Road Cracking Area Percentage Evaluation Using Airborne Hyperspectral Imagery

Background:
Although the airborne platform is efficient and economic compared to the popular ground vehicles in road condition survey (RCS), studies on applying it in RCS are limited. A former study on airborne hyperspectral imagery (AHI) tried to tie a band ratio to pavement condition index. Its result proved the value in AHI, yet pointed out the difficulty in quantitative evaluation.

Methods:
This study further explored the application of AHI in RCS, and fully took advantage of the entire spectrum shape, rather than a ratio. Aiming at the cracking area percentage (CAP) on the asphalt paved arterial road system in the City of Surrey, BC, the studied AHI was used to build a road CAP spectral library (SLib). The SLib contains five road classes separately with 0~1%, 2~5%, 6~10%, 11~30%, and 31~100% CAP. Then the study selects arterial roads in ten locations covering ~20 sq km to classify using the SLib.

Results:
The selected spectra well depict the reflectance increase from newer roads with less CAP to older roads with more CAP. But, the accuracies of the classification are only ~20%. By combining the first three classes and last two classes, the classification accuracy grows approximately 10~60% depending on the test tiles.

Discussion & conclusion:
Two conclusions are made: (1) the great misclassification among neighbor classes, e.g. class 0~1%, 2~5%, and 6~10, as well as 11~30% and 31~100% are often misclassified with each other; and (2) the result tends to overestimate the CAP.

Interdisciplinary reflection:
The engineering survey and geographic analysis contributed in extracting CAP from AHI. Its result is instructional in urban modeling and planning.