

Optical Character Recognition

Lecture 3



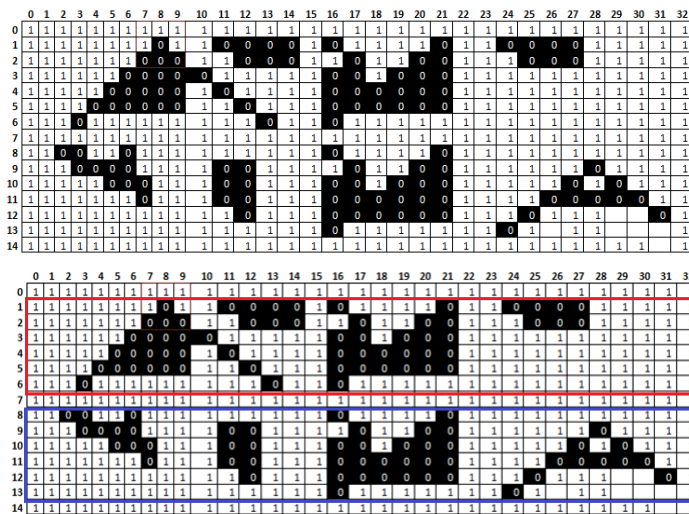
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Lecture-3 Agenda

- Algorithms
 - Connected component extraction
 - Line segmentation
 - Columns segmentation
 - Image read and write
 - Unicode file read and write

Exercise Discussion

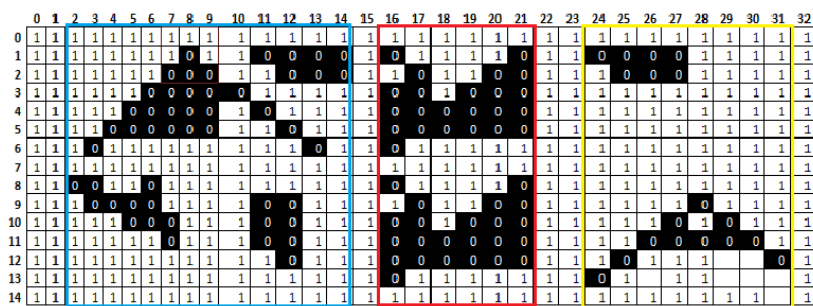


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3

Exercise Discussion

- 2. Column segmentation

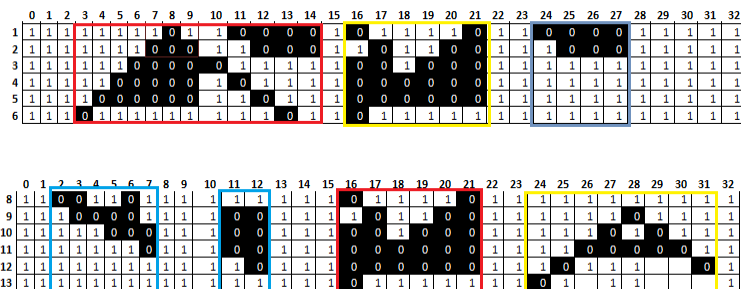


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4

Exercise Discussion

- 3. Line Segmentation into columns

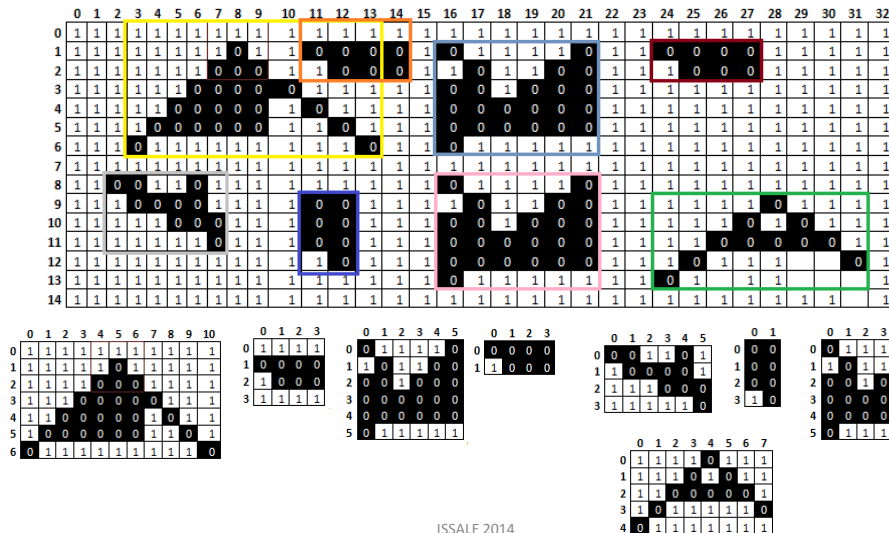


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5

Exercise Discussion

- 4. Connected Component Information



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6

Connected Component Extraction

- We need
 - (1) Point(x,y)
 - (2) Stack of Points
 - (3) Array of Point
 - (4) LEFT
 - (5) TOP
 - (6) RIGHT
 - (7) BOTTOM

