INTELLIGENT SYSTEM FOR DIFFERENTIATION OF NON-REFLECTIVE FIBER FAULTS IN OTDR TRACES

by

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ABSTRACT

Optical Time Reflectometry (OTDR) is a technique which widely used in fiber networks for fault detection and localization. OTDR trace analyzing had become a very difficult task, especially under low SNR conditions. During the early stages, many of these traces were inspected by specialists in laboratories or by man-made algorithms which were operating in embedded systems. At present, there are available systems for identifying known and unknown events using machine learning algorithms and using Deep neural networks. There are mainly two types of fault categories: reflective and non-reflective. Most of the automated techniques had been intent on distinguishing reflective faults such as longitudinal connector-misalignment, perpendicular fiber cut etc. However, there are few CNN models intent on identifying non-reflective faults and unknown faults as well. Non-reflective faults doesn't give any reflection and they only concern on attenuation of Rayleigh backscattering. Non-reflective faults are not detected by the prevalent OTDR analysis based on only OTDR trace since the faults generate similar OTDR traces for every Non-reflective fault. Therefore, those techniques faced many difficulties in differentiating between some of the non-reflective faults. In this research, I am proposing a CNN Model to differentiate two major non-reflective fault types; fiber bend and lateral connector misalignment. This approach is based on the verified fact that the wavelength is having a direct propotional relationship with bending loss while the lateral connector misalignment is having indirect proportionality. As per the results, model has been able differentiate aforementionedtwo fault types while successfully achieving above 95% training and validation accuracy, 0.6% training loss, and 10% validation loss. To tackle the manual inspection of non-reflective fault identification, I believe that this research will help to bring OTDR event detection to a highly precise,accurate and fast detecting stage while bringing fault detection to a fully automated level at the sametime.

Keywords - *2D-CNN, OTDR, SNR, REFLECTIVE, NON-REFLECTIVE*