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If one can assume that drop size distributions can be effectively described by a generalized gamma function [1], one can estimate this function on the basis of the distribution of time intervals between drops hitting a certain area. The arrival of a single drop is relatively easy to measure with simple consumer devices such as cameras or piezoelectric elements. Here we present an open-hardware design for the electronics and statistical processing of an intervalometer that measures time intervals between drop arrivals.

The specific hardware in this case is a piezoelectric element in an appropriate housing, combined with an instrumentation op-amp and an Arduino processor. Although it would not be too difficult to simply register the arrival times of all drops, it is more practical to only report the main statistics. For this purpose, all intervals below a certain threshold during a reporting interval are summed and counted. We also sum the scaled squares, cubes, and fourth powers of the intervals. On the basis of the first four moments, one can estimate the corresponding generalized gamma function and obtain some sense of the accuracy of the underlying assumptions.

Special attention is needed to determine the lower threshold of the drop sizes that can be measured. This minimum size often varies over the area being monitored, such as is the case for piezoelectric elements. We describe a simple method to determine these (distributed) minimal drop sizes and present a bootstrap method to make the necessary corrections.

Reference
[1] Uijlenhoet, R., and J. N. M. Stricker. "A consistent rainfall parameterization based on the exponential raindrop size distribution." Journal of Hydrology 218, no. 3 (1999): 101-127.