

DNA density-dependent uptake of DNA origami-based two-or three-dimensional nanostructures by immune cells

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The manuscript was written through contributions of all authors. All authors have given approval to the final version of the manuscript.

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Supplementary Table S1. Staple lists of five DNA nanostructures.

Rec180	
Name	Sequences (5' → 3')
Rec180-1	TTTTGGGGTGAACATATTGACTGAGAGATTTA
Rec180-2	TAGAATGAGGTTGGCAAGTTAACAGACTTTAC
*Rec180-3	TGTTATTGTCTTTTGGGCTTCTATATACATTT
Rec180-4	TTCTTTCCCATTTTGTCTACAAGTCTGTTTC
Rec180-5	TAAATCTTGATATTTACTCACTGT
Rec180-6	TTATTTATGCTTAATGGAATTATACAGCCAGT
Rec180-7	AGGTATCAAAAATACATATGATAAATTAAGAT
Rec180-8	AGGTCACCTGTAAAATGCCATATTCAAAAATC
Rec180-9	TGAGCTCTTCTAAAAAAGAAAAAGTCTCCATT
Rec180-10	CTATCCCCATTTTTTACATATAAATTTTGTGT
Rec180-11	TCAGGTCACAGAGAGCTGAACAAAATTCCATACCACATTT
Rec180-12	TATGCACATGGGTAGTGTGATAAAAACAGCTT
Rec180-13	CTTTAAGGATTCAATTAGTTCTTATTTTTCAT
Rec180-14	TTTCCCATTACATATATCAATGGGAATATTTT
Rec180-15	CCTGTTTTACTCTATTTTATCAGCGTGGAACA
Rec180-16	TCACATGCCTAAACCCTCATGGCTAAGCTCTC
Rec180-17	CAGCAGTTGTTTAATGTACTAAGCAAATCAGC
Rec180-18	TCTAAAAGTGATGGCATGCTTCTATGTACTAA
Rec180-19	TAGACTTAGTCATAAGAAATTTTCTATGGCC
Rec180-20	GTATGGTATAACAATCTTTTCTTTTTTTAAAA
Rec180-21	AAGCTCTCCAGATGAAAACCAAGAAATATGTT
Rec180-22	TTAATGAACCTAGAGATAATTTTAATCTATCA
Rec180-23	GCTCTCATCAACCTGTTGATAGTATATTATTT
Rec180-24	TGAAGTCTATTTAAAGTTTTGCCTATCATCAT
Rec180-25	GACTTTGATAATTCACCTGGAATTTTATATTTC
Rec180-26	ATGTTTGAGGTTTCCTAGGTTATCCAGGGCAA
Rec180-27	AACTTAAAAAAGAATATATAAGGCAATCTCT
Rec180-28	GTGTTGCACATATTACAATTCTCTAAGTTTTA
Rec180-29	TGACTTTTTACTGATTTGTAAGACCAATGATA
Rec180-30	ATAAGTCTATCTGTTCAAATTTTTTCTCATG
Rec180-31	TGCTCCTCTCATGTTTCATGTACTAATGTACT

Rec180-32	GGTTTAAACAATAAAATTAATATTCTCATGT
Rec180-33	TAAGAAAATAGCCTCTAAGGTTTTTTACTGGG
Rec180-34	ATAATCTGAATATTTTCTGTCATTCTCTACAC
Rec180-35	TTATTTTCTTAATGGTTTTTTAAGTGGTTAG
Rec180-36	ACTCTCTCAGTCCTCTCACCCACACAGGGTGA
Rec180-37	GTCATGGCCCACCTCACTCCACTCAGTCATCC
Rec180-38	TATTTCTCCACAGATGTTACTTAGCTGAAGTT
Rec180-39	GTTCTCTGGTTTAATTGTCAACTACACATCCC
Rec180-40	TGTAATGATGTATTATACTATGCATGGTCAACTTGGCCAT
Rec180-41	AGGGTGTTTGCCTGCTGGGTCTCTCTCAGTCC
Rec180-42	GCTCATCCCCCAGGGCTGCTCTCCTTTTAAA
Rec180-43	GGTGGAGAAGGGCCACTGGCATCCCCTTTTAA
Rec180-44	AATTAAGCTAATTTAGTGTATATGTTCTTTTT
Rec180-45	ATGCCAATATTTCTGAGATTGAGTGTCTAGTT
Rec180-46	CATCATCTCTGACCACACCTGCAAAGCATACA
Rec180-47	TCCACAAAATCTCTGGAGAACCCCAACCTGTC
Rec180-48	AGTCCAGAACTCAACAGCTCCAGCCCTGTTTT
*Rec180-49	TGGCTGTGAGCACTGGGACAGCACGATATACT
Rec180-50	GGACTGCTGAGATGAACCCAAGCC

