

Smart Self Orienting Vertical Axis Wind-Turbines

Status: Available

Group Members:

Sponsor(s):

Supervisor(s): Krishna Vijayaraghavan, PhD, PEng, Associate Professor, Mechatronic Systems Engineering

Project Description

Vertical-axis wind-turbines are smaller wind turbines that rotate about in the plane of the wind flow as seen in the figure below. Being independent of wind-direction combined with their ability to be located closer to the ground make them very attractive for small scale power local generation. They are also extremely versatile and are significantly less expensive than larger wind-turbines. While it is necessary to develop large-scale renewable energy resources, it is equally crucial to develop and optimize smaller scale local solutions. This is in large part due to the expected global increase in energy demand particularly in developing economies.

While vertical-axis wind-turbines offer great promise, they have very low efficiency. This is a result of the wind-turbine rotating in the plane of the wind flow which causes the relative wind direction to change continuously. The efficiency of these wind-turbines can be significantly improved by actively changing the orientation (or pitch) of the wind-turbine blade as the wind-turbine rotate. While we have done preliminary work in this area, the crux of the project will involve designing a mechanism that would detect the relative wind-direction and actively reorient the blade. The project will offer an exciting opportunity for students to use their mechatronics skills to solve a real-world problem in renewable energy.