

Table 1. List of basic kinematic features

Baseline kinematic features
95th percentile of angular of velocity
95th percentile of horizontal of velocity
95th percentile of velocity
95th percentile of velocity at peaks
95th percentile of velocity at valleys
95th percentile of vertical of velocity
median of angular of velocity
median of horizontal of velocity
median of velocity
median of velocity at peaks
median of velocity at valleys
median of vertical of velocity
non parametric coefficient of variation of angular of velocity
non parametric coefficient of variation of horizontal of velocity
non parametric coefficient of variation of velocity
non parametric coefficient of variation of velocity at peaks
non parametric coefficient of variation of velocity at valleys
non parametric coefficient of variation of vertical of velocity
number of changes in the of velocity profile
relative number of changes in the of velocity profile
signal to noise ratio between the original of velocity profile and the one reconstructed by the sigma lognormal model
slope of angular of velocity
slope of horizontal of velocity
slope of velocity
slope of vertical of velocity

Table 2. List of fractional order derivate features

Fractional order derivative features
velocity of x for alpha 0.1
velocity of x for alpha 0.2
velocity of x for alpha 0.3
velocity of x for alpha 0.4
velocity of x for alpha 0.5
velocity of x for alpha 0.6
velocity of x for alpha 0.7
velocity of x for alpha 0.8
velocity of x for alpha 0.9
velocity of x for alpha 1.0
velocity of y for alpha 0.1
velocity of y for alpha 0.2
velocity of y for alpha 0.3
velocity of y for alpha 0.4
velocity of y for alpha 0.5

velocity of y for alpha 0.6
velocity of y for alpha 0.7
velocity of y for alpha 0.8
velocity of y for alpha 0.9
velocity of y for alpha 1.0

Table 3. List of newly proposed directional based features

Directional based polar plot features
quartile 0.5 of velocity for alpha 0.1 area binned
velocity for alpha 0.1 octant -3
velocity for alpha 0.1 octant -2
velocity for alpha 0.1 octant -1
velocity for alpha 0.1 octant 0
velocity for alpha 0.1 octant 1
velocity for alpha 0.1 octant 2
velocity for alpha 0.1 octant 3
velocity for alpha 0.1 octant 4
quartile 0.5 of velocity for alpha 0.1 centroid theta
quartile 0.5 of velocity for alpha 0.1 centroid r
quartile 0.5 of velocity for alpha 0.1 centroid x
quartile 0.5 of velocity for alpha 0.1 centroid y
quartile 0.95 of velocity for alpha 0.1 area
quartile 0.95 of velocity for alpha 0.1 area binned
quartile 0.95 of velocity for alpha 0.1 centroid theta
quartile 0.95 of velocity for alpha 0.1 centroid r
quartile 0.95 of velocity for alpha 0.1 centroid x
quartile 0.95 of velocity for alpha 0.1 centroid y
quartile 0 of velocity for alpha 0.1 area
quartile 0 of velocity for alpha 0.1 area binned
quartile 0 of velocity for alpha 0.1 centroid theta
quartile 0 of velocity for alpha 0.1 centroid r
quartile 0 of velocity for alpha 0.1 centroid x
quartile 0 of velocity for alpha 0.1 centroid y
quartile 0.5 of velocity for alpha 0.2 area
quartile 0.5 of velocity for alpha 0.2 area binned
velocity for alpha 0.2 octant -3
velocity for alpha 0.2 octant -2
velocity for alpha 0.2 octant -1
velocity for alpha 0.2 octant 0
velocity for alpha 0.2 octant 1
velocity for alpha 0.2 octant 2
velocity for alpha 0.2 octant 3
quartile 0.5 of velocity for alpha 0.2 centroid theta
quartile 0.5 of velocity for alpha 0.2 centroid r
quartile 0.5 of velocity for alpha 0.2 centroid x
quartile 0.5 of velocity for alpha 0.2 centroid y