Rec90

Name	Sequences (5' → 3')
Rec90-1	TGAACATATTATTTATTGGGTAGTCTATCATA
Rec90-2	TTTAAAGGGTTTCATGTGAACATAACCCTCATGGCTAATG
Rec90-3	TAAATCTTGATATTTAGTGGAACATTCTTTCC
*Rec90-4	TGTTATTGTCTTTTGGGCTTCTATATACATTT
Rec90-5	ATGTTTAATACTAAGCTCTCATGTTTGAACAAAGAAAAAA
Rec90-6	AACTGAACCTTTTACTGGGGTGT
Rec90-7	CCCCAACCTTTTAATTAAGCAGGGCCACTGGC
Rec90-8	TCCCATTTGTTATTTTCTAAAAGATTTTCTCT
Rec90-9	AGGTCATTACATATACATCATTT
Rec90-10	TTAGGACTCATTTCTATGGCCTGACTTTTCTTATCTTTCAT
Rec90-11	TAGAATGAGGTTGGCAAGGTATCAATTCAATTAGTTCATTTT TTCAT
Rec90-12	CAATGTTTTTTCTCTAATTTAGTGATTTTTGT

Rec90-13	ACCTGATGCTTCTATATAAAATGCCATTTACA
Rec90-14	CAGAGAGCTGAACAAAGAGATTTATTGACTGAATTCCATACCACATT T
Rec90-15	TGCAAATAATTTTTTACTGATTTGACTTAGCC
Rec90-16	ATGCAATCTAATTAACAATCTTTTATTCACTGGAATTTTTTTGTGTGT TGATAAATGTGATAAAGACTTTACAGTTAACAAACAGCTTTTTTTGGG
Rec90-17	G
Rec90-18	AATGTACTTAGAGATAATTTTAATAATACATA
Rec90-19	GTTTTATATAAAATTATCATGTTT
Rec90-20	CAGAACTCAACAGCTCCAGCCACATACTATGC
Rec90-21	AGAGTTTCATGGTTTTTTAATTTT
Rec90-22	CTGTTCAATATATGCAATGATAGTTTATACTA
Rec90-23	GAGTTGTATCTCTGATTTCTGAGAGATTATTT
Rec90-24	ATCCCTGAAGTTGGTGGAGACCACTCTCTCCCCAGGGCTGGTTTTA A
Rec90-25	AAAAAGATTCAATGGGTCTGTTTCTCTACAAGAATATTTT
Rec90-26	ACTCAGCAGTGACATCATCTCTGACCACACCT
Rec90-27	TAAGCATATTACAATTGTCTTGATGGCTTGAT
*Rec90-28	GCAAAGTCATCCTCCACAAAATCTCTGGAGAA
Rec90-29	CATGGCCACAGATGTTTAAGACTTCTTTTTAT
Rec90-30	AGTATGTACTAAGCTCATATAAATCAGCAACT
Rec90-31	AAAATCCTTTAAGGAATAAGATCAGCAGTTCA
Rec90-32	TAAGAAATTTAAAGTTTTGCCTTCTAAAAAAG
Rec90-33	AAAGTGCACCTCTCACCCACACCCACCACCTGG
Rec90-34	CCTTTTATTTTTTACATATAAATATTATCAGCCTCACTGTCTATCCCC
Rec90-35	TCCTGGACTGCTGAGATGAACAGGTACAGCTC
Rec90-36	TGCAGATATCCCTGGCTGTGAGCACTGGGACAGCACTGGTCCTATAG T
Rec90-37	TGCACAGCGCCAGTTCACATGCCTAAGCTCTC
Rec90-38	AAGAATATGTCTCTCAGGGCAAACCTCACTCC
Rec90-39	ATCCAGTCCACAGTTGCCTGCTGGATAAGGCT
Rec90-40	TGTACTAAGCTCTCATTTTTAAGGTTTCCTAGTCTGCCAC
Rec90-41	TTTTAATAAATTGTCAACTACCTGTGTCAGTC
Rec90-42	CATTTTGTGAGCTCTACTCTATTTATTTCCC
Rec90-43	TGTTTTTCTCCATTTAGACTTATACTTTGTGG

