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LOCATION ESTIMATION OF A FREE-RANGING WILD ANIMAL USING A PARTICLE FILTER

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Tracking free-ranging wild animals has become a popular practice among biologists and researchers throughout the world. These tracking data are collected in different studies and analyzed to understand animal behaviour, daily movements, breeding grounds, animal-human conflicts and migrating patterns. However, it is extremely difficult to accurately locate a free-ranging wild animal due to many reasons. Among them, measurement errors in sensors that are used in tracking wild animals have become a major concern. Theoretically, these sensor measurements when recorded from multiple locations should meet at a point giving the true location of the animal. In practice, however, one obtains an area (*confidence area*) where the animal is believed to be positioned. Thus, an effective algorithm is needed to model measurement uncertainties and minimize their impacts on location estimations.

In this work, the performance of a non-linear estimation algorithm was evaluated. Since the underlying process is inherently non-linear, the use of a non-linear modelling approach is justified. The system dynamics involved in modeling the movement of a free-ranging animal was developed in the state space, and the estimation process was carried out using a particle filter. The state space model and the estimation algorithm were tested on a sample of data collected on an open field with minimal obstructions mimicking a typical grassland-like landscape. The data was collected using radio telemetric equipment that obtained three readings, from three receivers at different locations, for each transmitter-location. In order to emulate the actual measuring capabilities only the bearing was recorded. In order to compare the discrepancy between the two datasets, these actual location data were used with the estimations obtained from the algorithm. It was discovered that the prediction errors were small and fall in the acceptable range of wildlife tracking requirements. Moreover, the particle filter showed an improvement of about 20% in accuracy in comparison with Extended Kalman filtering. Further, it was observed that the algorithm was robust in highly random conditions.