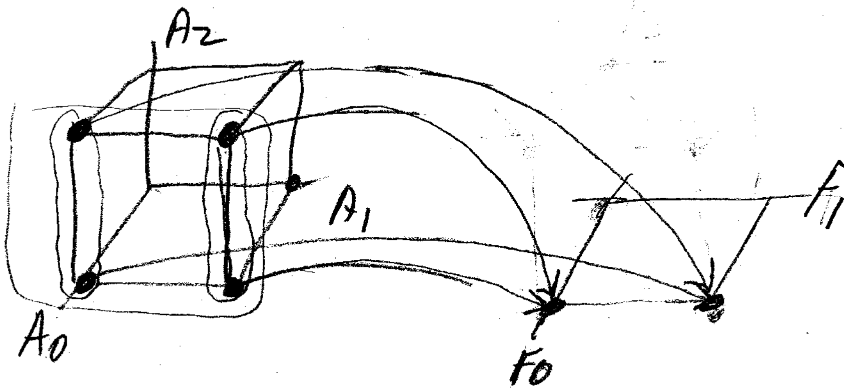
Error detection
ECC.

(2-11) Boolean Fn as mapping of Boolean-N space

Ex

A_0	A_1	A_2	F_0	F_1
0	0	0		
⋮				
1	1	1		

ON-SET applies to 1 col of TT.



ON-Set of $F_0 = \{\{100\},\{110\}\{111\}\{101\}\}$

" " $F_1 = \{\{100\},\{101\}\}$

Cubes: "shapes" in Boolean space.

$F_0 = A_0\bar{A}_1\bar{A}_2 + A_0A_1\bar{A}_2 + A_0A_1A_2 + A_0\bar{A}_1A_2$ — minterms 0-cubes (points)

$F_0 = A_0\bar{A}_1\cancel{(A_2+\bar{A}_2)} + A_0A_1\cancel{(A_2+\bar{A}_2)}$ — 1-cubes (lines)

$F_0 = A_0 \leftarrow$ 2-cube (plane)

A_0, $A_0\bar{A}_1$, $A_0\bar{A}_1\bar{A}_2$ are cubes of F_0 ON-SET

$A_0\bar{A}_1$ is also a cube of F_1 ON-SET,

ie. $F_1 = A_0\bar{A}_1$