Coding of attention in temporal cortex

Mike W. Oram
School of Psychology,
University of St. Andrews

Collaborators:
NIMH: Z. Lui, B. Richmond, M. Wiener

Coding of attention

• Basic rationale

• Changes in coarse response measures
  – Firing rates
  – Variability in firing rates
  – Correlation between firing rates

• Changes in fine temporal measures
  – Within neural responses
  – Between neural responses

• Summary

Delayed match to sample and the neural code

• DMS involves attention

• Attention
  – Increases detectability
  – Reduces likelihood of false conjunctions

• Effect of attention on the neural code
  – Increase in signal-to-noise
  – Increase in precisely timed spike patterns

Measures of responses

• Related to signal-to-noise
  – Mean response (signal)
  – Variability of response (noise)
  – Information

• Related to precisely timed spikes
  – Repeating triplets within responses
  – Repeating triplets between responses

Changes in signal

Changes in noise
Basic response statistics unchanged

Variability is not Poisson

Summary of non-Poisson variability

Correlation within responses

Correlation between responses
**Spike count matched model**

SCM Model
Calculate the SDF
Generate the cumulative SDF
Take each observed spike count (e.g., 3)
Simulate a spike train using random numbers (0-1)
Adjust to match ISI

**Repeating triplets**

**The number of triplets**

**Source of the triplets**

**Distribution of triplets**

**Predicting the triplets**
Predicting the triplets

Types of triplets

TE, Triplets & Sore thumbs

Overall information redundancy

Information carried by triplets

Information about stimulus and stage
Summary

• Coarse measures
  – Increased signal
  – No change in basic coarse temporal response statistics (mean = variance unchanged)
  – Increased detectability (stimulus information)
• Number of precisely timed spike patterns
  – Varies with DMS stage & stimulus
    • Stage & stimulus interact
  – Predictable by chance
    • Must include all coarse measures
  – Carry no unique information