

## Alternative Input Devices for Efficient Navigation of Large CTA Studies

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### PURPOSE:

To evaluate alternatives to the trackball for navigating large CTA studies of aortic dissection (AD), aortoiliac aneurysm (AA) and lower extremity occlusive disease (LEOD).

### METHOD AND MATERIALS:

We developed a system that allows axial CT navigation using various devices (trackball, force feedback joystick, tablet, jog-wheel, Scrollpoint mouse), while keeping accurate records of user performance. In phase 1, we asked 6 non-medically trained subjects to find the center of a digitally-embedded 3D pyramidal target (20 section depth and 20 pixel in-plane radius, colored white except for its central slice, which was red) in a CT study (769 sections). For each device, each subject performed 7 trials with the target inserted at a random location in the same image data. For each trial, we recorded: time until the subject first saw the target (t1), time to manipulate the device in response to seeing the target (t2), slices traversed during t2 (d1), time from first sight to target acquisition (t3), slices traversed during t3 (d2), and total trial time (t4). In phase 2, we asked 4 radiologists and one post-doctoral fellow to find 5 different vascular targets (chosen and localized by an expert) in each of 3 CTA studies (1 patient with LEOD (1006 sections), 1 patient with AD (891 sections) and 1 patient with AA+LEOD (1177 sections). Each subject searched for 5 targets with each device. For each trial, we recorded the total time to acquire the targets (T4).

### RESULTS

In phase 1, repeated measures ANOVAs for each outcome measure revealed significant differences in performance between devices for all outcome measures ( $p < .005$ ). Pairwise comparisons revealed a similar pattern of results for t1, t2, and t4, where the trackball was significantly slower than the other 4 devices ( $p < .05$ ). There were no significant differences among the other 4 devices. d1 and d2 showed the opposite pattern of results, where the trackball was significantly more accurate than the other devices ( $p < .05$ ). In phase 2, repeated measures ANOVA on T4 also revealed significant differences in performance between devices ( $p < .05$ ). Pairwise comparisons revealed that the trackball was both significantly slower than the tablet ( $p < .05$ ), and marginally slower than the jog-wheel ( $p < .1$ ).

### CONCLUSIONS

The results in this study suggest that the trackball, used in virtually every viewing station today, may not be the optimal device for navigation of large CTA studies, and that other existing devices may improve the efficiency of interpretation of these cases.