Expert and Novice Differences in Gaze Transitions During a Dynamic Video Game

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Overview

All eye, event, and keystroke data were collected from 60 players during an hour's play of Tetris™. The gaze data were each assigned to one of 6 dynamic (*dROI*) or 2 static (*sROI*) regions of interest (Hope, 2014). From our LogLinear analysis of transitional probabilities with group as a factor [Novice (NV) vs Expert (XP) Tetris players], we extracted the *adjusted residual matrices* for both groups. Taking as our criterion a z-score of $\geq \pm 8.0$, we examine and discuss differences btw XP and NV gaze transitions that suggest differences in strategies.

Design

- We collect 1hr of *free-play Tetris* data from all participants in our multisession or population assessment studies of Tetris expertise.
- Eye data collected with SMI Red 500, all Tetris play data collected with MetaT (Lindstedt & Gray, 2015).
- During free play all players were simply instructed to "do your best."
- Not discussed further (in this report) is our use of an Hclus analysis to cluster players into 5 skill levels based on their criterion scores. Our clusters of 22 NVs and 21 XPs are two of the five levels of this classification.

Data and Analyses

- 221,017 fixations from 4 games of Tetris for 22 NVs and 21 XPs.
- 129,367 saccades between one ROI and another. These are the data for our LogLinear analysis.
- A *base model* which assumes that the probability of a transition between two ROIs simply reflect the probabilities that an ROI is fixated.
- A log-linear analyses (see, Holmqvist et al., 2011, section *6.4.3 Transition matrices*) which tests the base model and rejects it.
- The log-linear model also yields an *adjusted residual matrix* which, for each cell, shows the probability of its having more or fewer transitions to or from it than would be expected by the base model.

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Difference btw Exp-Nov Adjusted Residuals

Table 1: LogLinear Analysis returns an *Adjusted Residual Matrix* with each cell in the matrix expressed as a z-score. For this table we subtract the XP and NV z-score for each of our 64 *from-/to-ROI* combinations. Green font shows transitions that XPs are "more likely" ($\geq +8.0$) than NVs to make. Brown font shows transitions that NVs are "more likely" (≤ -8.0) to make. For brevity we discuss only transitions *from* the CurDest (*where* the currently "onboard" Zoid was placed) and *from* the NextDest (*where* the Zoid currently in the Preview Box was placed during the *next episode*).

From / To	B.BTW	B.Top	CurDest	INFO	NextDest	PBox	Pile	Zoid
B.BTW	0.0	**18.9**	**18.6**	3.0	**-8.6**	**9.8**	2.9	**14.3**
B.Top	**39.5**	0.0	**15.6**	3.4	**-12.9**	**9.1**	6.2	**32.1**
CurDest	4.6	**24.7**	0.0	5.5	**-19.6**	5.9	−1.9	**13.0**
INFO	3.7	−0.2	5.4	0.0	−0.3	3.9	−0.5	2.0
NextDest	**-14.2**	**-10.5**	**-17.8**	2.5	0.0	3.1	**-41.6**	**-25.6**
PBox	**8.1**	7.9	3.3	**10.0**	1.1	0.0	0.9	6.8
Pile	−4.0	**10.9**	−4.2	0.6	**-41.2**	0.3	0.0	6.3
Zoid	**23.1**	**32.7**	**8.9**	0.8	**-28.0**	6.4	3.8	0.0

Figure 1: From NextDest to ??

