

Influence of Affect on Wayfinding

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Abstract

The goal of the proposed thesis is to explore the role of emotion or affect in the domain of human wayfinding. A VR Theater will be used to simulate the interior of a building. This will be used as a test environment. Positive and negative affect will be induced while subjects are asked to perform certain navigation tasks. The performance on the tasks across the type of affect induced will be compared. Results of the empirical study will be used to create a theoretical model that accounts for possible influence of affect on the access of route knowledge.

Motivation

Emotion or affect has been found to influence human cognition. Affect has been shown to effect our rational thinking, information processing, memory, reasoning, judgment and decision making (Damasio, 1995; Forgas, 2000). Human wayfinding tasks involve complex information processing and decision making that usually involves access to acquired or deduced spatial knowledge. Given that our cognitive abilities are influenced by our emotions, it is interesting to investigate the possible influence that affect may have on wayfinding tasks. In the proposed experiment, spatial tasks and experimental conditions are designed to analyze interactions between Stress and Non Stress conditions, Positive and Negative affect, across routes that are learnt previously, or across new routes. Results from the experiment will be used to build on the theory of 'Knowledge Routes' as introduced by Srinivas and Hirtle, (2006) to incorporate a possible affective component to the model. Possibly, the theory could propose considering spatial knowledge as a factor of an individual's 'state of mind' i.e. affect and prior knowledge, as opposed to the individual's prior knowledge alone. My work is intended to serve as a basis for future studies in the field of affect and wayfinding and also help in the design of GPS and navigation systems that take these two factors into account.

For instance, future GPS systems may direct users through routes based on the users' prior spatial knowledge and current affective state. Such a hypothetical system especially gains relevance as recent work by artist and teacher Christian Nold, on 'Bio Mapping,' has shown that subjects find certain areas of cities more stressful than others (Tracy Staedter, 2006). Under stress, longer but less complex routes might be optimal. Alternatively, a GPS might present the same route but with additional cues to guide the user who is in an alternate emotional state.

Methods

Hypotheses.

There are three primary hypotheses:

H1 Subjects induced with a negative affect perform significantly better on wayfinding tasks as compared to subjects induced with a positive affect.

H2 Subjects not exposed to stress perform significantly better on wayfinding tasks than subjects exposed to stress.

H3 Affect and Stress will not interact. The effect of stress and affect will be additive.

Participants.

4 groups of 20 subjects each will be recruited through flyers posted around the University of Pittsburgh campus. All subjects will be presented with the hidden-patterns, card rotation, and Vandenberg mental rotation tests of spatial abilities to ensure that subjects do not differ in spatial abilities across groups.

VR adaptation environment.

Prior to experimentation, all groups of subjects will be acquainted with the VR Theater (Jacobson et al., 2005). An adaptation environment will be used for this purpose. Subjects will be fitted with a galvanic skin response detector and heart rate monitor in order to mimic test conditions. They will be asked to practice 'walking' in straight paths and practice turns. Once subjects are familiar with navigating in the VR adaptation environment, they will be considered ready to begin the training phase in the test environment.

VR building - Test environment.

The test environment consists of a single floor in a building. The floor layout is asymmetric and consists of corridors and rooms with marked doors (Figure 1). A total of eight doors are marked with symbols to be determined. Here they are referenced using the small case Greek alphabets α , β , γ , δ , ϵ , η , θ , and λ . In order to test performance across routes of varying complexity, the test environment is designed to incorporate eight routes between the eight marked doors. These routes satisfy certain predetermined conditions and factors. The factors are 1) Number of turns 2) Minimum number of forced views of each

