

Wind Turbine Data Acquisition and Performance Analysis

Xuezheng Wang, Sean Gartland, Julie Hetey, Merrill Arthur, Bing Dong

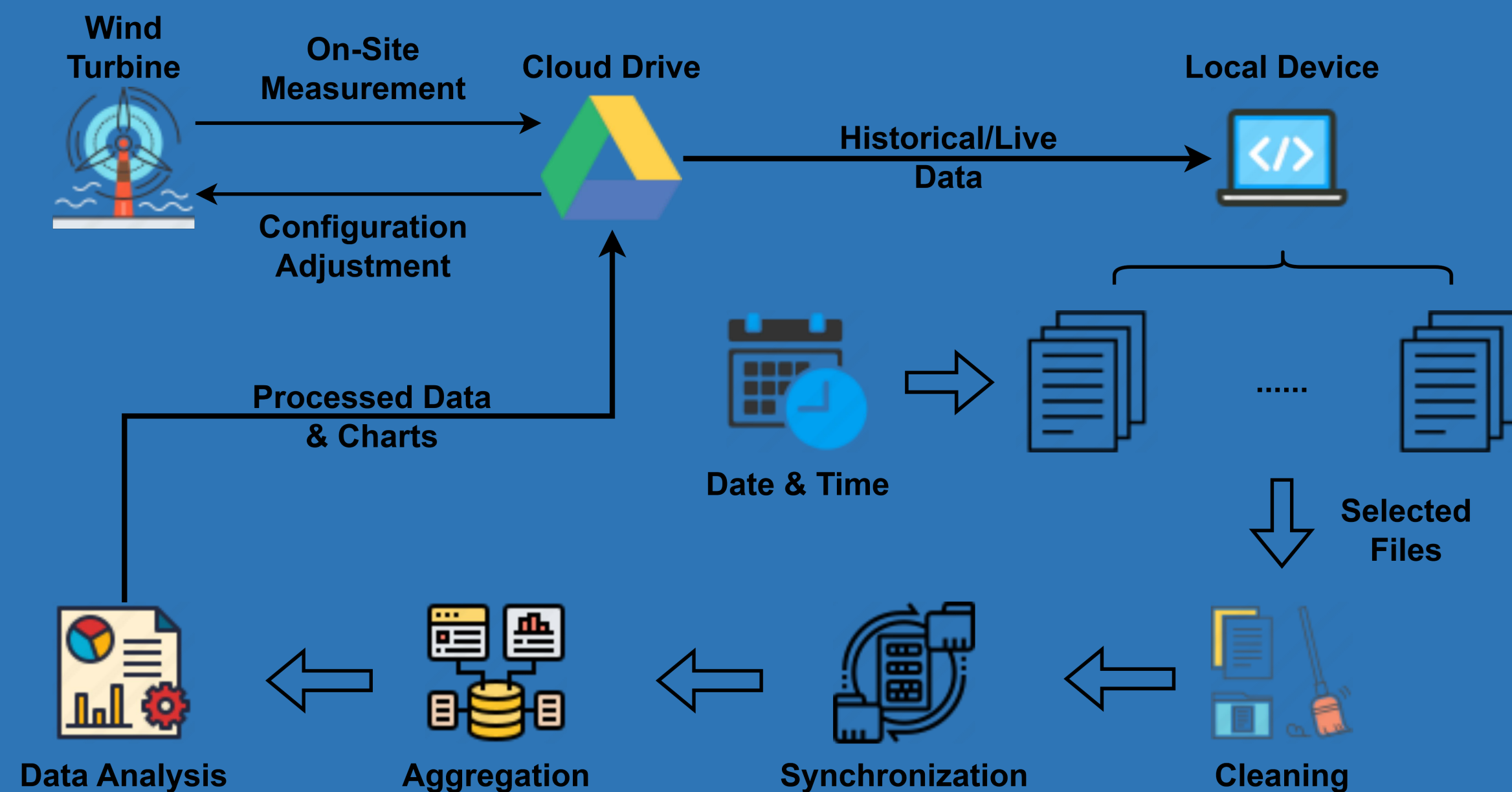
Introduction

The Aerovec wind turbine is designed for Distributed Energy applications, i.e., located close to the point of energy use. The prototype will have a nominal generator capacity of 5kW, which is expected to be achieved at wind speeds of 12 m/s and higher. A unique characteristic of this wind turbine concept is its rotating cowling fixed to the blades. The goal of the project is to analyze the performance and wind turbine behavior in support of Aerovec assessment of several design configuration options over the summer months.

