Animal tracking CSV format documentation

Animals are tracked by hub trackers (direct data transmission) and spoke trackers (transmission via hubs in the vicinity). The following two record formats are defined: hub information (hub-coords, in dm-hub.csv) and spoke information (spoke-visibility, in dm-spoke.csv).

Spoke format: <hubtracker> <timestamp> spoke-visibility <spoketracker> <rssi/dB> <device-state> <voltage/V> <temperature/°C> <animal-state> <state-resting/min> <state-walking/min> <state-grazing/min> <state-running/min> <features-vector/15 values>
Hub format: <hubtracker> <timestamp> hub-coords <latitude> <longitude> <voltage/V> <temperature/°C> ~~<signal/dBm(0-31)>~~

Both files have one more column added at the end that signals the delay of message arrival, i.e. of the origin timestamp relative to the current timestamp at the client receiver.

The fields beyond obvious ones are as follows:

device-state	problem / noproblem
voltage	"-" or fractional number x.y for the hub; always a number for the spoke
temperature	"-" or fractional number x.y for the hub; always a number for the spoke
~~signal~~	~~"-" or integer number for the hub; no-information for the spoke~~
hubtracker	always 6 digits ID as assigned by DM
spoketracker	alphanumeric ID

The features vector consists of three integer fields over five 2 minute time periods, related to IMU measurements over sliding windows of 10 seconds, which need to be post-processed:

standard acceleration of 3D acceleration magnitude	cast to signed byte, subtract 50, divide 20, calculate 2^x exponent
average absolute value of delta pitch derivative	divide by 10
mean pitch angle (degrees)	cat to signed byte

Animal state codes: 0 = resting, 1 = walking, 2 = grazing, 3 = running (all calculated heuristically based on device-internal decision tree)

Note: Several data quality issues exist, e.g. sometimes last value from feature vector cut off, random timestamp jumps, location jumps, ...