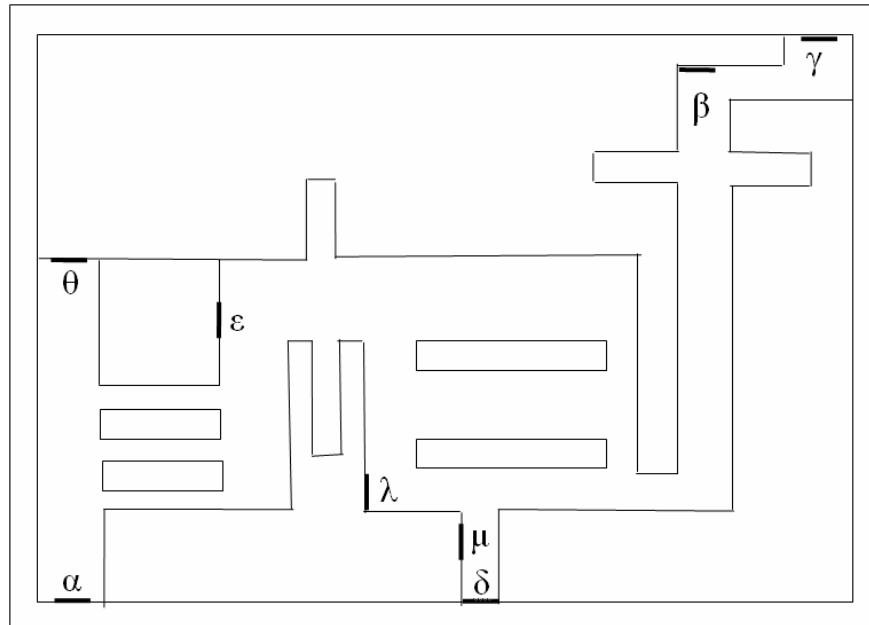


Figure 1. VR Layout of building-Test Environment

marked door (ϵ , η , θ , and λ) during training phase (i.e. traversal of routes 1 to 4 during training phase ensures that each marked door ϵ , η , θ , and λ is viewed at least twice), and 3) Starting points are unique within each phase. The factors and related details are listed in Table 1. Routes 1 to 4 are used in the training phase and the test phase, and routes 5-8 are used only in the test phase.

Training Phase.

In the training phase, subjects will enter the test environment at door α . First they will be given instructions to “Find a room marked γ ” and then find the “shortest path to γ ”. Subjects will be informed that the route with the least turns is the shortest path and there may be more than one shortest path for certain routes. The route taken will be observed. The task will be repeated until the subject has found the shortest path between α and γ . This process will be repeated for Routes 2 to 4 in Table 1.

Test Phase.

The test phase will consist of four experimental conditions and will take place after the subjects perform a distracter task for 15 minutes.

Condition 1. Role of positive affect on wayfinding ability-no stress condition. Subjects will be shown film clips from popular films that have been prejudged to induce a positive affect. Subjects will also be asked to recollect and write down one happy incident in their lives. Music that has been judged to have

Table 1

Details of Routes

Route Number	1	2	3	4	5	6	7	8
Route/path definition	$\alpha-\gamma$	$\delta-\gamma$	$\beta-\delta$	$\beta-\gamma$	$\gamma-\theta$	$\alpha-\eta$	$\delta-\varepsilon$	$\beta-\lambda$
Number of Turns	8	4	2	1	8	4	2	1
Minimum Number of Forced views in Training Phase.	2	2	2	2	2	2	2	2
Number of Decision points	14	5	3	1	11	8	5	3

positive affect would begin to play in the background. Subjects would then begin the test phase. Subjects will be asked to move from the start to the finish for each route in Table 1. The eight routes, four old and four new will be counterbalanced.

Measures might include

- Time to completion.
- Number of wrong turns.
- Direction judgments.
- Sketch maps of the environment.

Condition 2. Role of positive affect on wayfinding ability-stress condition. This condition is similar to condition 1; the only difference is that subjects would be asked to imagine that they are in a severe time constraint. Subjects would also be promised a reward of \$10 if their time to completion of the task is among the top five times of all subjects.

Condition 3 and 4. Conditions 1 and 2 will be repeated with the following modifications—Negative affect will be induced instead of positive affect. Negative affect will be induced by using films judged to have a negative affect and recollection of negative events in the subjects recent past. Music judged to induce negative affect will be played in the background.

Anticipated results

Recent studies on the role of affect on information processing have shown that negative affect improves subjects' judgment and performance on certain tasks. Hence I expect subjects to perform better in conditions of negative affect. I also expect subjects to perform better in the non stress conditions. Studies have also shown that affect infusion is reduced when the task is highly

motivated and requires less processing (Forgas, 2000). Based on the results of these studies, I predict an affect infusion on wayfinding tasks of greater complexity (e.g. navigation of routes 1, 2, 5 and 6). Simple tasks that require minimal processing will perhaps encounter less affect infusion (e.g. navigation of routes 3, 4, 7 and 8). I also expect increased number of errors in the stress condition for new routes and routes of greater complexity.

Understanding the role of stress and affect in wayfinding will be useful for future generations of navigation systems. Navigation systems might route users through longer but less complex routes if the user is judged to be under stress. A stressed user might also be directed through a well known but longer route as opposed to a new route that may be more complex. Similarly, results might suggest that it is advisable to direct users in a positive affective state through easily navigable routes that require less cognitive processing.

References

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