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# Design and fabrication of a low cost automated tipping bucket rain gauge with locally available materials

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Rainfall measurement is a key requirement in some modern industrial and agricultural fields. Hydrological forecasting, flood control, landslide prediction and many hydrological models require accurate precipitation observations. Traditional or conventional rain gauges need time-consuming human mediation due to their manual operation. Due to the simplistic structure, ability to easily interface with an electronic controlling system, and relatively inexpensive design, the Tipping Bucket Rain Gauge (TBRG) has become one of the most popular automated rain gauges. However, for accuracy of data many such devices are required in a specific geographical area, a network of automated rain gauges. Since an automated rain gauge is an expensive instrument, a significant investment is required to install a high-resolution rain gauge network. The objective of this research is to design and fabricate a low-cost automated tipping bucket rain gauge using locally available materials and to enhance the durability with the aid of optical sensors to count the tipping bucket oscillations. The automated measuring, readout and data recording functions are controlled by a NodeMCU. The real-time updates of the rainfall information are displayed on a Liquid Crystal Display (LCD) attached to the rain gauge, and the same updates are sent to the "Thingspeak" online server. The fabricated system was tested under different conditions and maximum uncertainty was estimated as 2.09%. Accordingly proposed rain gauge can be implemented as a cost-effective solution to measure the rainfall remotely under the aforesaid uncertainty.

**Keywords:** Tipping bucket, Rain gauge, Precipitation, Rainfall, High-resolution

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