This study proposes, in order to process efficient tracking of minke whales (Balaenoptera acutorostrata), a sparse coding of their boings vocalizations [1]. This sparse coding confers several advantages: it makes the structure in natural signals explicit and it represents complex data in a way that is easier to read out at subsequent levels of processing [2,3]. Thus different pulse repetition rate and durations of the boings are identified even if individual were not significantly different than the variation among individuals of the same boing type. More generally, l1-norm yields to robust Time Difference Of Arrival (TDOA). Recently [4] has described a l1-norm sparse Bayesian learning for acoustic blind channel identification and provides dramatic improvement in both speech dereverberation and TDOA estimation in reverberant environments compared to their conventional methods. Thus sparse coding provides an efficient mean of representing data from bottom mounted hydrophones. With complex sound propagation, the submarine environment provides an ideal benchmark for showing the efficiency of sparse coding applied to complex sound mixture decomposition. Therefore we build the histogram of the projection of an original MFCC vector on the sparse dictionary, and we use it as features for our particle filtering tracking method [5,6]. Results on the workshop challenge, on records from the bottom of the ocean surrounding the Hawaiian Islands, demonstrate the tracks of many minke whales, for which we can estimate the mean swimming speed and direction of travel.

References