Rec90-44	GAAGTACAGATGAAAACCAAGACATTAATGGAATTATAAATATGTT TC
Rec90-45	CTAGTTTTTTTTCTGTTTGAGTCA
Rec90-46	AATCTATAGCCTCTAAGCTCTCCAATCTCTGT

Rec50

Name	Sequences (5' → 3')
Rec50-1	GCAGGAGATGTTACTTACTTCTTTTTATAATC
Rec50-2	TTTTATTTCTGTCATTCAGTCATAA
Rec50-3	TGTTGCTTCTATATTA AAAATGCCATATACAA
*Rec50-4	TTGTTATTGTCTTTTGGGCTTCTATATACATT
Rec50-5	CTGAAGTCTACTGGGGTGTTGCAA
Rec50-6	GTTTAATTTCTAATTTAGTGTATATTGTCTAG
Rec50-7	TTAGAATGAGGTTGGCGGTATCAATTCAATTAGTTCTTTTTTTTCATA
Rec50-8	ATATATAACTCAGGGCAA ACTCTCCTCCACTC
Rec50-9	TAAATCTTGATATTTAGTGGAACATTCTTTC
Rec50-10	TTTCTCTTTTTTTTAATTTTAAAA
Rec50-11	AACCTGTCAATTAAGCCACGCCACTGGCATCC
Rec50-12	AGATTACAATTCTCTTTTGATGGCATGATAGT
Rec50-13	AAGGTTTTTCATGTACTAACTAAACCCTCATGGCTAATGTACT
Rec50-14	GGACTTTGTATGGCCTGACTTTTCTTAATGGTCATCTGT
Rec50-15	GGACTGCTGAGATGAACAGGGTGAGCTCATCC
Rec50-16	AAAAGATCCAATGGGTCTGTTTCTTCTACAAGAATATTT
Rec50-17	GTTTTTCTATTTAGACTTATAATTTGTGGTTA
Rec50-18	GTGAACATTATTTATTGGGTAGTGTATCATAT
Rec50-19	AGTCCTCTGTTGCCTGCTGGGTCTGGCTTTTA
Rec50-20	ATGTACTAAGCTCTCAAATCAGCAACTTAAAT
Rec50-21	GGTCACTTACATATATATCATTTT
Rec50-22	GTACTAAGAGATAATTTTAATTAAATACATAT
*Rec50-23	AGTCATCCTCCACAAAATCTCTGGAGAACCCC
Rec50-24	ACTCAACAGCTCCAGCCACATCCCATGCCAAT
Rec50-25	GAAATTTTAAGTTTTGCCTTCTCCAAAAAAGA
Rec50-26	CTAAGCTCTCATGTTTAAGGTTTCCTAGGTTACCACAAAG
Rec50-27	AAATCCTTTAAGGAAAGATCAGCAGTTCAACC
Rec50-28	GATATACTTGGCTGTGAGCACTGGGACAGCACTGGTCAACTAGTGAG

