

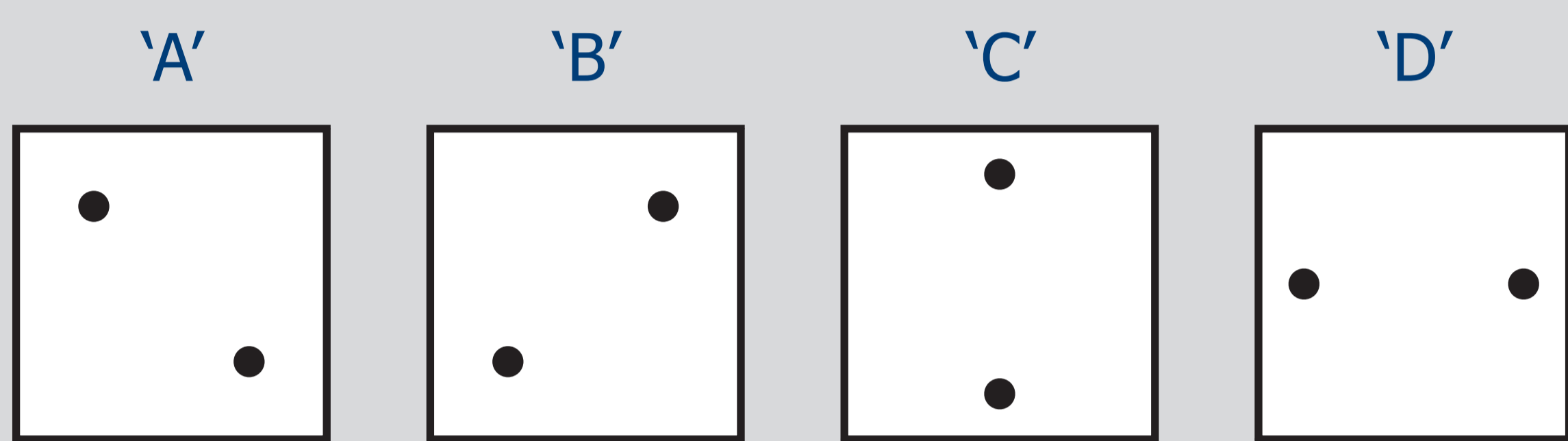
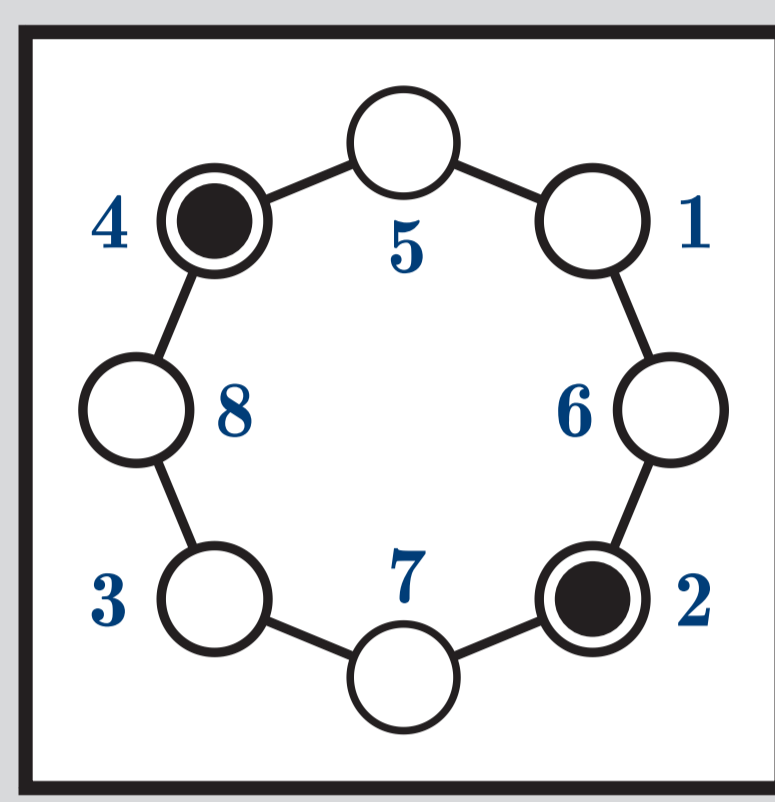


