**Study Rationale**

This experiment is a follow-up to Experiment 1 from the same project (<https://osf.io/6kj8t/>). In this experiment, we continue to investigate the effect of scene context on the functional set size. In Experiment 1, the scene was identical throughout the entire experiment. Thus, the relevant region of the scene was *perfectly* predictable, even before the scene was presented. Any effect of scene context could have simply been due to spatial attention being allocated to the bottom half (relevant region) of the screen even before the search display was presented.

Thus, in this experiment, we sought to remove this contingency such that the scene context would not be predictable from trial to trial. To this end, we utilized a top-down view of a beach scene which was horizontally divided into a “sea” region and a “sand” region. This way, both the sand and sea regions could appear on either the top or bottom half of the scene.

**Design**

The experiment will be almost identical to Experiment 1. The study will be a full-within 4 (turtle setsize) x 4 (tortoise setsize) experiment. The setsizes would be: 0, 4, 8, and 16. It should be noted that the setsize refers to the number of lures (e.g. there would be a total of 5 tortoises in the 4 tortoise condition). There would thus be 16 cells in total. There would be 45 trials per cell for a total of 720 cells. The entire experiment will be divided into 9 blocks of 90 trials each, with a rest period after each block. Within each block, there will be an equal number of conditions that will be presented in a random order. Both the tortoise and turtle lures will be brown in color, while the target tortoise will be green in color. All stimuli can be facing either the left or the right, with random rotation of ± 20 degrees.

The stimuli will be randomly presented on a 10 x 10 grid, with the constrain that turtles will only appear in the water, and tortoises will only appear on land No stimulus will be presented in the borders of the grid, effectively making it an 8 x 8 grid. In addition, no stimulus will be presented in the two center rows of the grid where the waves that separate the sand and the water are located. Thus, there will be 64 possible locations (32 each for fish and bird) for stimuli to be presented. Random x and y jitter would also be added to each stimulus.

Each trial will begin with a central white colored fixation cross against a black background that will be presented for 500ms. The display will then be presented for a maximum of 3 seconds. Participants will be required to respond to the direction to which the target tortoise is facing. Upon response, the display will terminate and a blank screen will be presented for 1.5 seconds. The next trial then begins.

Feedback, in the form of a loud beep, will be given for incorrect responses. No feedback will be given for correct responses. The experiment is expected to last around 40 minutes. An example display is shown below.

**Instructions and Procedure**

The following instructions will be presented to participants:

*Welcome!*

*You will be searching for a green tortoise in a scene of brown tortoises and brown turtles.*

*Tortoises will always be on land, while turtles will always be in the sea.*

*Your task is to decide which direction the tortoise is facing.*

*You will see examples of the tortoise on the following screens.*

Upon acknowledging the instructions, participants will be shown the left-facing target and required to press the left arrow key to continue. After which, participants will be shown the right-facing target and required to press the right arrow key to continue. A practice block, with 16 trials (one from each experimental cell) will then commence. All stimuli will be presented on a 22-inch cathode ray tube monitor with a refresh rate of 86Hz and a screen resolution of 1024 x 768 pixels.

**Exclusion criteria**

Before or during data collection:

1. If a researcher error occurs such as providing the participant with the wrong instructions or not properly setting up the experimental conditions (e.g. program or lighting conditions). Participants will be allowed to complete the study, but a note will be made in the experimental log sheet and the participant’s data will be excluded.
2. If the participant appears to be in an altered state due to being under the influence of a substance, or if they are extremely sleepy. A note will be made on the experimental log sheet and the participant’s data will be excluded.
3. If the participant is not following instructions, then they will be given a warning upon first notice and a note will be made on the experimental log sheet. The data from that participant will then be excluded.

After data collection:

1. Participants with error rates greater than 10% will be removed from analyses.
2. Reaction times greater than 1500 will be assumed to be due to attentional lapses, and reaction times lesser than 200ms will be assumed to be due to anticipations (Wolfe, Palmer, & Horowitz, 2010). These will be removed from analyses. In Experiment 1, this represented only 0.525 % of all trials.

**Analyses and hypotheses**

The dependent variables that will be collected are:

1. Reaction times
2. Accuracy

Since the main goal of this experiment is to examine whether items in irrelevant regions (i.e. turtles in the water while looking for tortoises on land) are processed in efficient search, our measure of interest is reaction times.

Logarithmic and linear slopes will be fitted to the reaction times for the relevant and irrelevant lures separately. We expect to see better logarithmic compared to linear fits (measured by both R2 and AIC values) at least for the relevant lures (tortoises). This would extend our model to another new stimulus set (cf. Buetti et al., 2016; Wang, Buetti, & Lleras, 2017).

If scene context influences efficient search, the number of turtles in the water (irrelevant set size) should not affect reaction times to find to target tortoises on land.

If the entire search display is processed in efficient search regardless of scene context information, then the set size of the irrelevant region would affect reaction times. There could be one of two possibilities:

1. The irrelevant lures would add a logarithmic cost to search time just like the relevant lures (e.g., Buetti et al., 2016)
2. The irrelevant lures would be rejected en masse and add on a constant cost (i.e. not affected by set size e.g. Humphreys & Müller, 1993).

**Participants**

Participants will be recruited from the student population of the University of Illinois at Urbana-Champaign. They will receive either course credit or monetary compensation. Only participants who have normal color vision will be recruited for the study.

A sequential Bayes factor approach will be taken with regard to the sample size (CITE). Starting with a minimal number of 20 participants (CITE), we will continue data collection until we reach or exceed BF10 = 20 or BF01 = 1/20. This would constitute “strong” evidence for the alternative or null hypothesis respectively (CITE).