	T
Rec50-29	CTGAAGTTGGTGGAGACCACCTCATCCCCAGGGCTGCTCTTAAGTT
	T
Rec50-30	GCACAGCTAGTTCACATGCCTTAGCTCTCATG
Rec50-31	TCAAATTTTGCAATGATAGTTCTCACTATGCA
Rec50-32	AGTACAGATGAAAACCAAGACAGCCTAATGGAATTATAAATATGTT
	TCAG
Rec50-33	TGCATCCTCTAAGGTTTCCAATCTCTGTCATG
Rec50-34	GATAAATCTGATAAAGACTTTACAAAGTTAACAAACAGCTTTTTTGG
	G
Rec50-35	AATATTTTCGTCAACTACCTGTTTTAGTCCAGA
Rec50-36	TGCACACACACCCACACCCAAGCCCTGGTCCT
Rec50-37	CAGAGAGCTGAACAAAGAGATTTATATTGACTGAATTCATACCACA
	TTT
Rec50-38	AGCATACACATCATCTCTGACCACACCTGCAA
Rec50-39	CCATTTTGGAGCTCTACTCTATTTATTTCCCT
Rec50-40	TTTAATGAAGCTCTCATGTTTGAACAATAAAAAAAAAAGA
Rec50-41	CCCATTGTTTTTCTAAAAGATTTATCTCTACA
Rec50-42	TGTATTATTGATTTCTGAGATTGAATTTAGAG
Rec50-43	TTTTATTTTTTACATATAAATATTATCAGCCTCACTGTCTATCCCC
Rec50-44	TATAAGAAATTAATATATGTTTAAT
Rec50-45	AATCTAATTAACAATCTTTTCTTCACTGGAATTTTTTTGTGTGTAT
Rec50-46	ATATTTTTTTACTGATTTGTAAGAGCCTTTT

Rec0

Name	Sequences (5' → 3')
Rec0-1	GTATGGTATAACAATCATAAGTCT
Rec0-2	GGGCAAACGGCACCACCTGGTCCTGTGACATCATCT
Rec0-3	AGGTATCAAAAATACATATGATAAATTAAGAT
Rec0-4	TTCTTTCCCATTTTGTGCACTGGTTTTTAATT
Rec0-5	TATGCACATGGGTAGTGTGATAAAAACAGCTTTTTT
Rec0-6	AAGGTTTTAAGTTGGGTGCTTCTATGTA
Rec0-7	TGTTGTCATCTCTCCCCAGGGCTGTTATCCT
Rec0-8	GCCATATTCAAAAATCCTTTAAGGATTCAATT
Rec0-9	TCTTTTTATCTATGGCCAAATTTTTCTCTACAC

