

Assessment of environmental infringement for power transmission lines

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This study proposes an innovative approach to assess environmental infringement in the inspection of overhead transmission lines. The proposed method not only integrates information from novel sensors but also addresses three essential aspects to overcome the existing limitations in environmental infringement with an unmanned aerial vehicle. First, a real-time 3D mapping method is introduced through coordinate transformation and probabilistic down-sampling method by fusing data from GPS, IMU, and 3D LiDAR. Second, a prognosis method for the transmission line is proposed for extracting the sag and temperature of transmission lines by utilizing a 3D LiDAR and thermal camera equipped with an automatic gimbal tracking system. Furthermore, the sag at specific temperatures is estimated to prognosis the health of transmission lines under extreme conditions due to thermal expansion. Third, an evaluation method for environmental infringement is proposed by integrating the 3D environmental map, sag, and temperature data of transmission lines. This method assesses encroachments between transmission lines and their surroundings in compliance with Korea Electronic Power Cooperation (KEPCO) regulations under both measurements and extreme conditions. Systematic analyses conducted in real-world environments validate the effectiveness of the proposed method. Consequently, the proposed method not only prognoses the health status of transmission lines but also evaluates their environmental compliance.