**Tuft Visualization**

**Abstract**

The problem we are addressing is analyzing wind effect on a different areas on a surface of wings in wind turbine.

Every such wing has little tufts glued on them and during the work of the turbine a camera takes film of the surface. In order to understand the flow of the wind over the wing, we can conclude how good the flow is by the orientation of every tuft over the wing. An attached flow is when the tufts turns to the direction of the wind, while when the tuft takes other direction or a group of tufts looks disordered then that’s implies of un attached flow.

Our goal is to take frames of tufts over a wing and analyze the overall flow over the wing in time. Analyze where was the attached flow on the surface of the wind.

The idea is to analyze a frame as a sequence of tufts related to each other through their physical location over the surface considering the wind direction.

**Data**

The data we are using will be frames from a camera posed over a wind tunnel, those frames consist of the look of the momentary effect of the wind over the surface.

A frame will consist of any amount of tufts over a surface that are directed to different areas and that will create a sequence to investigate.

Each tuft will have the following features:

1. Wind related angle
2. Length
3. Straightness
4. Edge related angle
5. Physical location
6. 4 closest neighbors considering the direction of the wind

Those features will be the key to consider our tagging of every tuft and understand whether it is attached or not to the general stream of the wind.

We will use about 150 frames each consist of about 90 tufts with 3 kind of tags: attached tuft, cross wind (when part of a group that directed to the same direction but is different from the wind angle) or unattached tuft.

The features extracted by running a segmentation on the frame and analyze it’s results into those features by measuring distances from center mass of each tuft to it’s edges, or a neighbor tuft.