

https://dspace.org/

A feasibility study on the three-dimensional reconstruction of high voltage and lightning descharge channels using digital images

Liu, Yu-Chieh (Jessie)

2012-07-19
http://hdl.handle.net/10539/11695

Downloaded from a DSpace repository. https://dspace.org/

Abstract

The work presented extends and contributes to research in the visualisation of discharge channels with an expectation to extend to lightning channels. Although previous work in this area has produced three-dimensional (3D) information of discharge channels, there has not been a method to visualise the channel and the characteristics of its shape in a 3D environment. In the research presented, photographed discharge channels are reconstructed in a virtual interactive 3D environment.

It is found that single-channelled discharges produce models that correctly follow the inferred channel paths from the photograph datasets. Single-channelled discharges have also been verified in the controlled laboratory environment, providing confidence in the two-image reconstruction algorithm. The algorithm is shown to fail for an angular separation of cameras less than 15°, which produces thicker channel segments. It is further shown that branched discharge channels can produce models that correctly follow the channel paths. If images are not accurately normalised for lens correction and slight camera tilts, missing segments and duplication of reconstructed branches are evident in the models. Furthermore, it is shown that the algorithm also fails for image perspectives with angular separations less than 15°, additional redundant branches are produced in addition to thicker channel segments.