CLAIMS

1. A method of generating three-dimensional (3D) spikes, the method comprising:

receiving a signal comprising time-series data;

generating a first two-dimensional (2D) grid, wherein generating the first 2D grid comprises:

mapping segments of the time-series data to respective positions of the first 2D grid; and

generating, for each position of the first 2D grid, a spike train corresponding to the respective mapped segment;

generating a second 2D grid, wherein generating the second 2D grid comprises performing, for each position of the second 2D grid, a mathematical operation on the spike train of the corresponding position of the first 2D grid;

generating a third 2D grid, wherein generating the third 2D grid comprises performing spatial filtering on the positions of the second 2D grid; and

generating a 3D grid based on a combination of the first 2D grid, the second 2D grid, and the third 2D grid, wherein the 3D grid comprises one or more 3D spikes, and wherein, for each position of the 3D grid, a respective voltage-spike (VS) converter of a 3D array of VS converters generates the one or more 3D spikes.

2. The method of claim 1, wherein the mathematical operation comprises a Laplacian operation.

3. The method of claim 2, wherein the Laplacian operation is performed using a single pass through the time-series data.

4. The method of claim 1, further comprising:

segmenting the time-series data at regular intervals.

5. The method of claim 1, wherein the segments of the time-series data are partly overlapping.

6. The method of claim 1, wherein generating the 3D grid comprises:

concatenating the first 2D grid, the second 2D grid, and the third 2D grid; and

generating the one or more 3D spikes.

7. The method of claim 6,

wherein, for each position of the first 2D grid, a respective VS converter of a 2D array of VS converters generates the respective spike train.

8. A computer processor comprising:

a segmenter configured to:

receive a signal comprising time-series data; and

map segments of the time-series data to respective positions of a first two-dimensional (2D) grid;

a spike generator configured to generate, for each position of the first 2D grid, a spike train corresponding to the respective mapped segment;

a mathematical operator configured to perform, for each position of a second 2D grid, a mathematical operation on the spike train of the corresponding position of the first 2D grid;

a spatial filter configured to generate a third 2D grid by performing spatial filtering on the second 2D grid; and

a 3D grid generator configured to generate a 3D grid based on a combination of the first 2D grid, the second 2D grid, and the third 2D grid, wherein the 3D grid comprises one or more 3D spikes, and wherein, for each position of the 3D grid, a respective voltage-spike (VS) converter of a 3D array of VS converters generates the one or more 3D spikes.

9. The computer processor of claim 8,

wherein the spike generator comprises a 2D array of VS converters, and

wherein, for each position of the first 2D grid, a respective VS converter of the 2D array generates the respective spike train.

10. The computer processor of claim 9, further comprising:

a memory coupled with the VS converters of the 2D array, the memory configured to store the first 2D grid,

wherein the 3D grid generator accesses the first 2D grid from the memory.

11. The computer processor of claim 10, wherein the memory comprises an accumulator, the computer processor further comprising:

a filter arranged between the accumulator and the mathematical operator.

12. The computer processor of claim 8, wherein the mathematical operator is a Laplacian operator comprising:

a plurality of differential operators, each differential operator corresponding to a respective position of the second 2D grid; and

a summer.

13. The computer processor of claim 11, wherein the Laplacian operator is configured to perform a Laplacian operation using a single pass through the time-series data.

14. The computer processor of claim 8, wherein the segmenter is configured to:

segment the time-series data at regular intervals.

15. The computer processor of claim 8, wherein the segments of the time-series data are partly overlapping.

16. A method comprising:

generating, for each position of a first two-dimensional (2D) grid, a spike train corresponding to a respective segment of time-series data mapped to the position;

performing, for each position of a second 2D grid, a mathematical operation on the spike train of the corresponding position of the first 2D grid;

performing spatial filtering on the positions of the second 2D grid to generate a third 2D grid; and

generating a 3D grid based on a combination of the first 2D grid, the second 2D grid, and the third 2D grid, wherein the 3D grid comprises one or more 3D spikes, and wherein, for each position of the 3D grid, a respective voltage-spike (VS) converter of a 3D array of VS converters generates the one or more 3D spikes.

17. The method of claim 16,

wherein, for each position of the first 2D grid, a respective VS converter of a 2D array of VS converters generates the respective spike train.

18. The method of claim 16, wherein the mathematical operation comprises a Laplacian operation.

19. The method of claim 16, wherein the segments of the time-series data are partly overlapping.