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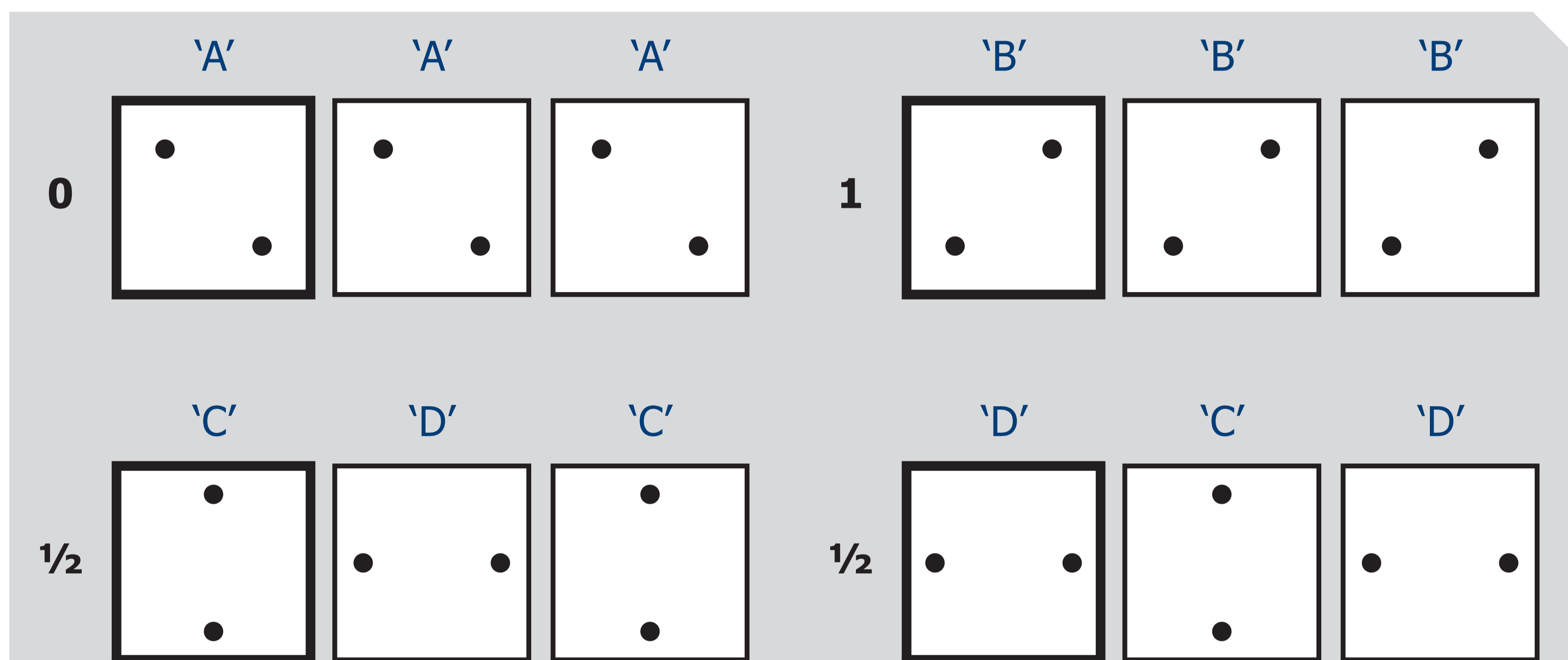
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