Learning...

Epoch 1

Epoch 2

Epoch 3

Epoch 4

Epoch 5

Epoch 6

Epoch 7

Epoch 8

Epoch 9

Epoch 10

Done.

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Parameters:

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Epochs: 10

Grid size: 10x10

h (neighbourhood function) type: bubble

alpha function type: simple\_div

Starting vicinities: 3

Random seed: 0

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Quantization error: 0.36547654237995775

Topographic error: 0.05185185185185185

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Resulting grid:

(showing input vectors' classes)

1 2 3 4 5 6 7 8 9 10

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_1\_|\_\_1\_|

2 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_2\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

3 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_22\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

4 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_1\_|

5 |\_\_\_\_|\_33\_|\_\_\_\_|\_\_\_\_|\_\_2\_|\_\_2\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

6 |\_\_3\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

7 |\_\_\_\_|\_33\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

8 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

9 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|

10 |\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_\_\_\_|\_11\_|

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Training statistics:

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Grid after training:

[[[5.08179235 2.42445073 4.17465311 1.4914698 ]

[5.32667173 2.48917468 4.17446974 1.42553889]

[5.39772724 2.51313031 4.18680167 1.3931933 ]

[5.42715512 2.53128339 4.14514243 1.35769755]

[5.32138434 2.47841988 3.81164893 1.17550208]

[5.17731125 2.77963363 2.76996676 0.71871722]

[5.00229879 2.898484 2.29640266 0.53759311]

[4.89819917 2.96367502 1.96565345 0.41601143]

[4.73311152 3.11578125 1.42505757 0.20359546]

[4.72471356 3.1176345 1.40508979 0.19334001]]

[[5.4997425 2.5669377 4.62306231 1.64443553]

[5.57746518 2.57182562 4.46114681 1.52549644]

[5.60262655 2.59398367 4.41649566 1.48909809]

[5.59405773 2.59476929 4.3268927 1.4394181 ]

[5.50259173 2.53405181 3.9383358 1.21083852]

[5.26040109 2.80930257 2.88211267 0.76921318]

[5.06190241 2.93905377 2.37362259 0.56797455]

[4.96796356 2.99866004 2.07479152 0.45914852]

[4.77947697 3.15089622 1.4861583 0.23123001]

[4.75206516 3.15858317 1.41666228 0.19623395]]

[[5.72232103 2.65167633 4.8318434 1.72888262]

[5.84838239 2.71572637 4.60516295 1.57626312]

[5.84029013 2.72248166 4.5398259 1.53151093]

[5.83747686 2.719727 4.48719726 1.50189846]

[5.86995041 2.72584974 4.29942596 1.37639359]

[5.56304087 2.87083625 3.38835845 0.98779722]

[5.27240984 3.0694162 2.54349323 0.64491678]

[5.20438173 3.11145012 2.32012317 0.56918517]

[4.91082969 3.29582392 1.45807313 0.21936896]

[4.89652149 3.30420635 1.41315784 0.19679046]]

[[5.88643181 2.71047003 4.97065397 1.77608725]

[5.94637217 2.73789402 4.69594747 1.61012243]

[5.94468525 2.75394202 4.61994426 1.57146936]

[5.94407658 2.75029481 4.55842802 1.52880101]

[5.97717134 2.78814423 4.37414527 1.41731766]

[5.67034839 2.89075137 3.55345038 1.05961175]

[5.34601995 3.06630232 2.6728743 0.70388315]

[5.25489411 3.11827964 2.37698302 0.59693144]

[4.92399615 3.31010629 1.45772386 0.22993722]

[4.91025445 3.31815684 1.41458691 0.20825268]]

[[6.12967605 2.89655606 5.38831031 2.0106328 ]

[6.15388586 2.86567109 5.03031334 1.78357515]

[6.14367266 2.87194683 4.94854642 1.73981241]

[6.14441969 2.8765452 4.87562653 1.69191981]

[6.13172908 2.86953011 4.50860848 1.4675379 ]

[5.89466532 2.95250736 3.87879846 1.19559937]

[5.51756595 3.19660442 2.77531207 0.74994144]

