Identifying greenery, urban cover and water bodies using google street view images and visualizations

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Github: https://github.com/Ektagavas/urban-treecover-gsv

ID: 21

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Overview

This project aims at the study and reproduction of results of the paper Urban Forestry & Urban Greening to better understand the concept of greenery identification along streets using Google Street View (GSV) images, also extending the developed algorithms for identification of water bodies and urban cover along the streets in a city.

Goals

1. To find the measure of greenery/tree coverage in a designated city using data collected from Google Street View API.
2. To research the possibilities of resolving the issues of reducing the misclassification of artificial green features in the images.
3. To explore the possibility to get and use remotely sensed images along with google street view images to calculate the measure of greenery of a site
4. To devise a similar algorithm to identify water bodies and urban cover in the designated city.
5. To create visualizations for the identified greenery, water bodies, and urban cover.

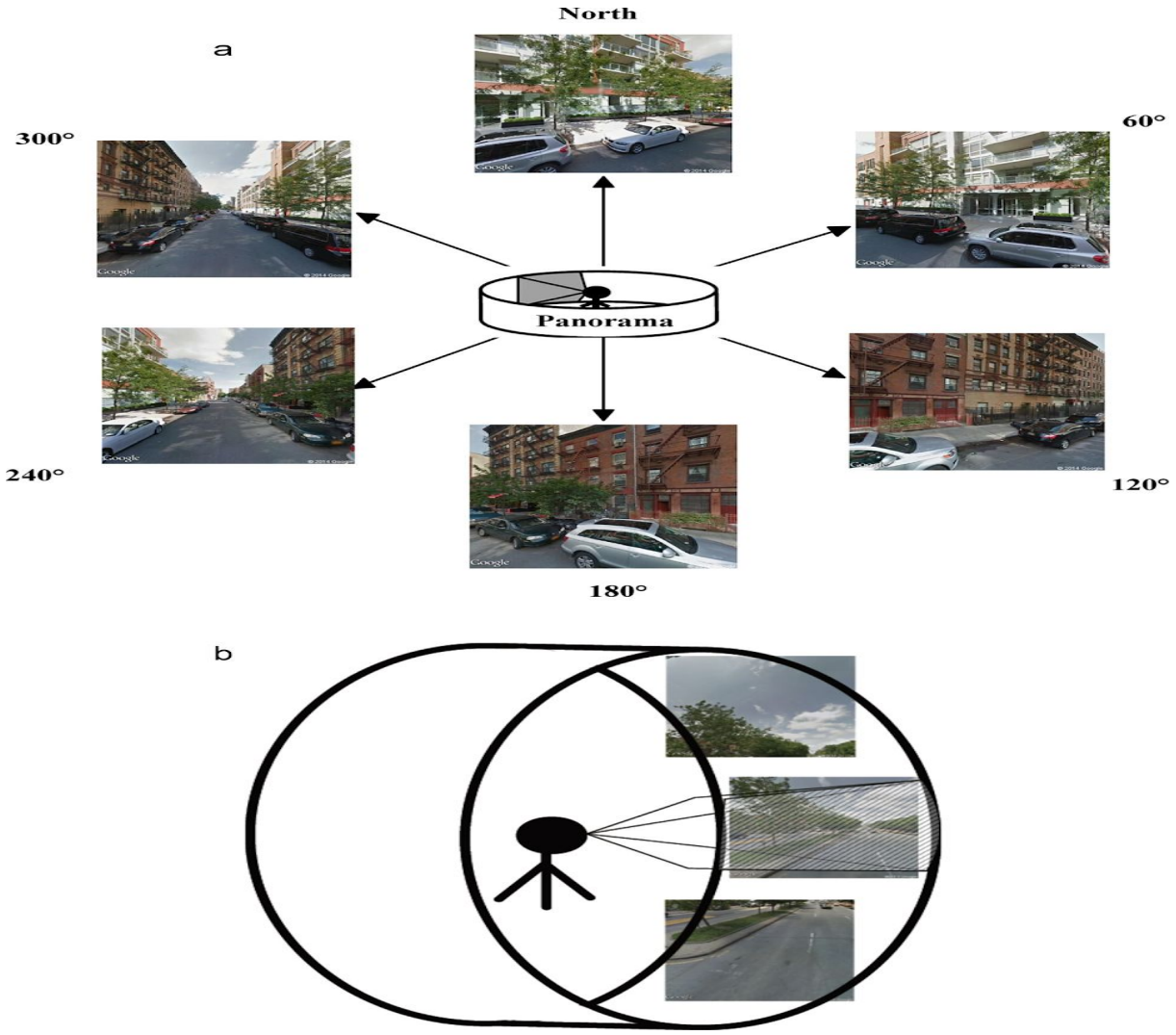
Problem definition

In the original paper, it is noticed that the remotely sensed images have limitations that these do not provide us with adequate data to identify greenery from a pedestrian's point of view. Some green features like small vegetation growing under canopy covers or green walls may be missed by remote sensing images. Similar is the issue with water bodies and urban cover. So, we can use google street view images obtained through google APIs to detect/identify the amount of greenery/water bodies in urban areas, thus, providing a pedestrian's perception of these features which is generally different from that of remotely sensed images. As the images are collected using google street view APIs, it makes the data collection task less tedious compared to engaging manual efforts for the same. This, in turn, makes the data collection phase less expensive and more accurate and efficient.

Specifications

A city would be designated as an area of study where enough random sites would be selected. We require 18 GSV images at each site: 6 in horizontal directions at 60° apart to

create a 360° panoramic view at 3 different vertical angles of -45°, 0°, 45°. This gives a whole pedestrian view.

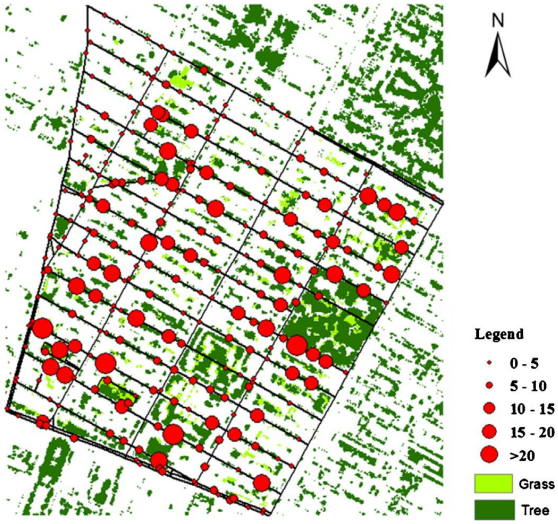


Algorithm