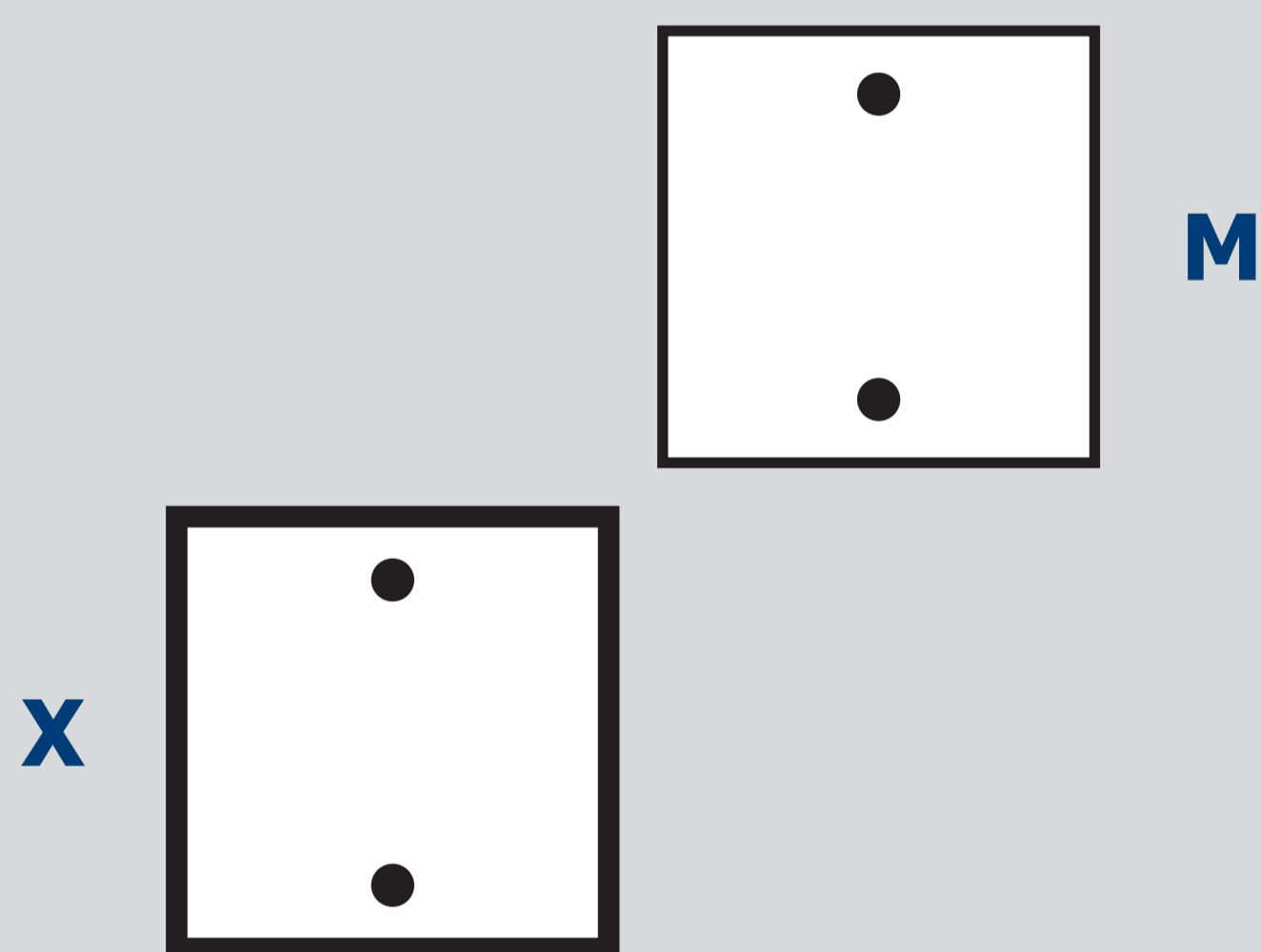
Towards the bottom-up concept: extended quantum-dot cellular automata



