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SolarSource

A framework to evaluate rooftop solar potential

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Abstract

Solar panels are becoming increasingly affordable. Yet if a homeowner were interested in installing rooftop solar, they would likely hire a contractor to perform an on-site evaluation. There is a need for a simple, free framework for homeowners to evaluate the cost-effectiveness of rooftop solar. We present Solar Source, a framework that provides homeowners for the tools to do just that.

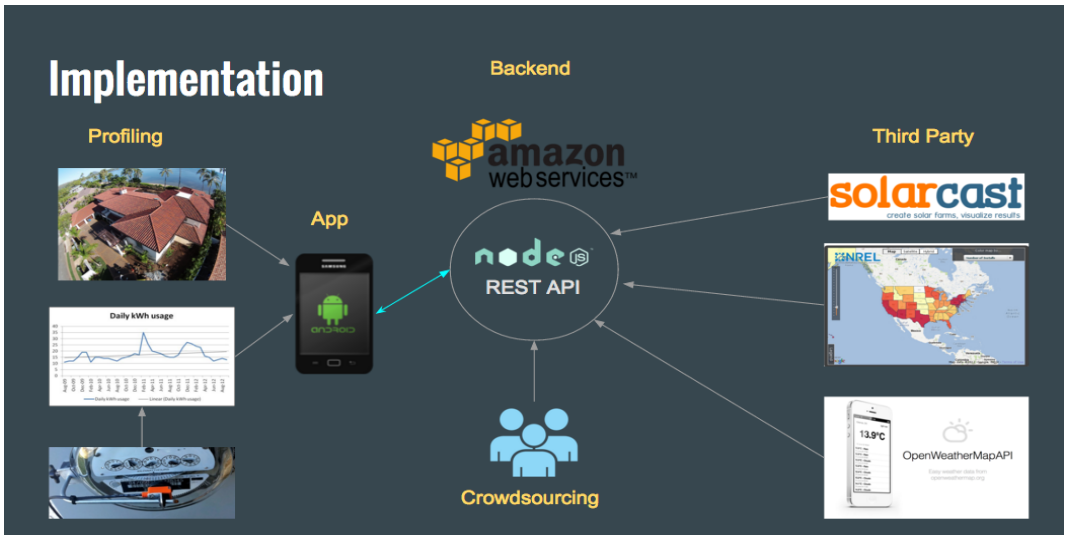
1. Introduction

We designed our framework to be general. Although the project is presented as an Android app, the exposed RESTful API is open source and documented on Github. Anyone can make requests to the API endpoints to determine the viability of a solar installation at a certain site.

2. Background and Related Work

[1] [2] [3] [4]

3. Key Features



- Do it yourself home profile - our framework allows the user to generate a profile for his or her roof and electricity consumption.
- Crowdsourced data - we collect solar performance data to generate the most accurate installation recommendation
- Future-centric - we look at forecasted future weather data, as well as predicted performance of the array

4. Use Cases

1. A homeowner is interested in installing solar panels on his roof but is unsure how large an installation will be the most cost-effective. He opens the SolarSource app and begins the appraisal process by outlining the perimeter of his roof from a map aerial view. He inputs his monthly electricity bill and annotates the data stream from his Wattvision electricity monitor, specifying when during the day and year he uses the most electricity. The information from the profile is sent to the backend, which determines the most cost-effective installation based on the current market landscape and weather data. On a map screen the homeowner can see if thee are any similar installations in the area, with detailed data on the performance of each of those systems.
2. A solar energy provider (e.g. SolarCity) is interested in marketing to a particular neighborhood. It launched the SolarSource app and types in a GPS location. From there it can outline the rooftop of a home and get access to utility pricing in that area. It uses the output of the recommendation engine to determine if it makes sense to market to that community.
3. A homeowner is uninformed about solar energy but has the app installed. She received a text message that he neighbor just installed solar panels based on a SolarSource recommendation and that she is saving 40% on her monthly electricity bill. She opens the app and finds her neighbor's house on the map. Her neighbor's roof dimensions are similar to those of her own house so, interested in saving money, she begins the evaluation process described in the first use case.

5. Evaluation

To evaluate the success of our framework we tested it on two homes in the Princeton area with solar panels already installed.

6. Conclusion

We presented SolarSource, an open source framework that recommends to homeowners a cost-effective solar installation. We also discussed several use cases where our RESTful API can be effectively used.

7. Acknowledgements

References

[1] J. Kjeldskov, M. B. Skov, J. Paay, D. Lund, T. Madsen, and M. Nielsen, "Eco-forecasting for domestic electricity use," in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, ser. CHI '15. New York, NY, USA: ACM, 2015, pp. 1985–1988. [Online]. Available: http://doi.acm.org/10.1145/2702123.2702318

[2] U. Cubasch, D. Wuebbles, D. Chen, M. Facchini, D. Frame, N. Mahowald, and J.-G. Winther, *Introduction*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2013, book section 1, p. 119–158. [Online]. Available: www.climatechange2013.org

[3] S. Iyengar, N. Sharma, D. Irwin, P. Shenoy, and K. Ramamritham, "Solarcast: A cloud-based black box solar predictor for smart homes," in *Proceedings of the 1st ACM Conference on Embedded Systems for Energy-Efficient Buildings*, ser. BuildSys '14. New York, NY, USA: ACM, 2014, pp. 40–49. [Online]. Available: http://doi.acm.org/10.1145/2674061.2674071

[4] US Energy Information Administration, "Monthly energy review," September 2015.