

Lecture SAT Example

Depth First Search

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State Space

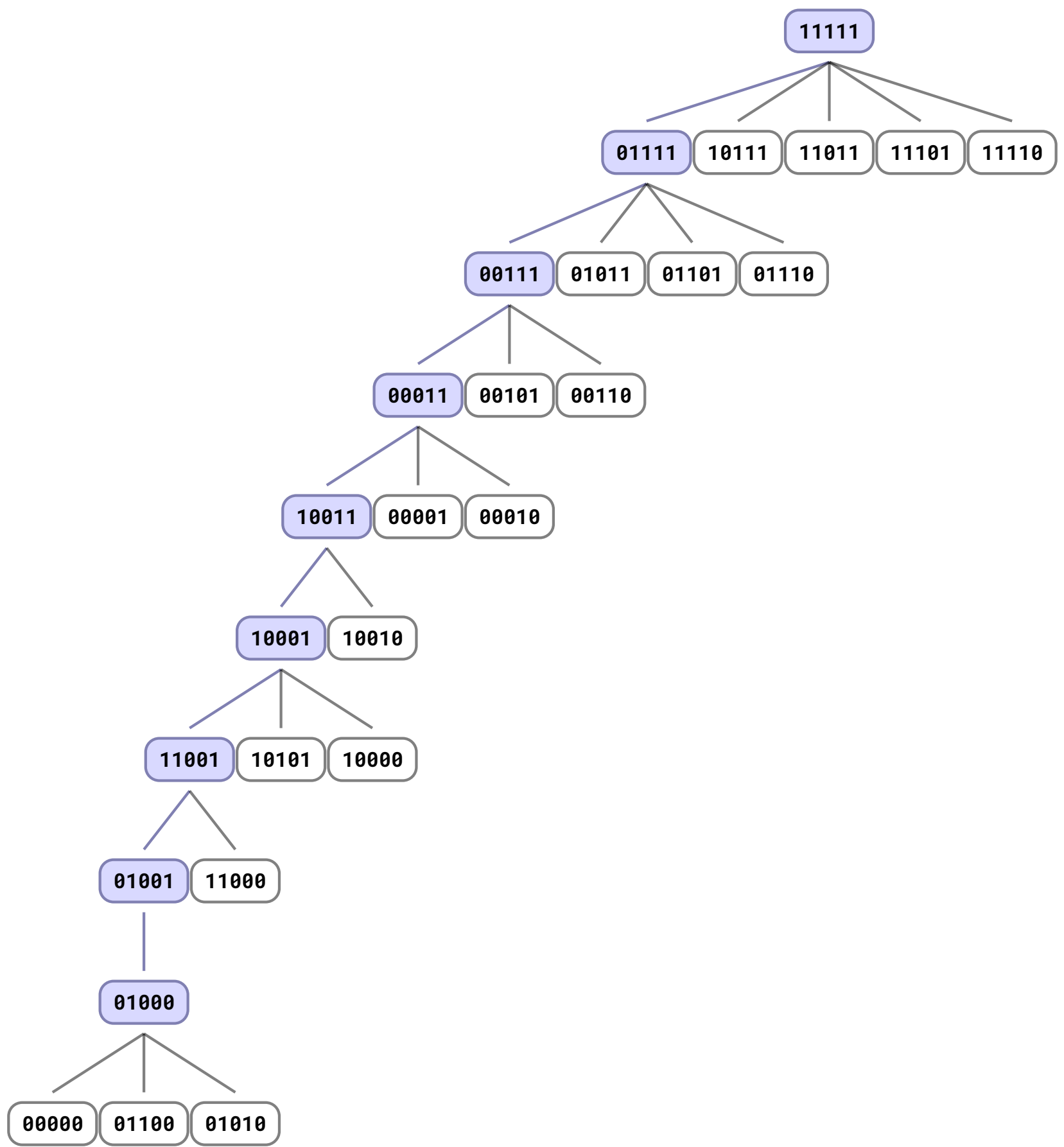
The start state is “11111”.

MoveGen is a one bit flip function.
It flips the bits from left to right, one bit at a time, and accordingly returns the neighbours.

$$F(abcde) = (b \vee \neg c) \wedge (c \vee \neg d) \wedge (\neg b) \wedge (\neg a \vee \neg e) \wedge (e \vee \neg c) \wedge (\neg c \vee \neg d)$$