The extended quantum-dot cell with eight quantum dots separated with tunneling barriers. Owing to electrostatic repulsion the two electrons tend to align along one of four distinct configurations that correspond to their maximum spatial separation.

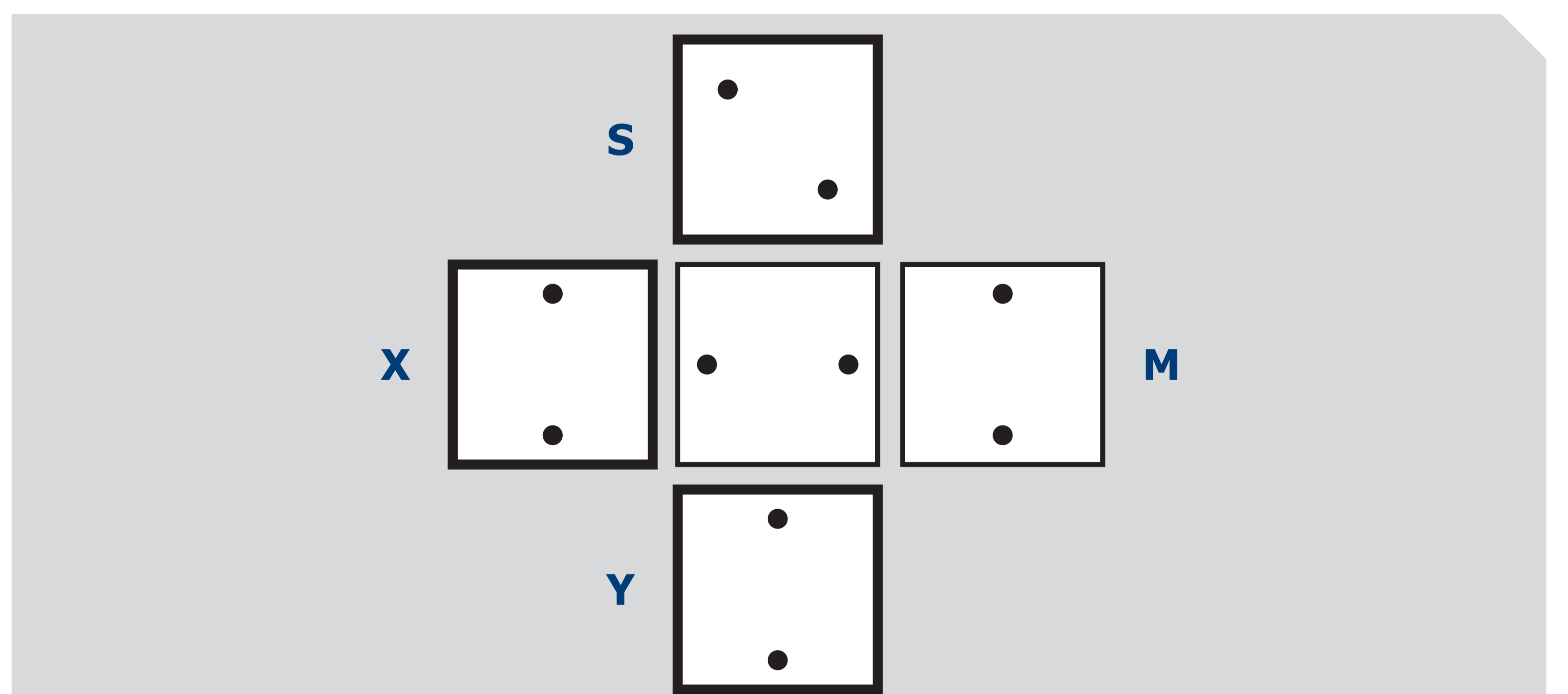


The three-state wire. Propagation of logic values 0, $\frac{1}{2}$ and 1 over a line of extended quantum-dot cells.