quartile 0.95 of velocity for alpha 0.2 area
quartile 0.95 of velocity for alpha 0.2 area binned
quartile 0.95 of velocity for alpha 0.2 centroid theta
quartile 0.95 of velocity for alpha 0.2 centroid r
quartile 0.95 of velocity for alpha 0.2 centroid x
quartile 0.95 of velocity for alpha 0.2 centroid y
quartile 0 of velocity for alpha 0.2 area
quartile 0 of velocity for alpha 0.2 area binned
quartile 0 of velocity for alpha 0.2 centroid theta
quartile 0 of velocity for alpha 0.2 centroid r
quartile 0 of velocity for alpha 0.2 centroid x
quartile 0 of velocity for alpha 0.2 centroid y
quartile 0.5 of velocity for alpha 0.3 area
quartile 0.5 of velocity for alpha 0.3 area binned
velocity for alpha 0.3 octant -3
velocity for alpha 0.3 octant -2
velocity for alpha 0.3 octant -1
velocity for alpha 0.3 octant 0
velocity for alpha 0.3 octant 1
velocity for alpha 0.3 octant 2
velocity for alpha 0.3 octant 3
quartile 0.5 of velocity for alpha 0.3 centroid theta
quartile 0.5 of velocity for alpha 0.3 centroid r
quartile 0.5 of velocity for alpha 0.3 centroid x
quartile 0.5 of velocity for alpha 0.3 centroid y
quartile 0.95 of velocity for alpha 0.3 area
quartile 0.95 of velocity for alpha 0.3 area binned
quartile 0.95 of velocity for alpha 0.3 centroid theta
quartile 0.95 of velocity for alpha 0.3 centroid r
quartile 0.95 of velocity for alpha 0.3 centroid x
quartile 0.95 of velocity for alpha 0.3 centroid y
quartile 0 of velocity for alpha 0.3 area
quartile 0 of velocity for alpha 0.3 area binned
quartile 0 of velocity for alpha 0.3 centroid theta
quartile 0 of velocity for alpha 0.3 centroid r
quartile 0 of velocity for alpha 0.3 centroid x
quartile 0 of velocity for alpha 0.3 centroid y
quartile 0.5 of velocity for alpha 0.4 area
quartile 0.5 of velocity for alpha 0.4 area binned
velocity for alpha 0.4 octant -3
velocity for alpha 0.4 octant -2
velocity for alpha 0.4 octant -1
velocity for alpha 0.4 octant 0
velocity for alpha 0.4 octant 1
velocity for alpha 0.4 octant 2
quartile 0.5 of velocity for alpha 0.4 centroid theta

quartile 0.5 of velocity for alpha 0.4 centroid r
quartile 0.5 of velocity for alpha 0.4 centroid x
quartile 0.5 of velocity for alpha 0.4 centroid y
quartile 0.95 of velocity for alpha 0.4 area
quartile 0.95 of velocity for alpha 0.4 area binned
quartile 0.95 of velocity for alpha 0.4 centroid theta
quartile 0.95 of velocity for alpha 0.4 centroid r
quartile 0.95 of velocity for alpha 0.4 centroid x
quartile 0.95 of velocity for alpha 0.4 centroid y
quartile 0 of velocity for alpha 0.4 area
quartile 0 of velocity for alpha 0.4 area binned
quartile 0 of velocity for alpha 0.4 centroid theta
quartile 0 of velocity for alpha 0.4 centroid r
quartile 0 of velocity for alpha 0.4 centroid x
quartile 0 of velocity for alpha 0.4 centroid y
quartile 0.5 of velocity for alpha 0.5 area
quartile 0.5 of velocity for alpha 0.5 area binned
velocity for alpha 0.5 octant -3
velocity for alpha 0.5 octant -2
velocity for alpha 0.5 octant -1
velocity for alpha 0.5 octant 0
velocity for alpha 0.5 octant 1
velocity for alpha 0.5 octant 2
quartile 0.5 of velocity for alpha 0.5 centroid theta
quartile 0.5 of velocity for alpha 0.5 centroid r
quartile 0.5 of velocity for alpha 0.5 centroid x
quartile 0.5 of velocity for alpha 0.5 centroid y
quartile 0.95 of velocity for alpha 0.5 area
quartile 0.95 of velocity for alpha 0.5 area binned
quartile 0.95 of velocity for alpha 0.5 centroid theta
quartile 0.95 of velocity for alpha 0.5 centroid r
quartile 0.95 of velocity for alpha 0.5 centroid x
quartile 0.95 of velocity for alpha 0.5 centroid y
quartile 0 of velocity for alpha 0.5 area
quartile 0 of velocity for alpha 0.5 area binned
quartile 0 of velocity for alpha 0.5 centroid theta
quartile 0 of velocity for alpha 0.5 centroid r
quartile 0 of velocity for alpha 0.5 centroid x
quartile 0 of velocity for alpha 0.5 centroid y
quartile 0.5 of velocity for alpha 0.6 area
quartile 0.5 of velocity for alpha 0.6 area binned
velocity for alpha 0.6 octant -3
velocity for alpha 0.6 octant -2
velocity for alpha 0.6 octant -1
velocity for alpha 0.6 octant 0
velocity for alpha 0.6 octant 1

