

A technique for TDOA mapping based non-contact source localization using a multi-point laser interferometer sensor

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High-voltage industrial structures often experience discharge when the health of their internal electrical components deteriorates, and the structures can be seriously damaged due to discharge with large intensity. Thus, determination of its occurrence and location is necessary. In the case of large structures, it is difficult to specify the inspection area because they have a large area. Therefore, searching the location is important as well as detecting the occurrence. This paper introduces the development of sensor and technique for estimating the location of source occurring random times and locations such as discharge. First, an optical fiber-type laser interferometer sensor was developed, and an optical system was configured to simultaneous measurement of three points. Also in this study, the discharge phenomenon was simulated by a simple impact using a metal rod. Before detecting the impact location, a mapping process was implemented by applying impact to the grid node point in the inspection area and measuring the signal. Information of TDOA(time difference of arrival) for each node point location was then extracted through signal processing. After the impact, the same signal processing was applied to the measured signal to obtain TDOA information. The impact location was finally estimated by comparing TDOA information of the measured signal and the mapped data. Several experiments were performed to verify the developed sensor and localization technique. A steel plate with a thickness of 0.5 mm and area of 300 X 300 mm was used for the experiment. As results of the experiments, it was confirmed that source localization was possible with less than 4 mm error in average.