Log-Polar Trasform for Rotation Invariant Object Classification

A Rotated object will result in the same correlation pattern with a given filter except for a shift

Here’s two identical patterns one shifted form the other:

Chart

Description automatically generated

Convert these two patterns to the frequency domain (or just don’t inverse transform the correlation) and produce the magnitude and phase of the two patterns.

Mag:

Graphical user interface, chart

Description automatically generated Graphical user interface, chart, line chart

Description automatically generated

The frequency spectrum of the two are identical. Can we use this property to build a naturally rotation invariant network?

The phase of the two signals are not identical. Furthermore the spectrum alone can’t be used in a lower level FC network because we can’t back propagate through it. It is not a holomorphic function according to the Cauchy-Riemann constraint meaning the derivitive can’t be computed. So the error can not be propagated throught he spectrum (alone) and back to the filters.

A correlation between the two patterns would yield a peak that identified the shift in the patterns that could be used to know the angle between them. A normalized correlation would let us know when to trust the peak.