Graphical Functions for Prior Selection

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In a Bayesian analysis the choice of prior distributions for model parameters reflects the analyst's *a priori* belief. Most discussion and presentation of prior densities are in terms of the model parameter values using the BUGS squiggle notation. With the exception of the Uniform and Normal distributions, using this notation alone can make it difficult to immediately assess the beliefs represented by the priors. Thus, the squiggle notation presentation creates interpretational difficulty in that it does not reflect the process by which analysts will choose priors. In most cases, particularly when experts outside of the statistical field are asked to give information to elicit priors, the construction will be in terms of the moments, mode and/or coverage probabilities of the parameters. It would be useful then to have a set of functions that will take these quantities as arguments and translate them into the corresponding prior density, returning the parameter values and providing a density plot.

This presentation will demonstrate a set of graphical functions written in R which allow

the user flexibility in specifying the desired moments, mode or coverage probabilities when deciding on the appropriate prior. Examples from the literature are given showing how these functions can facilitate prior determination when eliciting priors from experts as well as reveal misspecification of *a priori* beliefs. The graphical functions are based on the base graphics system which enables the user to easily annotate and customize the display. The tools are available for commonly used densities of the stats package including the Normal, Student's t, Beta and Gamma. Current work is being done to expand these plotting functions so as to allow the specification of mixture priors. It is the goal of this work to provide prior selection tools in the R language comparable to those of Tony O'Hagan's First Bayes. With these simple extensions of R's standard statistical and graphical facilities Bayesian statisticians working in R will be able to more efficiently select and present prior distributions.