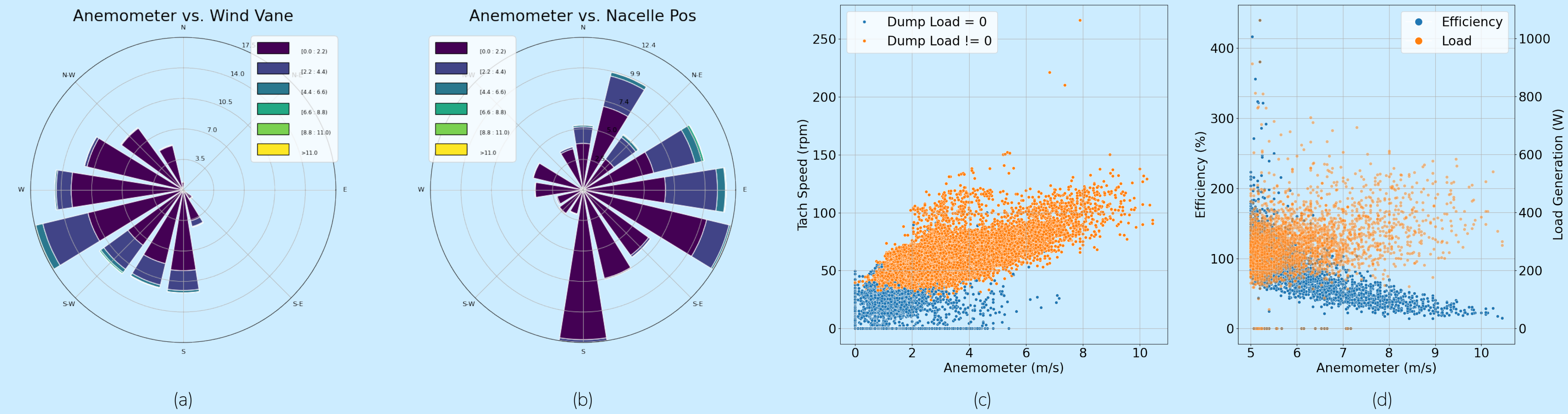
To achieve this goal, it will be necessary to set up the data acquisition and real-time monitoring system for the remotely located wind turbine.

Methods

The sensor data is recorded on site every second and uploaded to the cloud drive every day at midnight. A remote desktop will access the data on the cloud. Based on the user-selected date and time, the remote desktop will process and analyze the data to guide the operation and adjustment on site.



Figures



Wind turbine performance analysis: (a) wind speed vs. wind direction; (b) wind speed vs. yaw direction; (c) wind speed vs. tach speed, yellow and blue indicate whether there is power generation or not, respectively; (d) wind speed vs. generation & efficiency.

Results / Discussion

The data acquisition and analysis framework works well. For the current configuration, the wind turbine works functionally as the power is generated according to the pre-defined tach speed set point. Despite this, it is also observed that the yaw direction did not correspond well with the wind direction. The reason has been identified to be sensor calibration issues. Moreover, the power generation is under expectation, indicating that further optimization is needed. Further adjustments will be made accordingly. Due to the time limitation and weather conditions, only one wind turbine configuration was analyzed. However, the overall framework would enable the company to assess and optimize the wind turbine design in the coming months.



Use the QR code to know more about Aerovec!

Impact on LMI or Public Health

The Aerovec compact wind turbine is designed with portability in mind, making it ideal for rapid deployment in locations requiring immediate access to electric energy, such as in the aftermath of natural disasters. This feature is particularly beneficial for supporting first responders.

