Computational Prediction of Sunlight in Urban Locations Throughout a Year Using a Smartphone & Image Processing

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Shade made by buildings changes unpredictably. However, people may want to know quantified values about sunlight for some purposes such as solar generation, urban agriculture or everyday problems, and it's hard for ordinary people to predict sunlight considering all obstacles that block sunlight. For an attempt to solve this problem, I started this project. This project includes research and development of the algorithm for predicting sunlight in urban location.The solution can be summarized like this - "Just take a couple of pictures on your smartphone anytime during the year, then you will get all the sunlight information for the place you are standing on or even the place you are looking at". The information includes exact times when you can get sunlight in a particular day, amount of sunlight and estimation of solar generation during certain period. It only takes less than a minute. The proposed solution consists of the following steps. First, recognizes the surrounding environment using multiple pictures taken by users to distinguish sky from other obstacles. Second, captures buildings and roads and recognizes the composition of structures. Afterwards, it will build that environment on a 3D space and perform one year simulation on the built space. I have tested my algorithm in a variety of places, comparing the recorded observation with the results of the simulation for that places. In conclusion, I found that my algorithm can actually predict sunlight in urban locations using pictures taken on smartphone.

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