# Sphere in a Box: Psychophysical experiments in reality close context

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## Introduction

Psychophysical experiments are designed to provide highly precise parameter estimations. Thus, numerous highly controlled trials are needed in an isolated environment. But due to this isolation the experiment is not completely applicable to reality, because in a native environment there are many confounding variables and a more complex visual stimulus. So our approach to get more reality close results is to embed the experiment in a game-engine created surrounding with Unreal4.

## Theory

Visual attention is a complex process. Many stimuli compete for attention resources . Due to limited capacity misjudgments can occur. The experiment focuses on these misjudgments in which we expect one stimuli to get an advantage over the others through a visual contrast. We refer here to Wolfe, J. M., & Horowitz, T. S. (2004), who show that it is highly propabal that color is important for attention. We also obtain to Donk und Soesmann (2011). They show that time is an important variable in order to create effective saliet stimulie especially also in temporal-order-judgement-experiments. To combine time and color predictions we point to Dombrowe, Olivers und Donk (2010). According to Krüger et al. (2016) Bundesen's (1998) theory of visual attention can be applied to temporal-order judgments. Therefore we measure in the experiment associated game the attentional weight w and C the overall processing rate to analyze the relation of time, color and salienz in reality close context.

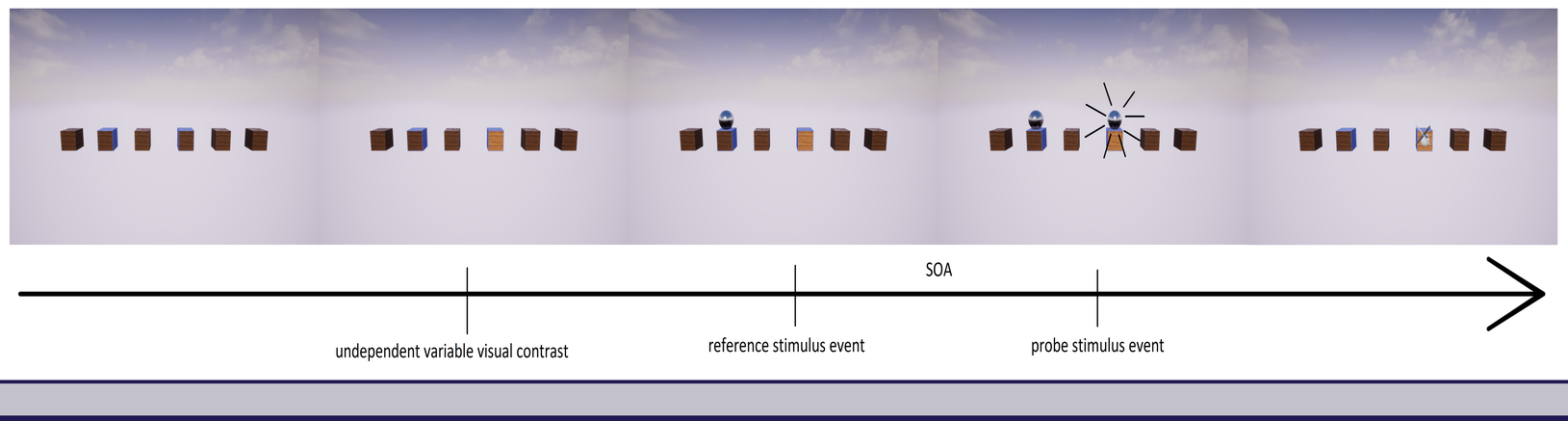
## Game

- Multiple boxes are shown on screen.


- Each turn two boxes get selected, one on the left and one on the right. One of them gets a contrast in color.

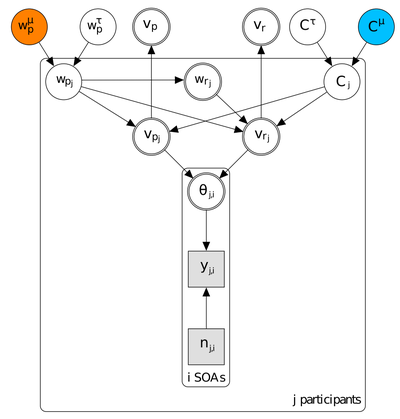
- The selected boxes blink with changing time offsets
- The Player has determine which side blinked first, choosing his supposed side with the arrow keys.

## Procedure (game and classical experiment)

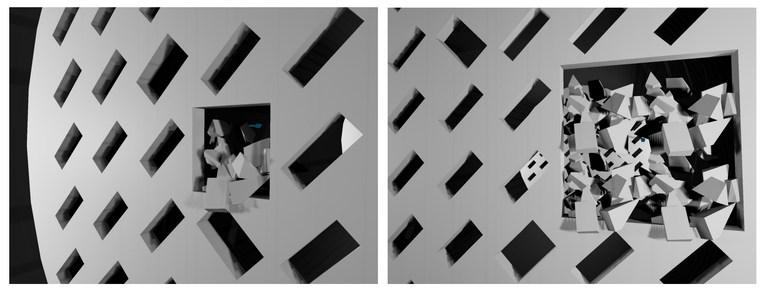



## Analysis

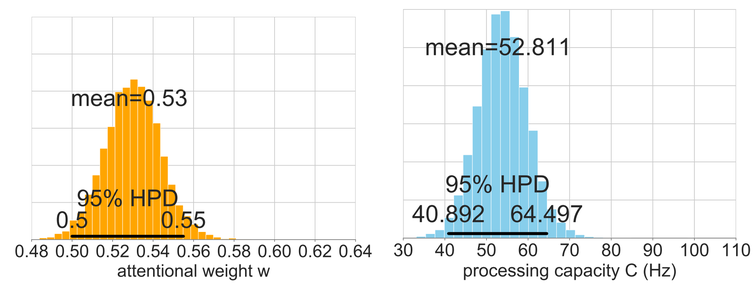
- Theory-based TVA parameters and data were connected by a Bayesian hierarchical model.



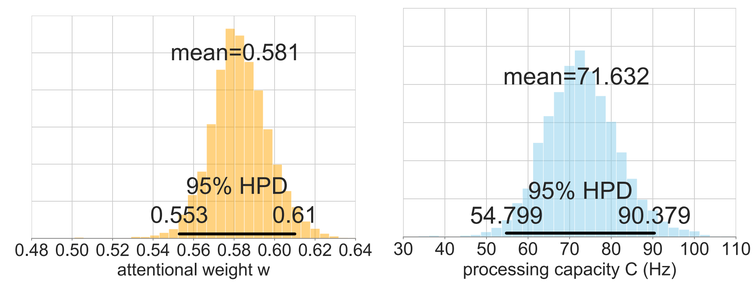

- Repetitions of trials per participant vary because of the freedom in the game – difficult to model with classical statistics.



- psychophysical parameter estimation: game (19 participants, ongoing)




- psychophysical parameter estimation: classical experiment (13 participants, ongoing)




## Conclusion

The results from the game and the classical experiment are similar: The salient probe stimulus receives an increased attentional weight in contrast to the reference stimulus. Importantly, estimation accuracy was comparable.
Quantitatively, there is a difference: In the game, the probe stimulus receives less attention and the overall visual processing capacity is reduced that may be caused by the necessity to visually monitor the position of the dragonfly. This requires capacity and attention to be distributed among three instead of two positions.
We conclude that the gaming approach is viable in general and that Bayesian data analysis allows for precise estimation despite the freedom in games.

## References

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