velocity for alpha 0.6 octant 2
quartile 0.5 of velocity for alpha 0.6 centroid theta
quartile 0.5 of velocity for alpha 0.6 centroid r
quartile 0.5 of velocity for alpha 0.6 centroid x
quartile 0.5 of velocity for alpha 0.6 centroid y
quartile 0.95 of velocity for alpha 0.6 area
quartile 0.95 of velocity for alpha 0.6 area binned
quartile 0.95 of velocity for alpha 0.6 centroid theta
quartile 0.95 of velocity for alpha 0.6 centroid r
quartile 0.95 of velocity for alpha 0.6 centroid x
quartile 0.95 of velocity for alpha 0.6 centroid y
quartile 0 of velocity for alpha 0.6 area
quartile 0 of velocity for alpha 0.6 area binned
quartile 0 of velocity for alpha 0.6 centroid theta
quartile 0 of velocity for alpha 0.6 centroid r
quartile 0 of velocity for alpha 0.6 centroid x
quartile 0 of velocity for alpha 0.6 centroid y
quartile 0.5 of velocity for alpha 0.7 area
quartile 0.5 of velocity for alpha 0.7 area binned
velocity for alpha 0.7 octant -3
velocity for alpha 0.7 octant -2
velocity for alpha 0.7 octant -1
velocity for alpha 0.7 octant 0
velocity for alpha 0.7 octant 1
velocity for alpha 0.7 octant 2
quartile 0.5 of velocity for alpha 0.7 centroid theta
quartile 0.5 of velocity for alpha 0.7 centroid r
quartile 0.5 of velocity for alpha 0.7 centroid x
quartile 0.5 of velocity for alpha 0.7 centroid y
quartile 0.95 of velocity for alpha 0.7 area
quartile 0.95 of velocity for alpha 0.7 area binned
quartile 0.95 of velocity for alpha 0.7 centroid theta
quartile 0.95 of velocity for alpha 0.7 centroid r
quartile 0.95 of velocity for alpha 0.7 centroid x
quartile 0.95 of velocity for alpha 0.7 centroid y
quartile 0 of velocity for alpha 0.7 area
quartile 0 of velocity for alpha 0.7 area binned
quartile 0 of velocity for alpha 0.7 centroid theta
quartile 0 of velocity for alpha 0.7 centroid r
quartile 0 of velocity for alpha 0.7 centroid x
quartile 0 of velocity for alpha 0.7 centroid y
quartile 0.5 of velocity for alpha 0.8 area
quartile 0.5 of velocity for alpha 0.8 area binned
velocity for alpha 0.8 octant -3
velocity for alpha 0.8 octant -2
velocity for alpha 0.8 octant -1

