# Relaxing Error Assumptions on Dynamic models

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The state space representation and its application on time series analysis provides us with new ways for analyzing time series. From pioneering first research by Akaike (1974) to most recent work Kitagawa (1998), Durbin (1998) or Arulampalam (2002), researchers have worked based on state space representation and have tried to model situations, where time series goes from simple stationary situations to the most complex non-stationary, non-linear and non-gaussian situations. Recently there has been a great interest in particle filtering methods to perform filtering and prediction in general state space models. Our goal shifts the interest through the usual assumptions on error distributions (related with the system and observation equation).

A way to obtain filtering densities without imposing assumptions on error distributions by means of kernel density estimation (kde) is presented. The advantage of this kind of solution is clear: self adaptation of the estimated densities and a wides range of possible ways to perform this estimation.

The paper presents three ways for dealing with kde. The firs one comes from the fact that once all the data has been processed, estimated errors will define the data used to estimate the new density. Then we repeat the filtering process with the new estimated densities and again with all the data. This process goes on until we get to the best filtering density. To overcome the problem of too much iteration with all data a second approach which tries to reduce the kde step just for the data available is presented. This means that once all the data has been processed we obtain the estimated densities. The last approach takes previously knowledge or the need to impose gaussian assumptions.