Harvard-MIT Division of Health Sciences and Technology
HST.750: Modeling Issues in Speech and Hearing, Spring 2006
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Problem/Discussion Set for "Detail vs Heuristic I"

1. **Model Complexity.** In their second paper, K&D increase the complexity of their model by adding a dynamic spike-blocking mechanism. In Z et al., the "spatially extended" model for MSO cells is more complex than the point neuron models considered previously. In each case, are you convinced that the added model complexity is helpful in understanding the mechanisms underlying the neuronal responses?

2. **Simplicity vs Realism.** What reasons do Z et al. and K&D-I,II give for adopting a more realistic or more simplistic representation of the neuron membrane properties? What insights would have been missed [or gained] if Z et al. had adopted a "leaky integrator" model instead of a "channel-based" model? What additional insights might K&D have lost [or gained] had they adopted a channel-based model? Would your answers change if more information were available concerning the membrane properties of cochlear nucleus and MSO neurons?

3. **Parameter Values and Assumptions.** Explain and evaluate how K&D and Zhou et al. constrain their model parameters (e.g., are they constrained in a convincing way?). Outline the main assumptions of the models and evaluate their validity.

4. **Modeling Role.** Compare the role that models play in G&K, K&D, and Z et al. If the roles are different, are the differences appropriate? Which of the models, if any, would you characterize as "heuristic"?

5. **Modeling Insights.** Which of the three papers (G&K, K&D, Z et al.) provides the greatest insights and which the least? How much does your answer depend on (1) the issue addressed by each paper, (2) the modeling approach, (3) the way the paper is written, (4) other factors?