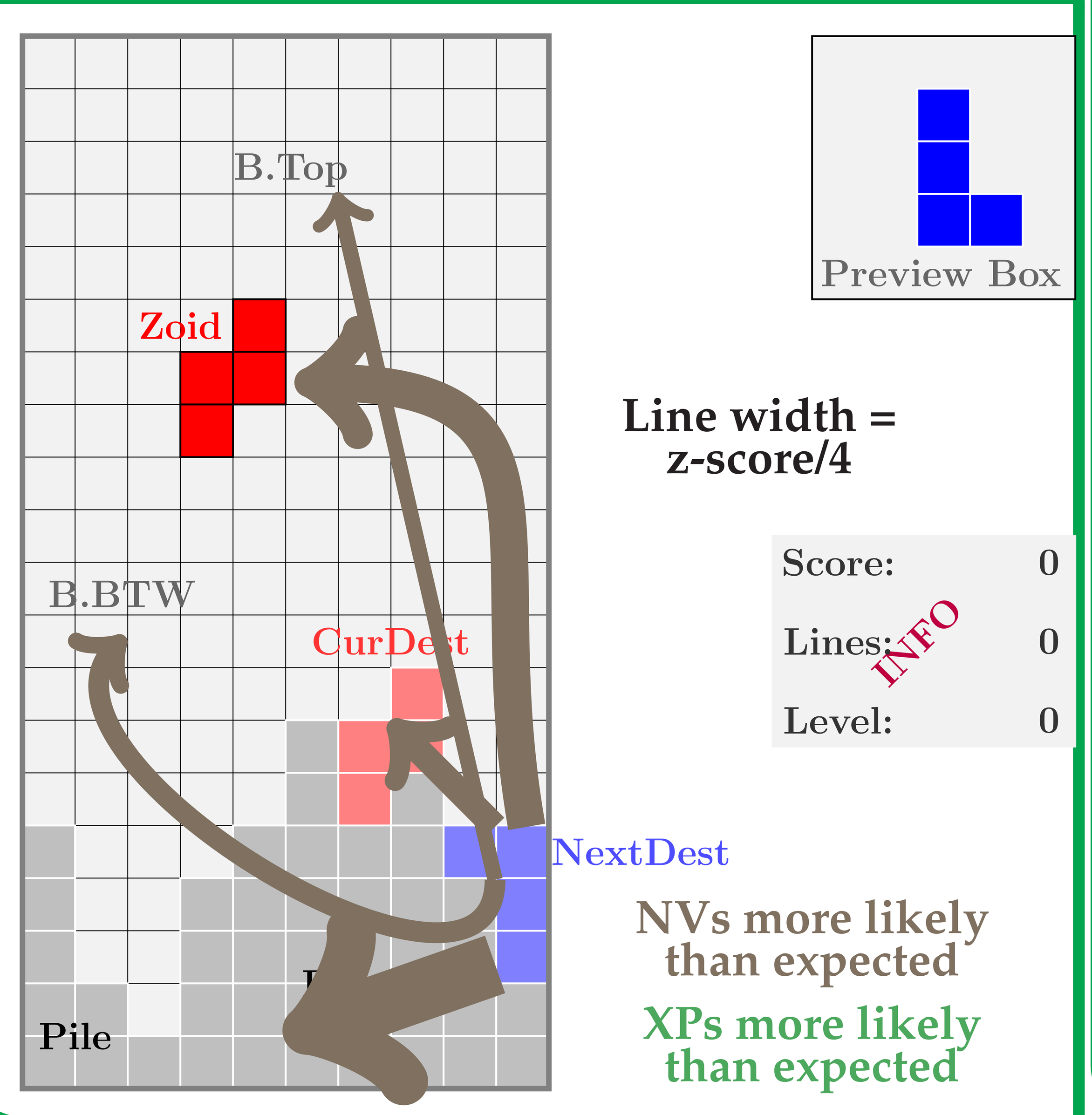
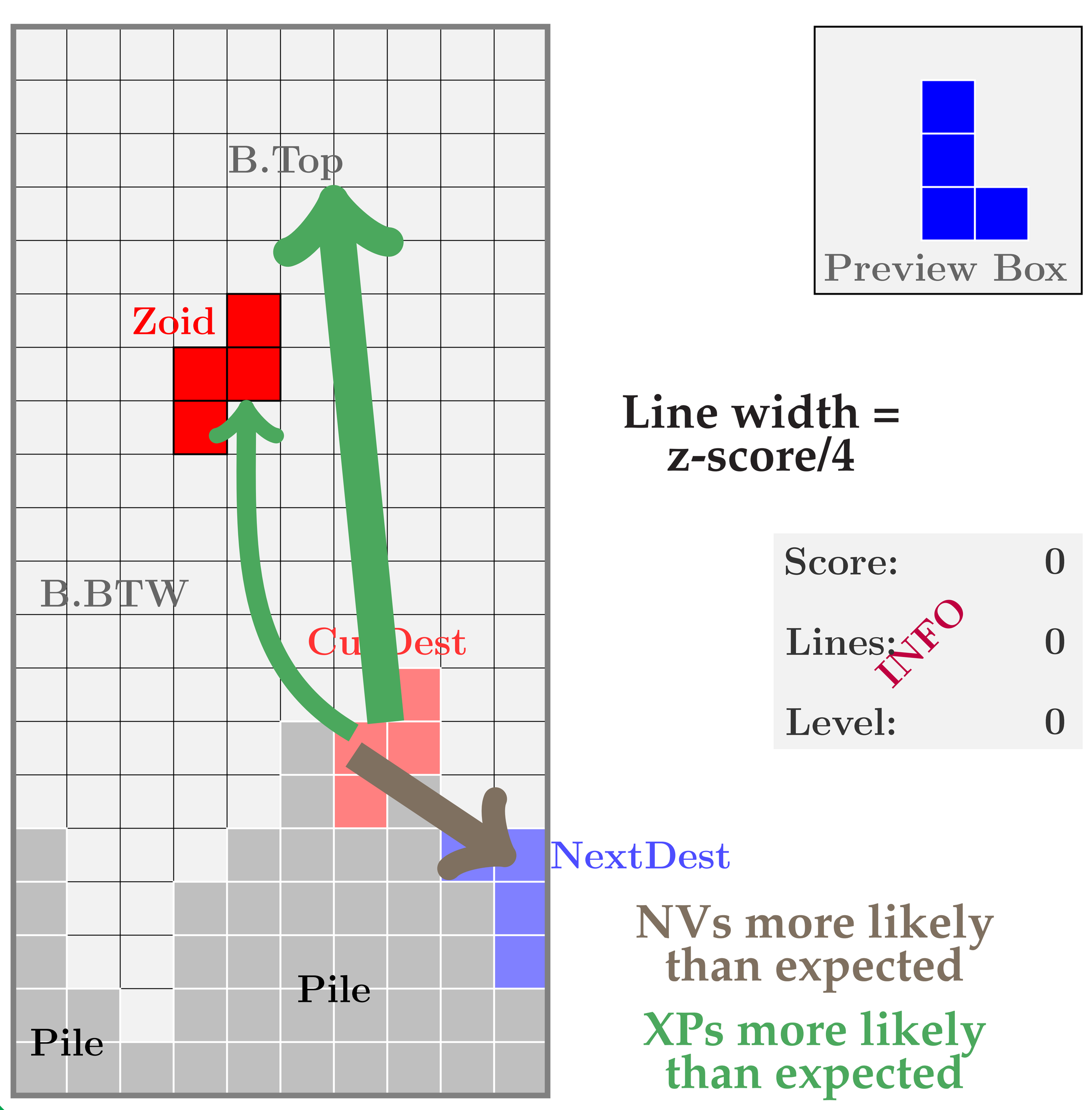


Figure 2: From CurDest to ??



Discussion

The difference btw XPs and NVs in how they view the *NextDest* is striking. After gazing at the location where the next Zoid will be placed (Figure 1), NVs are much more likely than XPs to gaze at other board areas. NVs are also more likely than XPs to examine the location of the next Zoid (Figure 2) after gazing at the location where they soon will place the current zoid. These complementary patterns suggests that NVs do NOT possess *next destination* as either a destination or a concept. In contrast, XPs tend to view the NextDest location as already occupied and remove it from active consideration when monitoring the current Zoid and its placement in the Pile.

Conclusions

This poster highlights the richness of our data and the ability of loglinear analyses to suggest behavioral differences that can be interpreted as strategic and, even, conceptual differences btw XP and NV Tetris players. It also highlights the utility of dROIs to shed light on real-time interactive behavior in a complex interactive task.

References

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Hope, R. M. (2014). Gazetools: a collection of functions for processing and classifying eye gaze data.
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