The LIDAR generates scans at a certain rate. Each scan is an array of length N of float values representing distance measurements. N is typically in a range of ~[200, 1000] measurements, and it is fixed. Measured distances are typically in a range of [0.03, 50] meters. Each time a scan is received, it will be passed on to the filters. Each filter object have an update method, that takes a length N array of ranges and returns a filtered length N array of ranges.

● A range filter

The range filter crops all the values that are below range\_min (resp. above range\_max), and replaces them with the range\_min value (resp. range\_max)

● A temporal median filter

The temporal median filter returns the median of the current and the previous D scans:

y i(t) = median(x i(t), x i(t 1), ... , x i(t D))

where x and y are input and output lengthN scans and i ranges from 0 to N 1. The number of previous scans D is a parameter that should be given when creating a new temporal median filter. Note that, although the update method will receive a single scan, the returned array depends on the values of previous scans. Note also that the for the first D scans, the filter is expected to return the median of all the scans so far. Here is a short example of the result (Y) of a temporal median filter object with D =3 for an input (X) of dimension N=5, for the first five updates:

T (time) X (input scan) Y (return of the update)

0 [0., 1., 2., 1., 3.] [0., 1., 2., 1., 3.]

1 [1., 5., 7., 1., 3.] [0.5, 3. , 4.5, 1. , 3. ]

2 [2., 3., 4., 1., 0.] [ 1., 3., 4., 1., 3.]

3 [3., 3., 3., 1., 3.] [ 1.5, 3. , 3.5, 1. , 3. ]

4 [10., 2., 4., 0., 0.] [ 2.5, 3. , 4. , 1. , 1.5]