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Mock-Up or Eye Movement Recording: Big Paybacks from a 'Discount' Method for Multimedia Interface Design.

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1 Introduction

Eye movement recording is a helpful, but costly method to measure the primary attention focus of a user [Rauterberg, 1993]. If there is a possibility to estimate the attention focus with a cheap method, then we can use this 'discount' method during the design process without loosing time and money. We try to prove the hypothesis that eye movements correlate with users' choices in mock-ups.

2 Two Empirical Investigations: 'Mock-up' and 'Eye Movement Recording'

We carried out two different empirical investigations with exactly the same multimedia screens: (1.) an experiment with measurements of eye movements (8 men, 26±3 years), and (2.) a mock-up study (17 women , 34±6 years). From both investigations we got two different kinds of data: (a) the unconscious eye movements as a parameter of the users' attention focus during an interactive task solving process with a multimedia information system [Rauterberg, 1995]; (b) the conscious and intentional users' choices looking on a static screen dump. We used the eye tracking system (ETS) of DORNIER Inc. The subject sat in a normal distance (30"-50") in front of a computer screen (17") without any contact to the eye recording measurement unit. In the mock-up study the subjects were instructed to make a virtual mouse click at each screen area of interest. This was done by marking each screen dump with maximal three numbered crosses (first, second, and third choice).

Analysing the recorded eye movements we have to differentiate two situations: (1) the user comes to a screen, (2) the user looks around on the screen. In case (1) a user tries to orient himself. After this orientation phase (2) he is looking for the task related information. So, we differentiate between the first fixation (measure: E first) and all fixations (measure: E total). In the mock-up study we analysed the first three different choices (measure: M first, M second, M third) and all choices for each screen (measure: M total = M first + M second + M third). We calculated the correlation coefficients among these six measures for each screen separately and over all four screens (see Table 1). All correlations of the condition 'screens 1-4' (last column in Table 1) are significant. The main result of this methodological investigation is the significant correlation 'E total x M total' ($r=.727$; $p \leq .001$).

Table 1. Product moment correlation (r), significance level (p) and number of different screen areas (a).

Measures	Screen 1 (a=12)	Screen 2 (a=8)	Screen 3 (a=11)	Screen 4 (a=18)	Screens 1-4 (a=49)
E first x M first	r = .269 (p≤.408)	r = .813 (p≤.011)	r = .503 (p≤.118)	r = .594 (p≤.008)	r = .581 (p≤.001)
E total x M first	r = .445 (p≤.151)	r = .808 (p≤.012)	r = .745 (p≤.007)	r = .638 (p≤.004)	r = .629 (p≤.001)
E total x M total	r = .545 (p≤.067)	r = .869 (p≤.003)	r = .857 (p≤.001)	r = .515 (p≤.027)	r = .727 (p≤.001)

On a more detailed level of our analysis, we can only find significant correlations for screen 2, 3, and 4, but not for screen 1 (cf. Table 1). We found a significant correlation between the primary attention focus and users' choices in the mock-up study. The results of our investigation indicate that design of a multi media screen layout can be validated with the discount method of mock-ups. Our research goal was a methodological question: Is it possible to replace the expensive and costly method of eye movements' recordings by the discount method of mock-ups? The results of our correlation analysis give us a sufficient empirical basis to do this. Now, we can interpret the results of mock-ups in the way, that the marks on the screen dumps are in 50% of all cases reliable and valid empirical indicators for the users' primary attention foci in a later usage situation.

3 References

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