S.No.	abcde	h(F)	eval(F)	eval					
				$(b \vee \neg c)$	$(c \vee \neg d)$	$(\neg b)$	$(\neg a \vee \neg e)$	$(e \vee \neg c)$	$(\neg c \vee \neg d)$
1	00000	6	1	1	1	1	1	1	1
2	00001	6	1	1	1	1	1	1	1
3	00010	5	0	1	0	1	1	1	1
4	00011	5	0	1	0	1	1	1	1
5	00100	4	0	0	1	1	1	0	1
6	00101	5	0	0	1	1	1	1	1
7	00110	3	0	0	1	1	1	0	0
8	00111	4	0	0	1	1	1	1	0
9	01000	5	0	1	1	0	1	1	1
10	01001	5	0	1	1	0	1	1	1
11	01010	4	0	1	0	0	1	1	1
12	01011	4	0	1	0	0	1	1	1
13	01100	4	0	1	1	0	1	0	1
14	01101	5	0	1	1	0	1	1	1
15	01110	3	0	1	1	0	1	0	0
16	01111	4	0	1	1	0	1	1	0
17	10000	6	1	1	1	1	1	1	1
18	10001	5	0	1	1	1	0	1	1
19	10010	5	0	1	0	1	1	1	1
20	10011	4	0	1	0	1	0	1	1
21	10100	4	0	0	1	1	1	0	1
22	10101	4	0	0	1	1	0	1	1
23	10110	3	0	0	1	1	1	0	0
24	10111	3	0	0	1	1	0	1	0
25	11000	5	0	1	1	0	1	1	1
26	11001	4	0	1	1	0	0	1	1
27	11010	4	0	1	0	0	1	1	1
28	11011	3	0	1	0	0	0	1	1
29	11100	4	0	1	1	0	1	0	1
30	11101	4	0	1	1	0	0	1	1
31	11110	3	0	1	1	0	1	0	0
32	11111	3	0	1	1	0	0	1	0

Search Tree



Solution

OPEN and CLOSED carry pairs: (NODE,PARENT)

OPEN	(11111,null):[]
CLOSED	[]
1.	
NODE	11111
close	(11111,null)
moveGen	01111:10111:11011:11101:11110:[]
newNodes	01111:10111:11011:11101:11110:[]
newPairs	(01111,11111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
OPEN	(01111,11111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(11111,null):[]
2.	
NODE	01111
close	(01111,11111)
moveGen	11111:00111:01011:01101:01110:[]
newNodes	00111:01011:01101:01110:[]
newPairs	(00111,01111):(01011,01111):(01101,01111):(01110,01111):[]
OPEN	(00111,01111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(01111,11111):(11111,null):[]
3.	
NODE	00111
close	(00111,01111)
moveGen	10111:01111:00011:00101:00110:[]
newNodes	00011:00101:00110:[]
newPairs	(00011,00111):(00101,00111):(00110,00111):[]
OPEN	(00011,00111):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(00111,01111):(01111,11111):(11111,null):[]
4.	
NODE	00011
close	(00011,00111)
moveGen	10011:01011:00111:00001:00010:[]
newNodes	10011:00001:00010:[]
newPairs	(10011,00011):(00001,00011):(00010,00011):[]
OPEN	(10011,00011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(00011,00111):(00111,01111):(01111,11111):(11111,null):[]
5.	
NODE	10011
close	(10011,00011)
moveGen	00011:11011:10111:10001:10010:[]
newNodes	10001:10010:[]
newPairs	(10001,10011):(10010,10011):[]
OPEN	(10001,10011):(10010,10011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(10011,00011):(00011,00111):(00111,01111):(01111,11111):(11111,null):[]
6.	
NODE	10001
close	(10001,10011)
moveGen	00001:11001:10101:10011:10000:[]
newNodes	11001:10101:10000:[]
newPairs	(11001,10001):(10101,10001):(10000,10001):[]
OPEN	(11001,10001):(10101,10001):(10000,10001):(10010,10011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(10001,10011):(10011,00011):(00011,00111):(00111,01111):(01111,11111):(11111,null):[]
7.	
NODE	11001
close	(11001,10001)
moveGen	01001:10001:11101:11011:11000:[]
newNodes	01001:11000:[]
newPairs	(01001,11001):(11000,11001):[]
OPEN	(01001,11001):(11000,11001):(10101,10001):(10000,10001):(10010,10011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(11001,10001):(10001,10011):(10011,00011):(00011,00111):(00111,01111):(01111,11111):(11111,null):[]
8.	
NODE	01001
close	(01001,11001)
moveGen	11001:00001:01101:01011:01000:[]
newNodes	01000:[]
newPairs	(01000,01001):[]
OPEN	(01000,01001):(11000,11001):(10101,10001):(10000,10001):(10010,10011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(01001,11001):(11001,10001):(10001,10011):(10011,00011):(00011,00111):(00111,01111):(01111,null):[]
9.	
NODE	01000
close	(01000,01001)
moveGen	11000:00000:01100:01010:01001:[]
newNodes	00000:01100:01010:[]
newPairs	(00000,01000):(01100,01000):(01010,01000):[]
OPEN	(00000,01000):(01100,01000):(01010,01000):(11000,11001):(10101,10001):(10000,10001):(10010,10011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(01000,01001):(01001,11001):(11001,10001):(10001,10011):(10011,00011):(00011,00111):(00111,01111):(01111,null):[]
10.	
NODE	00000
GOAL	00000
OPEN	(00000,01000):(01100,01000):(01010,01000):(11000,11001):(10101,10001):(10000,10001):(10010,10011):(00001,00011):(00010,00011):(00101,00111):(00110,00111):(01011,01111):(01101,01111):(01110,01111):(10111,11111):(11011,11111):(11101,11111):(11110,11111):[]
CLOSED	(01000,01001):(01001,11001):(11001,10001):(10001,10011):(10011,00011):(00011,00111):(00111,01111):(01111,null):[]
PATH	11111:01111:00111:00011:10011:10001:11001:01001:01000:00000:[]