Random effects term for exponential decay in covariance: expDecay

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One may induce covariance among the levels of a grouping factor, such that the covariances fall off exponentially with distance among the levels. The distance matrix for the levels can come from many sources, including spatial coordinates, phylogenies and other trees, and trait space. Such exponential decay models are specified with the following notation.

$$\texttt{respVar} \sim \texttt{expDecay}(1 \mid \texttt{grpFac}, \texttt{distMat} = \texttt{distMat}, \texttt{minCov} = 1e - 3, \texttt{distCutoff} = 2) \tag{1}$$

where `distMat` in an R `dist` object giving the distances among levels in `grpFac`, and `minCov` and `distCutoff` are parameters for trading off accuracy for computation speed. If `distCutoff > max(distMat)` and `minCov == 0`, then there is no approximation but result in the slowest speeds. Reducing `distCutoff` below `max(distMat)` causes all covariances associated with distances larger than `distCutoff` to be zero. Finally, `minCov` is the covariance associated with `distCutoff`, and should be chosen to be as low as possible.

The model has a single parameter, α, specifying the rate of decay. The covariance, ρ_{ij} between level i and j is a function of the distance, δ_{ij}, between the levels.

$$\rho_{ij} = \exp\left(-\alpha \delta_{ij}\right) \tag{2}$$