Rec0-10	TTAATATTTCTACCACCTCACTCCACTCAGCATGTCAGTC
Rec0-11	TCATGTTTCATGTACTCTCCTCTGCCACAAAGGTCTCTCA
Rec0-12	TTTTTTAAATTTTTTACTGATTTGTTGAGTTT
*Rec0-13	CAGAACTCAACAGCTCCAGCCACATCCCTGGC
Rec0-14	CTGTCATTAATCTGCATATTACAATATATGCA
Rec0-15	TCTAAAAGTGATGGCAGTGTTGCAAATATTTT
Rec0-16	TAGACTTAGTCATAAGTGACTTTTCTTAATGG
Rec0-17	AGTTCTTATTTTTCATAGGTCACTTGTA AAAAT
Rec0-18	ATCTCTGGAGAAAGTTAACAGACTTTAC
Rec0-19	GACTTTGATAATTCACTGGAATTTTATATTTC
Rec0-20	CAGTCCTGAAGCTCTCTCATGGCTAATGTACT
Rec0-21	AAGCTCTCCAGATGAAAACCAAGAAATATGTT
Rec0-22	TTATTTATGCTTAATGGAATTATACAGCCAGT
Rec0-23	CCATGATGGCCCTCCTGATATTTACTCACTGT
Rec0-24	ATCTCTGTCTCTCACCCACACCCAATCCTCCACAAA
Rec0-25	TTTCCCATTACATATATCAATGGGAATATTTT
Rec0-26	TGAAGTCTATTTAAAGTTTTGCCTATCATCAT
Rec0-27	AAGCCACATCTCTGATTTCTGAGATAAGACT
Rec0-28	TAAATCTTATAGTGAGTACTATGC
Rec0-29	TTTAAAGGAAATCAGCTACTAAGCTCTCATGT
Rec0-30	CCTGTTTTACTCTATTTTATCAGCGTGGAACA
Rec0-31	ATGATAGTGATGTTACTTAGCCTT
Rec0-32	TAAAATTAATATTTTAAAGGTTTCCTAGGCTCTCCA
Rec0-33	TAGAATGAGGTTGGCACCCCAACCTACAGCTC
Rec0-34	GGGGTGAACATAGCAAAGTCAGCCAGGG
Rec0-35	TCACATGCCTAAACCCATGTTTGAACAA
Rec0-36	CTCATGTGAATTGTCAACTACCTGCAACTTGG
Rec0-37	AAGAATATGCATCCCTGAAGTTGGTGGAGCTA
Rec0-38	CAATGTTTTAATGATTATTTAGAGATTTTTGT
Rec0-39	CTAGTTTTTTTTTAAAATTTTCTTTGTGGTTAG
Rec0-40	TTAATGAACTTAGAGATAATTTTAATCTATCA
Rec0-41	TGTGAGCACTGGGACATCTACAAGTCTGTTTC
Rec0-42	TGAGCTCTTCTAAAAAAGAAAAAGTCTCCATT
Rec0-43	ATTTAGTGTTCTCTTTACTTTATAAGAAAAAA
Rec0-44	CTATCCCCATTTTTTACATATAAAATTTTGTGT

Rec0-45	CAGCAGTTGTTTAATGAACTTAAATAGCCTCT
Rec0-46	CTGACCACACCTTTGACTGAGAGATTTA
*Rec0-47	TGTTATTGTCTTTTGGGCTTCTATATACATTT
Rec0-48	TCAGGTCACAGAGAGCTGAACAAAATTCCATACCACATTT
Rec0-49	CTAAGCTCTCATCAACCTGTTGATAGTATATTATTT
Rec0-50	ATCCAGTCCATGGCAGGGCCACTGATAAGGCT

Rec50/50

Name	Sequences (5' → 3')
Rec5050-1	TGATATTTAGTGGAACATTCTTTCCTCTATTT
Rec5050-2	CTTAGAGATAATTTTATGTACTAAGCTCTCATAAATTAAT
Rec5050-3	CTGCTGAGATGAACAGGGTGACATAGACCACC
Rec5050-4	TTCTATGGAGACTTCTTTGATAGTT
Rec5050-5	CAACAGCTCCAGCCACATCCCTGGAGTTGTAT
*Rec5050-6	ACCACACCTGCAAAGTCATCCTCCAGCCACAG
Rec5050-7	ATTTAAAGTTTTGCCTAGAAATTTTCTCTACTTCTGTCA
Rec5050-8	GTTCAAATAAATAAGT
Rec5050-9	CTAAGCTCTATCCTCAGGGCAAAC
Rec5050-10	TTGTAAAATTTTCATAGGTCACCTGTCTTTTG
Rec5050-11	GATTTGTACCTGACTTTTCTTAATAGGACTTT
Rec5050-12	ATTGTCAATTTAGTGTATATGCAATTTATAATCTGCATA
Rec5050-13	TTCTCTAACTACCTGTTTTAATTAACAAAATC
Rec5050-14	TGTCAGGCACCACCTGTCCAGTCCTCTCACCCCTGCTGGG
Rec5050-15	ATGTTTAAATTAAGATCCCTTTAAG
Rec5050-16	CTCTCCCCCTCAGCATAACAGCTCAGTCCTGGA
Rec5050-17	TTATACTGCTCTTAGTTTTTAATAT
Rec5050-18	GAGTCATATCTCCATTTCCCTGTTT
Rec5050-19	GAAAATACACTTTACAGGTATCAAAGGTTGGC
Rec5050-20	TCTCTCAGTCCTGCTCCTCTGCC
Rec5050-21	TTCTAAAACCTGTTTCTGAGCTCTACCATTTTG
Rec5050-22	ATTGACTGAATTCATACCACATTAGAGAGCT
Rec5050-23	ATGGCAGGTCCCTGAAGTTGGTGGCATCTCTG
Rec5050-24	TAATTCACCTGGAATTTTCTTTTCTTTGTGGTTGGTTTTT
Rec5050-25	CAGATGAAAACCAAGACCTCATGGCTAATGTATTCATGTA
Rec5050-26	TCTGGAGAACCCCAACCTGTCAGTAATGTTTA

