Modelling response times in multi-alternative categorization with TVA

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Background

In TVA\(^1\) it is assumed that encoding in VSTM is a race between competing categorizations. Previously\(^2\), we presented a Poisson Counter model of visual identification of mutually confusable stimuli in pure accuracy tasks. Here we propose and test a multi-dimensional Poisson Random Walk model to explain response time distributions in four alternatives.

Experiment

**Fixation**  
**Stimulus**  
**Response**

**Speeded response time task**  
*Respond as quickly and accurately as possible (4-AFC).*

**Task:**  
*Judge the orientation of a Landolt C-ring*

Varying difficulty: ±33 deg, ±39 deg, and ±42 deg  
Three participants were tested in 4800 trials

Multi-alternative random walk model

![Diagram of multi-alternative random walk model](image)

Varying difficulty: ±33 deg, ±39 deg, and ±42 deg  
Three participants were tested in 4800 trials

Results

**Individual fits**

<table>
<thead>
<tr>
<th></th>
<th>+90 deg err</th>
<th>-90 deg err</th>
<th>180 deg err</th>
</tr>
</thead>
<tbody>
<tr>
<td>easy</td>
<td></td>
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<td></td>
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<tr>
<td>medium</td>
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<tr>
<td>hard</td>
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</tbody>
</table>

**Group results**

- Probability of a correct response
- RT quantiles (in s)

Conclusions

The assumption of a relative response rule with exponential processing leads to a simple Poisson random walk model that can easily be generalized to multiple alternatives. The Poisson Random Walk model accounts well for observed performance in a speeded response time task with multiple alternatives.

References


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