The google street view images do not have a near-infrared band which helps to detect vegetation. Now, as the reflectance of the green band is more than the red and blue bands for vegetation, we extract features where the amount of green band is more than the other two. This is to be accomplished by taking the two difference images of green, red and green, blue bands and multiplying the two. This when thresholded would give the region of greenness in the image. A similar algorithm would be employed which can be used with some modification to identify blueness using the blue band for water bodies.

The green view index is then calculated by taking the amount of green area divided by the total area in the image. Similar indices would be devised for water bodies and urban cover also.

Based on these indices, visualizations would be created showing regions of acute greenness or abundant greenness and water bodies, etc.



Results

The areas of vegetation (greenery), water bodies and urban cover would be identified and measured and an index would be calculated for these, representative of the amount of greenery, water bodies and urban cover. Visualizations would be provided which would, in turn, depict the above-mentioned features in the designated city. We would provide a comparative analysis of the results with the results of the original paper. The possibilities of improvisation of the originally proposed algorithm and resolving the so-mentioned issues in the original paper would be explored.

Milestones

I. Research - (5 days)

We would explore if remotely sensed image data can be useful in calculating the green index. Also, if any more modifications to the current algorithm are feasible or not, like taking into account artificial green features.

II. Data collection and pre-processing - (4 days)

Images would be collected using google street view API for a few sites in a designated city. The dataset would then be manually examined to remove any erroneous image.

III. Extracting green areas - (7 days)

Identify green areas from images by applying the devised algorithm on the collected google street view images datasets

IV. Green view index calculation - (2 days)

Identify green areas from images by applying the devised algorithm on the collected google street view images datasets and create visualizations based on this index

V. Visualizations - (7 days)

Identify green areas from images by applying the devised algorithm on the collected google street view images datasets and create visualizations based on this index

VI. Testing the results - (1 day)

The results obtained using the algorithm would be tested by manually identified green areas from images to get the measure of the accuracy of the algorithm by randomly getting GSV images of the designated city.

VII. Employing the whole process for the identification of urban cover - (6 days)

VIII. Employing the whole process for the identification of water bodies - (5 days)

IX. Report and Presentation - (3 days)