Methods for simulation of weather and climate (mobility).

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I. Introduction

To simulate both mobility and energy use, realistic modeling of the weather is necessary. In this paper, you will discuss ways in which we can do this. Considering the effect of the position of the virtual city, seasons, and the ability to represent specific phenomena (storms, snow, heat waves).

II. Topics

A. STEP (short-term ensemble prediction system) computation algorithm

B. Openweather API

OpenWeatherMap is a weather API that provides weather data for any location on the globe. It uses machine learning (ML) to significantly advance both the accuracy and computing speed of global assemble forecasting models, a practice that was impossible only a few years ago [1].

OpenWeatherMap offers a variety of APIs, including the One Call API 3.0, which provides current weather and forecasts, minute forecast for 1 hour, hourly forecast for 48 hours, daily forecast for 8 days, and government weather alerts [1]. The API also provides weather data for any timestamp for 40+ years historical archive and 4 days ahead forecast, daily aggregation of weather data for 40+ years archive and 1.5 years ahead forecast, hourly forecast for 4 days, 16 days forecast, and climatic forecast for 30 days [1].

In addition, OpenWeatherMap provides beautiful multi-layer maps that create the visual perception of weather. You can choose from a set of OpenWeather Model layers such as wind, temperature, pressure, and others, or select radar data for a detailed precipitation picture [1].

1) Advantages: Here are some of the advantages of Open-WeatherMap

- **Accuracy and speed** - OpenWeatherMap uses machine learning to significantly advance both the accuracy and computing speed of global assemble forecasting models, a practice that was impossible only a few years ago [1].
- **Global coverage** - OpenWeatherMap provides weather data for any location on the globe [1].

- **Historical data** - OpenWeatherMap provides weather data for any timestamp for 40+ years historical archive and 4 days ahead forecast, daily aggregation of weather data for 40+ years archive and 1.5 years ahead forecast, hourly forecast for 4 days, 16 days forecast, and climatic forecast for 30 days [1].
- **Multi-layer maps** - OpenWeatherMap provides beautiful multi-layer maps that create the visual perception of weather [1].

2) Disadvantages: Here are some of the disadvantages of OpenWeatherMap

- **Limited free plan** - OpenWeatherMap offers a free plan that allows 60 calls per minute, one million calls per month, and 5-day forecast, but it does not include historical data [1].

3) Motivation: OpenWeatherMap is a weather API that provides accurate weather data for any location on the globe. Making use of the STEP algorithm explained previously. Combining this algorithm with machine learning (ML) to significantly advance both the accuracy and computing speed.

Also with the free plan we get up to 60 calls per minute, one million calls per month, and 5-day forecast, which is more than enough for our application. Although the free plan doesn't include historical data, we can save the data and make our own historical data. The Downside of this approach is that we have to wait for the data to be collected.

In case we want forecast data for more than 5 days, we have to implement our own model to predict the weather (making use of the collected historical data), or upgrade to a paid plan.

C. ClimaX

D. GraphCast

III. Conclusion

Acknowledgment

"R. B. G. thanks...". Put sponsor acknowledgments in the unnumbered footnote on the first page.

References

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