velocity for alpha 0.8 octant 0
velocity for alpha 0.8 octant 1
velocity for alpha 0.8 octant 2
quartile 0.5 of velocity for alpha 0.8 centroid theta
quartile 0.5 of velocity for alpha 0.8 centroid r
quartile 0.5 of velocity for alpha 0.8 centroid x
quartile 0.5 of velocity for alpha 0.8 centroid y
quartile 0.95 of velocity for alpha 0.8 area
quartile 0.95 of velocity for alpha 0.8 area binned
quartile 0.95 of velocity for alpha 0.8 centroid theta
quartile 0.95 of velocity for alpha 0.8 centroid r
quartile 0.95 of velocity for alpha 0.8 centroid x
quartile 0.95 of velocity for alpha 0.8 centroid y
quartile 0 of velocity for alpha 0.8 area
quartile 0 of velocity for alpha 0.8 area binned
quartile 0 of velocity for alpha 0.8 centroid theta
quartile 0 of velocity for alpha 0.8 centroid r
quartile 0 of velocity for alpha 0.8 centroid x
quartile 0 of velocity for alpha 0.8 centroid y
quartile 0.5 of velocity for alpha 0.9 area
quartile 0.5 of velocity for alpha 0.9 area binned
velocity for alpha 0.9 octant -3
velocity for alpha 0.9 octant -2
velocity for alpha 0.9 octant -1
velocity for alpha 0.9 octant 0
velocity for alpha 0.9 octant 1
velocity for alpha 0.9 octant 2
quartile 0.5 of velocity for alpha 0.9 centroid theta
quartile 0.5 of velocity for alpha 0.9 centroid r
quartile 0.5 of velocity for alpha 0.9 centroid x
quartile 0.5 of velocity for alpha 0.9 centroid y
quartile 0.95 of velocity for alpha 0.9 area
quartile 0.95 of velocity for alpha 0.9 area binned
quartile 0.95 of velocity for alpha 0.9 centroid theta
quartile 0.95 of velocity for alpha 0.9 centroid r
quartile 0.95 of velocity for alpha 0.9 centroid x
quartile 0.95 of velocity for alpha 0.9 centroid y
quartile 0 of velocity for alpha 0.9 area
quartile 0 of velocity for alpha 0.9 area binned
quartile 0 of velocity for alpha 0.9 centroid theta
quartile 0 of velocity for alpha 0.9 centroid r
quartile 0 of velocity for alpha 0.9 centroid x
quartile 0 of velocity for alpha 0.9 centroid y
quartile 0.5 of velocity for alpha 1 area
quartile 0.5 of velocity for alpha 1 area binned
velocity for alpha 1 octant -3

velocity for alpha 1 octant -2
velocity for alpha 1 octant -1
velocity for alpha 1 octant 0
velocity for alpha 1 octant 1
velocity for alpha 1 octant 2
velocity for alpha 1 octant 3
velocity for alpha 1 octant 4
quartile 0.5 of velocity for alpha 1 centroid theta
quartile 0.5 of velocity for alpha 1 centroid r
quartile 0.5 of velocity for alpha 1 centroid x
quartile 0.5 of velocity for alpha 1 centroid y
quartile 0.95 of velocity for alpha 1 area
quartile 0.95 of velocity for alpha 1 area binned
quartile 0.95 of velocity for alpha 1 centroid theta
quartile 0.95 of velocity for alpha 1 centroid r
quartile 0.95 of velocity for alpha 1 centroid x
quartile 0.95 of velocity for alpha 1 centroid y
quartile 0 of velocity for alpha 1 area
quartile 0 of velocity for alpha 1 area binned
quartile 0 of velocity for alpha 1 centroid theta
quartile 0 of velocity for alpha 1 centroid r
Quartile 0 of velocity for alpha 1 centroid x
quartile 0 of velocity for alpha 1 centroid y
velocity for alpha 1 area bin size
velocity for alpha 1 centroid theta bin size
velocity for alpha 1 centroid r bin size
velocity for alpha 1 centroid x bin size
velocity for alpha 1 centroid y bin size