[5.4391223 3.2521725 2.48975053 0.64623154]

[5.05688315 3.46560884 1.46630279 0.23512346]

[5.04583441 3.47726056 1.4224221 0.21306711]]

[[6.21184004 2.94629556 5.51552675 2.09183025]

[6.24999554 2.93326372 5.17599171 1.87355154]

[6.23100139 2.93136834 5.08243562 1.8220593 ]

[6.2339481 2.9423883 4.98294918 1.76494039]

[6.24734859 2.9495532 4.56847886 1.50797073]

[6.06639245 3.03557254 4.07432646 1.29548551]

[5.55414479 3.30383445 2.63157911 0.7062392 ]

[5.50436771 3.33143664 2.46475825 0.63820049]

[5.09391492 3.48225444 1.47386223 0.23650161]

[5.08364239 3.49408233 1.4306665 0.21479776]]

[[6.50025896 2.99993594 5.67201179 2.12312037]

[6.53181811 3.01347241 5.28314678 1.8764082 ]

[6.50045526 2.997272 5.20674756 1.82178952]

[6.49132776 2.99372781 5.12796573 1.77268554]

[6.56051737 3.05557496 4.68980738 1.51335368]

[6.48705705 3.1074965 4.44786435 1.40409749]

[6.04647636 3.27640916 3.38836493 0.98841552]

[6.01149634 3.29847281 3.25857683 0.93558463]

[5.15203031 3.52527553 1.4739084 0.24591478]

[5.14262217 3.53842016 1.42962307 0.22384254]]

[[6.70188606 3.07522945 5.86350996 2.16431151]

[6.71478298 3.07692877 5.44431745 1.90400142]

[6.69959579 3.06627674 5.38371084 1.86190521]

[6.64257968 3.05700933 5.22813526 1.79185628]

[6.64695153 3.0828354 4.6944866 1.50087312]

[6.55096003 3.13131842 4.43659177 1.38760053]

[6.06449006 3.29311307 3.36255459 0.97543446]

[5.98473617 3.34997426 3.12146598 0.88374843]

[5.17987374 3.5575891 1.47285098 0.25148568]

[5.1711438 3.56978618 1.43175802 0.23100454]]

[[6.81436614 3.10256582 5.95083666 2.17964431]

[6.8113592 3.09982904 5.47368214 1.89524888]

[6.7814177 3.08887615 5.4175178 1.86941586]

[6.72693649 3.08739438 5.28484403 1.81674911]

[6.70559786 3.10126499 4.74529487 1.52578209]

[6.70424948 3.12852928 4.65070009 1.46440721]

[6.16731372 3.29897863 3.48939222 1.01562033]

[6.08932419 3.3569356 3.25477389 0.92650926]

[5.1814201 3.58425434 1.43259646 0.22594063]

[5.1814201 3.58425434 1.43259646 0.22594063]]

[[6.85693566 3.13080092 6.01177968 2.20731118]

[6.89993236 3.13064473 5.62753216 1.95952523]

[6.86576251 3.12070424 5.56612036 1.93879579]

[6.80894586 3.11883028 5.44476036 1.89507607]

[6.86812075 3.14282623 4.7602964 1.48829245]

[6.85486768 3.15664252 4.69014549 1.43742375]

[6.60285703 3.27106404 4.12539744 1.23230568]

[6.46443513 3.35914375 3.75718468 1.09162384]

[5.56322647 3.67534311 2.07181075 0.50811207]

[5.33796474 3.77302829 1.48964103 0.27431267]]]

Winner neurons together with a list of pairs indicating

associated input vectors' classes and their numbers:

(0, 8): [[1, 1]]

(9, 9): [[1, 2], [1, 4]]

(0, 9): [[1, 3]]

(3, 9): [[1, 5]]

(4, 5): [[2, 6]]

(2, 4): [[2, 7], [2, 10]]

(4, 4): [[2, 8]]

(1, 5): [[2, 9]]

(6, 1): [[3, 11], [3, 13]]

(4, 1): [[3, 12], [3, 15]]

(5, 0): [[3, 14]]