Turfgrass Evaluation

Under image analysis

Using machine learning model

Historically, field experiments investigating turfgrass have been evaluated by visual ratings. Although relevant information may result from such evaluations, final inferences may be questionable because of the subjective nature in which the data were collected. Recently, digital image analysis techniques have been developed that allow researchers to objectively measure turfgrass characteristics such as percent ground cover and turf color. The analysis techniques select pixels representing turf within an image so that they may be further processed for the evaluation of interest. Under normal use of the image analysis, each image must be processed manually, which may take several minutes and limit large-scale use of the techniques.

The objective of the follow work was to develop a methodology to be capable of automated on the batch analysis of an unlimited number of digital images. First is to collect the turfgrass images and the manually evaluation result for these images by experts. We use the images and the evaluation result as the training data to train a machine learning model, and use that trained model to do the automated evaluation for the new image of turfgrass.

The challenge is to design proper features retrieved from images those are close to what an expert is looking for while doing the manually evaluation. The follow work focus on both color feature such as greenness and color percentage and texture feature that calculated by Gabor filter and Gray Level Co-Occurrence Matrix.

As long as we have features retrieved from the image to represent the turfgrass, we can use the evaluated images to train a model. Our feature space would not have a lot of dimensions, which allow us to work on some simple machine learning models. The follow work would train pre-evaluated data on some simple linear models such as LARS regression and Ridge regression. Also some complicated linear model such as Bayesian regression. And then we will train on some non-linear models like Support Vector Machine and Neuro Network. Cross-validation will be used to choose the most fit machine learning model trained on the pre-evaluated images. There we get the automated capability to evaluate turfgrass.