	X	M
0	'A'	'B'
$\frac{1}{2}$	'C'	'C'
$\frac{1}{2}$	'D'	'D'
1	'B'	'A'

The inverter. The logic values 0 and 1 enforced to the driver appear inverted in the target cell, whereas the logic value $\frac{1}{2}$ retains the same configuration.



S	X	Y	M
'A'	'A'	'A'	'A'
'A'	'A'	'B'	'A'
'A'	'A'	'C'	'A'
'A'	'A'	'D'	'D'
'A'	'B'	'A'	'D'
'A'	'B'	'B'	'B'
'A'	'B'	'C'	'C'
'A'	'B'	'D'	'D'
'A'	'C'	'A'	'A'
'A'	'C'	'B'	'C'
'A'	'C'	'C'	'C'
'A'	'C'	'D'	'D'
'A'	'D'	'A'	'D'
'A'	'D'	'B'	'D'
'A'	'D'	'C'	'A'
'A'	'D'	'D'	'D'

S	X	Y	M
'B'	'A'	'A'	'A'
'B'	'A'	'B'	'D'
'B'	'A'	'C'	'C'
'B'	'A'	'D'	'D'
'B'	'B'	'A'	'B'
'B'	'B'	'B'	'B'
'B'	'B'	'C'	'C'
'B'	'B'	'D'	'D'
'B'	'C'	'A'	'C'
'B'	'C'	'B'	'B'
'B'	'C'	'C'	'C'
'B'	'C'	'D'	'D'
'B'	'D'	'A'	'D'
'B'	'D'	'B'	'D'
'B'	'D'	'C'	'C'
'B'	'D'	'D'	'D'

S	X	Y	M
'C'	'A'	'A'	'A'
'C'	'A'	'B'	'C'
'C'	'A'	'C'	'C'
'C'	'A'	'D'	'A'
'C'	'B'	'A'	'C'
'C'	'B'	'B'	'B'
'C'	'B'	'C'	'C'
'C'	'B'	'D'	'B'
'C'	'C'	'A'	'C'
'C'	'C'	'B'	'C'
'C'	'C'	'C'	'C'
'C'	'C'	'D'	'C'
'C'	'D'	'A'	'A'
'C'	'D'	'B'	'B'
'C'	'D'	'C'	'C'
'C'	'D'	'D'	'D'

S	X	Y	M
'D'	'A'	'A'	'D'
'D'	'A'	'B'	'D'
'D'	'A'	'C'	'A'
'D'	'A'	'D'	'D'
'D'	'B'	'A'	'D'
'D'	'B'	'B'	'D'
'D'	'B'	'C'	'B'
'D'	'B'	'D'	'D'
'D'	'C'	'A'	'D'
'D'	'C'	'B'	'D'
'D'	'C'	'C'	'C'
'D'	'C'	'D'	'D'
'D'	'D'	'A'	'D'
'D'	'D'	'B'	'D'
'D'	'D'	'C'	'D'
'D'	'D'	'D'	'D'

S	X	Y	M
0	0	0	'A'
0	0	$\frac{1}{2}$	'A'
0	0	1	'A'
0	$\frac{1}{2}$	0	'A'
0	$\frac{1}{2}$	$\frac{1}{2}$	'C'
0	$\frac{1}{2}$	1	'C'
0	1	0	'D'
0	1	$\frac{1}{2}$	'C'
0	1	1	'B'

S	X	Y	M
1	0	0	'A'
1	0	$\frac{1}{2}$	'C'
1	0	1	'D'
1	$\frac{1}{2}$	0	'C'
1	$\frac{1}{2}$	$\frac{1}{2}$	'C'
1	$\frac{1}{2}$	1	'B'
1	1	0	'B'
1	1	$\frac{1}{2}$	'B'
1	1	1	'B'

The majority gate. When the whole spectrum of electron configurations is used the majority gate does not behave as desired. Nevertheless, marking electron configuration 'D' as a processing configuration results in only two erroneous states. These, however, are the only two in which the target cell ends up in configuration 'D' (the processing configuration) and both have notable symmetrical properties.

