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**Improving Electricity Generation & Mechanical Reliability
in Wind Turbines**

Minorities in the Scientific Field

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Abstract

The purpose of this project is to develop a process that predicts wind behavior and uses those predictions to control the direction that a wind turbine faces. Additional benefits of prediction are the use of speed projections to determine when a turbine may be operating outside of its optimal range.

Problem

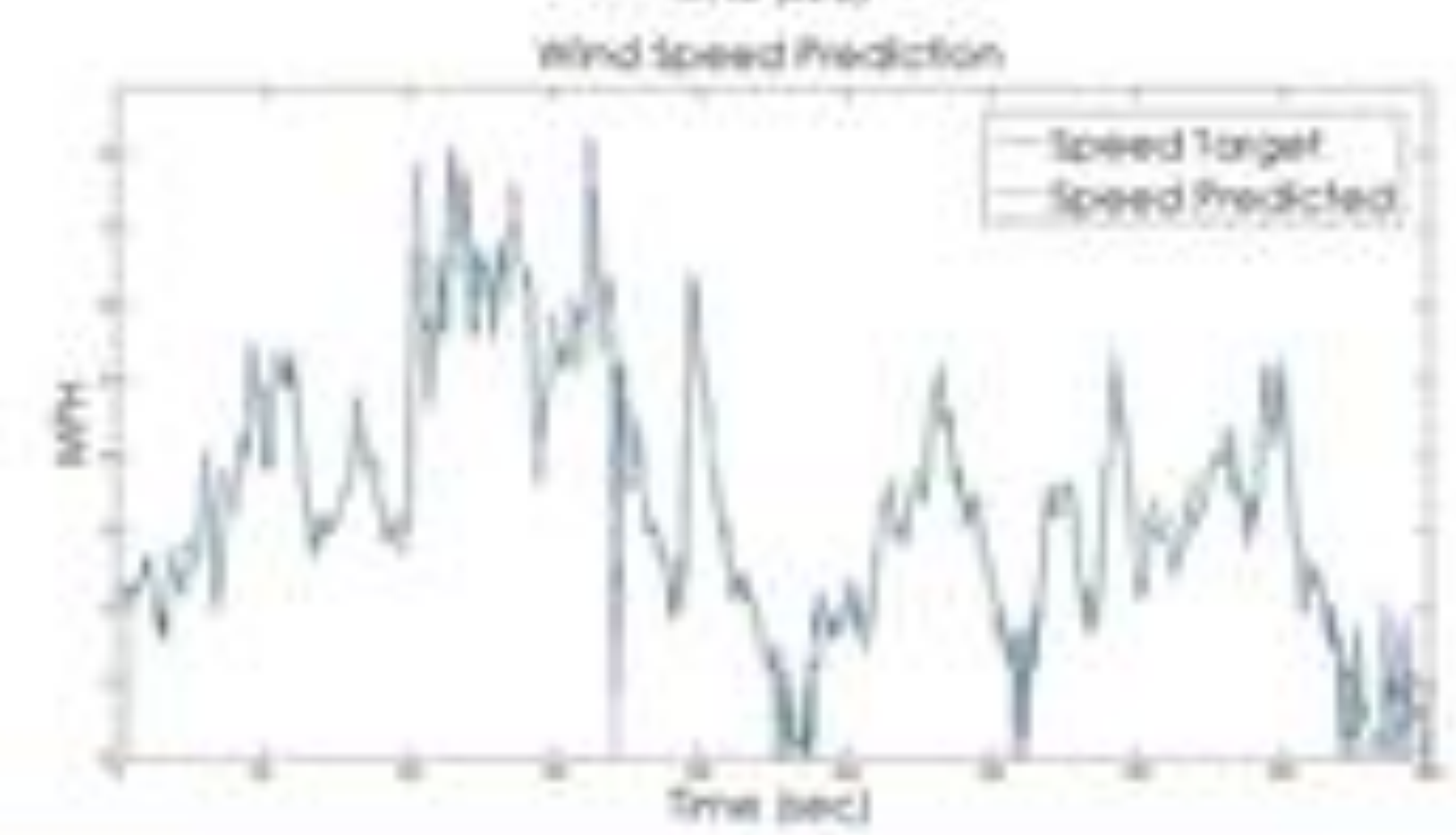
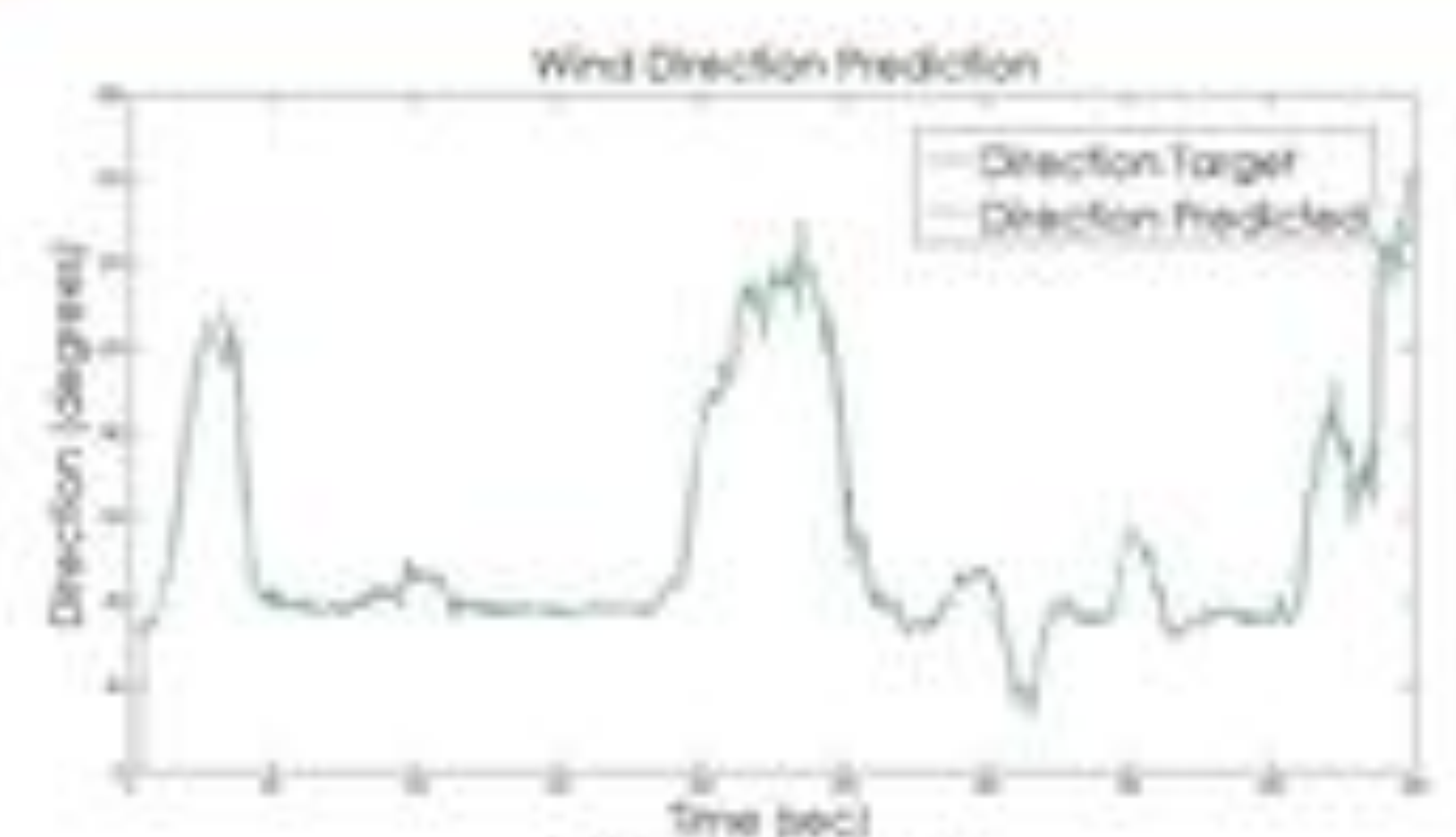
Most traditional horizontal axis wind turbines stay facing one direction, losing maximum angle of attack. Some turbine directions are adjusted by the wind, absorbing potential energy for electricity generation and increasing wear and tear on the turbine components.

Current Methods

- WindWorks anemometer and e-vane kits
- ETAS Group's IVSE Neural network generating software
- MATLAB's Simulink
- MicroC/OS development software
- Intel 8086 on TS-SER2 card

Discoveries

- Two concurrent nets are needed with two different windows
- Only required to turn the turbine 180 degrees
- Should keep track of window for which the speed is outside of range
- Understand how much electricity required to move turbine
- Further research into controlling motor



Approaches

Collected data is run through a Self Organizing Map (most accurately predicted changes in wind speed 3 seconds into the future). Changes in wind speed were predicted in a 25 minute window. When predicted output deviates from current wind direction, signal is sent to the board which controls the motor.

Design Flowchart



Future Work

My goal is to integrate all aspects of this process (input, neural network analysis, and control signal output) onto a microcontroller running a real time operating system. Eventually it would be necessary to incorporate a networked aspect to accommodate entire wind farms.

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