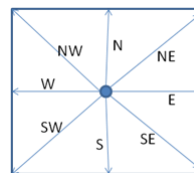
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7

Connected Component Extraction

- We need
 - (1) Point(x,y)
 - (2) Stack of Points
 - (3) Array of Point
 - (4) LEFT
 - (5) TOP
 - (6) RIGHT
 - (7) BOTTOM



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
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14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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8

• Pass -1

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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Stack	Points
9,17	8,16

• Pass -2

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
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2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	
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5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.9	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	
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Stack	Points
10,16	9,17
10,17	8,16

• Pass -3

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
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8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	0	1	1	1	1	1	1	
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13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
11,16	10,16
11,17	9,17
10,17	8,16

• Pass-4

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
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4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
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9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	
10	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	
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14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
12,16	11,16
12,17	10,16
11,17	9,17
10,17	8,16

• Pass-5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
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2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
10	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0	0	1	1	1	1	1	1	0	1	0	1	1	1	1		
11	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.4	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.4	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	12,16
13,16	11,16
12,17	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

13

• Pass-6

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1		
2	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
10	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1		
11	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.4	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	13,16
	12,16
	11,16
12,17	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

14

• Pass-7

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	12,17
	13,16
	12,16
12,18	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-8

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	12,18
	12,17
	13,16
	12,16
12,19	11,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-9

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1
2	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	
3	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	
10	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.4	0.4	0.4	0	1	1	1	1	0	0	0	0	0	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.4	0	1	1	1	0	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	12,19
	12,18
	12,17
12,20	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-10

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	0	1	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	
10	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.4	0.4	0.4	0	1	1	1	1	0	0	0	0	0	1	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0	1	1	1	0	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	12,21
	12,20
	12,19
	12,18
	12,17
11,21	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-11

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1		
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1		
10	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	0.8	0.4	1	0	0.4	0.4	1	1	1	1	1	0	1	0	1	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	1	0	0	0	0	0	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,21
	12,21
	12,20
	12,19
	12,18
10,21	12,17
10,20	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-12

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1	1		
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0.8	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1		
10	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	0.8	0.4	1	0	0.4	0.4	1	1	1	1	1	0	1	0	1	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	1	1	1	1	0	0	0	0	0	1	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1		
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,21
	12,21
	12,20
	12,19
	12,18
10,21	12,17
10,20	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-13

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Stack	Points	
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	0	1	1	1	1		10,21
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1		11,21	
3	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1		12,21	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1		12,20	
5	1	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1		12,19	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		12,18	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		9,21	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1		9,20	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.4	0.4	1	1	1	1	1	1	0	1	1	1	1		10,20	
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0.4	0.8	1	1	1	1	1	0	1	0	1	1	1		11,20	
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	1	0	0	0	0	1	1		11,19		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1		11,18	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1		11,17	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		10,17

• Pass-14

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Stack	Points					
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							
1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1		9,21					
2	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1		10,21					
3	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1		11,21					
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1		12,21					
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1		12,20					
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		12,19					
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		12,18					
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.4	1	1	1	1	1	1	1	1	1	1	1		8,21					
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.4	0.8	1	1	1	1	1	1	0	1	1	1	1		9,20					
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0	0.4	0.8	1	1	1	1	1	0	1	0	1	1	1		10,20					
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	1	0	0	0	0	0	1	1		11,20					
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1		11,19					
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1		11,18					
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		11,17				
																																							10,17	
																																								8,16

• Pass-15

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	
2	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1		
3	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	0.8	1	1	0.4	0.8	1	1	1	1	1	1	1	0	1	1	1	1		
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	0.8	0.4	1	0	0.4	0.8	1	1	1	1	1	0	1	0	1	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	1	0	0	0	0	1	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
9,20	12,17
10,20	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-16

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1		
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	1	0	1	1	1	1	1		
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	0.8	0.4	1	0.4	0.4	0.8	1	1	1	1	1	0	1	0	1	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	1	0	0	0	0	1	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
10,19	12,17
10,20	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

• Pass-17

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1	1		
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	1	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	1	0	1	1	1	1	1	1		
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.4	0.8	1	1	1	1	1	0	1	0	1	1	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	1	0	0	0	0	0	1	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	12,17
10,20	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

25

• Pass-18

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1		
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1		
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	0	0	1	1	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	0	1	1	1	1	1	1	1	1	
10	1	1	1	1	1	0	0	0	1	1	0	0	1	1	1	1	0.8	0.4	1	0.8	0.8	0.8	1	1	1	1	0	1	0	1	1	1	1	1	1		
11	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0.8	0.4	0.4	0.4	0.4	0.8	1	1	1	0	0	0	0	0	0	1	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	12,17
13,16	13,16
11,20	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

