

## Gender Characteristics of Visual Information Perception Ability Using Signal Detection Theory

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### Abstract:

Correct perception of visual stimuli in human-machine systems is crucial for enhancing system safety, usability, and task performance. With the widespread adoption of digital technology, the importance of visual interfaces and information has increased significantly. Therefore, designing visual interfaces and information by taking user characteristics into account is essential to ensure that users can accurately perceive visual information. This study used the Cognitive Perceptual Assessment for Driving (CPAD) to evaluate and compare the ability to perceive visual signals in complex visual stimuli by gender. The experimental equipment included a computer with CPAD installed, a touch monitor, a mouse, a joystick, and a keyboard. The participants consisted of 11 male and 20 female students, with an average age of 22 for males and 21 for females.

Before the experiment, participants were instructed to assess the presence of the signal stimulus: if a square, presented as the signal, was included in the visual stimulus, they moved the joystick to the left; if it was absent, they moved it to the right. Each participant completed a total of 40 trials. The entire experiment was recorded on video to measure the total response time. The experiment measured the number of correct detections of signal presence, response times, the number of misses (failing to detect the signal when present), and false alarms (detecting the signal when absent).

Analysis of the experimental data showed no significant differences in human perceptual ability or response time for visual stimuli between genders. However, males showed slightly superior perceptual ability and slightly shorter response times compared to females. Sensitivity and response bias analyses using signal detection theory also indicated a marginally higher perceptual ability in males. In conclusion, although these differences were not statistically significant, males demonstrated a slightly better perception ability for visual stimuli.

The findings from this study can contribute to the design of information, user interfaces, and visual information in human-machine systems, especially in alignment with the recent trend of increased female participation in the industrial sector. Future research will focus on diverse types of visual information to further validate these findings.

### Keywords:

Perception capability, Signal detection theory, Response time, Field dependence, CPAD.