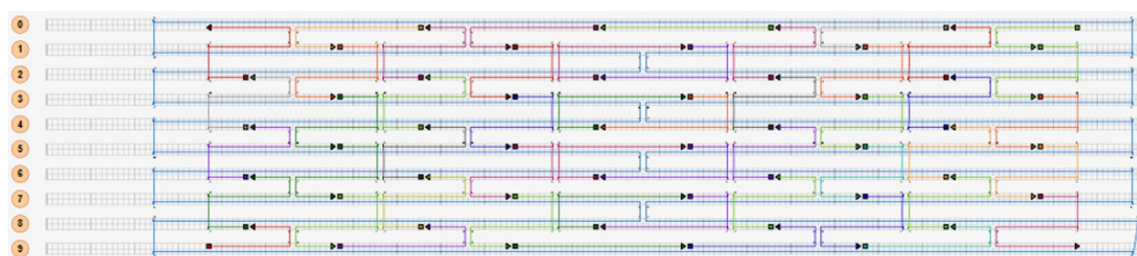
Rec5050-27	AACTAAACCAGCCAGTTATATGCAC
Rec5050-28	GAACAAAGGGAATTATAAATATGTTGAAGTA
Rec5050-29	TGATAAAGATATGATAAATCTATCCACATGC
Rec5050-30	ATGTGGCAGCCACTTACTTAGCCTTTATAAGAAAAAAAA
Rec5050-31	TCTCATGTCTAAGCTC
Rec5050-32	AATTTTAATTTTGTCTATCATGTGT
Rec5050-33	TCCTAGGTTTCATGTTTGAACAATAGTTTAATG
Rec5050-34	CTCTGATTGCAGATATACTATGCCCCAGAACT
Rec5050-35	ATTAACAATTTTGTGTGTTCCCTTT
Rec5050-36	TATTTTTTTCCTGTCTATCCCCACTAAATCT
Rec5050-37	AATGATTATGGCCCTCCTATAGTGCTGTGAGCACTGGGAC
Rec5050-38	TTACAATTGGGTGTTGCAAATATTACTGAAGT
Rec5050-39	TTCTACAAGAATATTTTGTATTACATATAT
Rec5050-40	TATCAGCCACATATAAATATATTTAGACTTA
Rec5050-41	GTTTATTTTGCCACTTACAAAAATAGCAGTT
Rec5050-42	CAACCTGTTGATTCTACATGCTAGTATGTACTCTAAGGTT
Rec5050-43	GAATATATGCAACTTAAATAGCCTAAGCTCTC
Rec5050-44	ATAAATCAAAGGCTTTTTCTCTGTC
Rec5050-45	CTTGATGGTATTATTTTTTTTCCCA
Rec5050-46	TCACTCCACAGGGCTGCTCTCCAAAAAGGTTTAAAGGTT
*Rec5050-47	GGCTTCTATATACATTTTAGAATGTTCAATTA
Rec5050-48	TATACTATTCTGAGATTGAGTTTCGTTTTATTTTTTACT
Rec5050-49	AAGTTAACAAACAGCTTTTTTGGGGGGTAGTG
Rec5050-50	AGCTTAATAGATTTATTATTTATTGTGAACAT
Rec5050-51	CAATGGGTAAGAAAAAGATCATCACTAAAAG

All ODNs have a phosphodiester backbone. Modification with Alexa Fluor 488 at the 5'-end is indicated by asterisk (*).