26

• Pass-19

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1		
2	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1		
3	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
4	1	1	1	1	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1		
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
8	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1		
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	0	1	1	1	1	1	1		
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.8	0.8	1	1	1	1	0	1	0	1	1	1	1	1		
11	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0.8	0.4	0.4	0.4	0.8	0.8	1	1	1	1	0	0	0	0	0	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	12,17
	13,16
	12,16
11,19	11,16
11,18	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

27

• Pass-20

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	1	1	0	0	0	0	1	1	1	1	1	
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.9	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	0	1	1	1	1	1	1	1	
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.8	0.8	1	1	1	1	0	1	0	1	1	1	1	1	1	
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.4	0.8	0.8	0.8	1	1	1	1	0	0	0	0	0	1	1	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	12,17
	13,16
	12,16
	11,16
11,18	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

28

• Pass-21

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	1	0.8	0.8	1	1	1	1	1	1	0	1	1	1	
10	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.8	0.8	0.8	1	1	1	1	1	0	1	0	1	1	
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.8	0.8	0.8	0.8	0.8	1	1	1	1	0	0	0	0	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	0	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,18
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	13,16
	12,16
	11,16
	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

29

• Pass-22

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	
3	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.8	0.8	0.8	1	1	1	1	1	0	1	1	1	1	
10	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.8	0.8	0.8	1	1	1	1	0	1	0	1	1	1	
11	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0.8	0.4	0.8	0.8	0.8	0.8	0.8	1	1	1	1	0	0	0	0	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	0	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,18
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	13,16
	12,16
	11,16
	10,16
11,17	9,17
10,17	8,16

ISSALE 2014

• Pass-23

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1	
2	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	0	1	1	1	0	0	0	1	1	1	1	1	
3	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	1	1	0	1	1	1	1	
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.8	0.8	1	1	1	1	1	0	1	0	1	1	1	1	
11	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	1	0	0	0	0	0	1	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Stack	Points
	11,17
	11,18
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	13,16
	12,16
	11,16
	10,16
	9,17
10,17	8,16

ISSALE 2014

31

• Pass-24

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1	
2	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	
3	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
6	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	0.8	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0.8	1	1	0.8	0.8	1	1	1	1	1	0	1	1	1	1	1	
10	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0.8	0.4	1	0.8	0.8	0.8	1	1	1	1	1	0	1	0	1	1	1	
11	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	1	0	0	0	0	0	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	1	1	1	0	1	1	1	1	1	1	1	
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

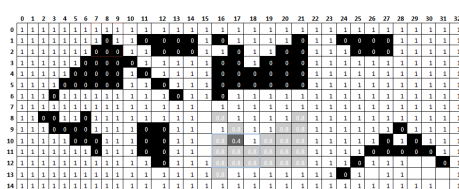
Stack	Points
	11,17
	11,18
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	13,16
	12,16
	11,16
	10,16
	9,17
10,17	8,16

ISSALE 2014

32

CC Coordinate Information

- Top?
- Bottom?
- Left?
- Right?
- CC Height?
- CC Width?
- CC Size (Height)

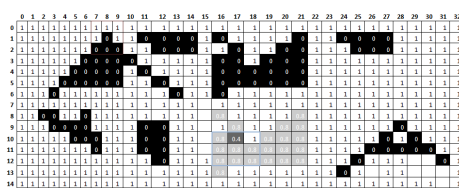


Stack	Points
	11,17
	11,18
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	13,16
	12,16
	11,16
	10,16
	9,17
10,17	8,16

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CC Coordinate Information

- Top=
- Bottom=
- Left=
- Right=
- CC Height=
- CC Width=
- CC Size (Height)=



Stack	Points
	11,17
	11,18
	11,19
	11,20
	10,20
	10,19
	9,20
	8,21
	9,21
	10,21
	11,21
	12,21
	12,20
	12,19
	12,18
	12,17
	13,16
	12,16
	11,16
	10,16
	9,17
10,17	8,16

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Populating CC Matrix

- NewX=X-TOP
- NewY=Y-LEFT
- Connected Component

TOP	LEFT
8	16

	0	1	2	3	4	5
0	0	1	1	1	1	0
1	1	0	1	1	0	0
2	0	0	1	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	1	1	1	1	1

Points	New Points (X-TOP, Y-LEFT)
10,17	2,1
11,17	3,1
11,18	3,2
11,19	3,3
11,20	3,4
10,20	2,4
10,19	2,3
9,20	1,4
8,21	0,5
9,21	1,5
10,21	2,5
11,21	3,5
12,21	4,5
12,20	4,4
12,19	4,3
12,18	4,2
12,17	4,1
13,16	5,0
12,16	4,0
11,16	3,0
10,16	2,0
9,17	1,1
8,16	0,0

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35

Segmentation

- Pseudo Code of Line Segmentation
- Pseudo Code of Column Segmentation

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36

Assignment

- Write CCs according to the Naming
- CC Name=
Image_Name_T_Tvalue_B_Bvalue_L_Lvalue_R
_RValue
- Write Line Segmentation Code
- Write Column Segmentation Code