Fig. S1

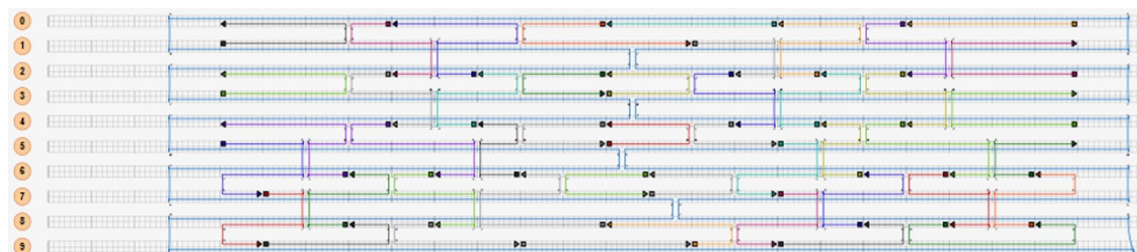
caDNAno diagrams and helix arrangements of five DNA nanostructures. The blue strands are the scaffold. (a) Rec180, (b) Rec90, (c) Rec50, (d) Rec0, and (e) Rec50/50.

(a) Rec180



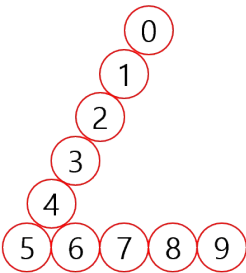
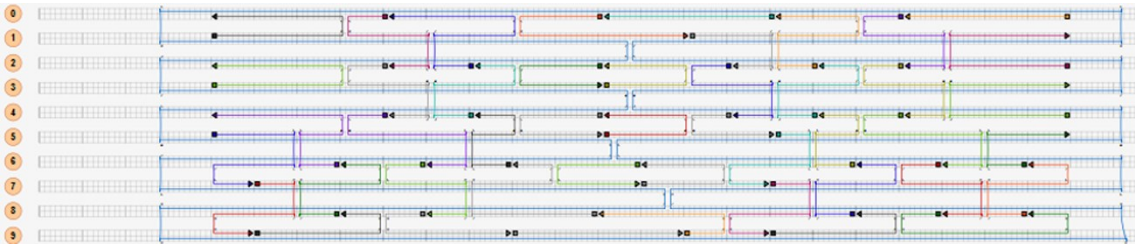
0 1 2 3 4 5 6 7 8 9

(b) Rec90

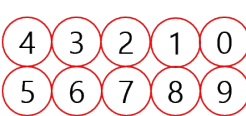
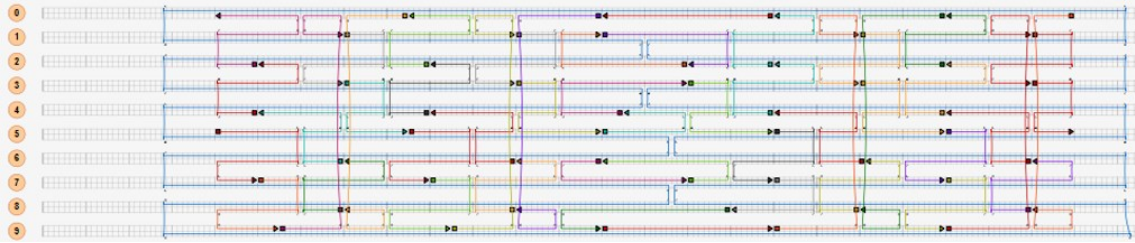


0
1
2
3
4
5 6 7 8 9

(c) Rec50



(d) Rec0



(e) Rec50/50

