

Effect of Input Control Device on Performance During Training To Operate A Simulated Micro Aerial Vehicle



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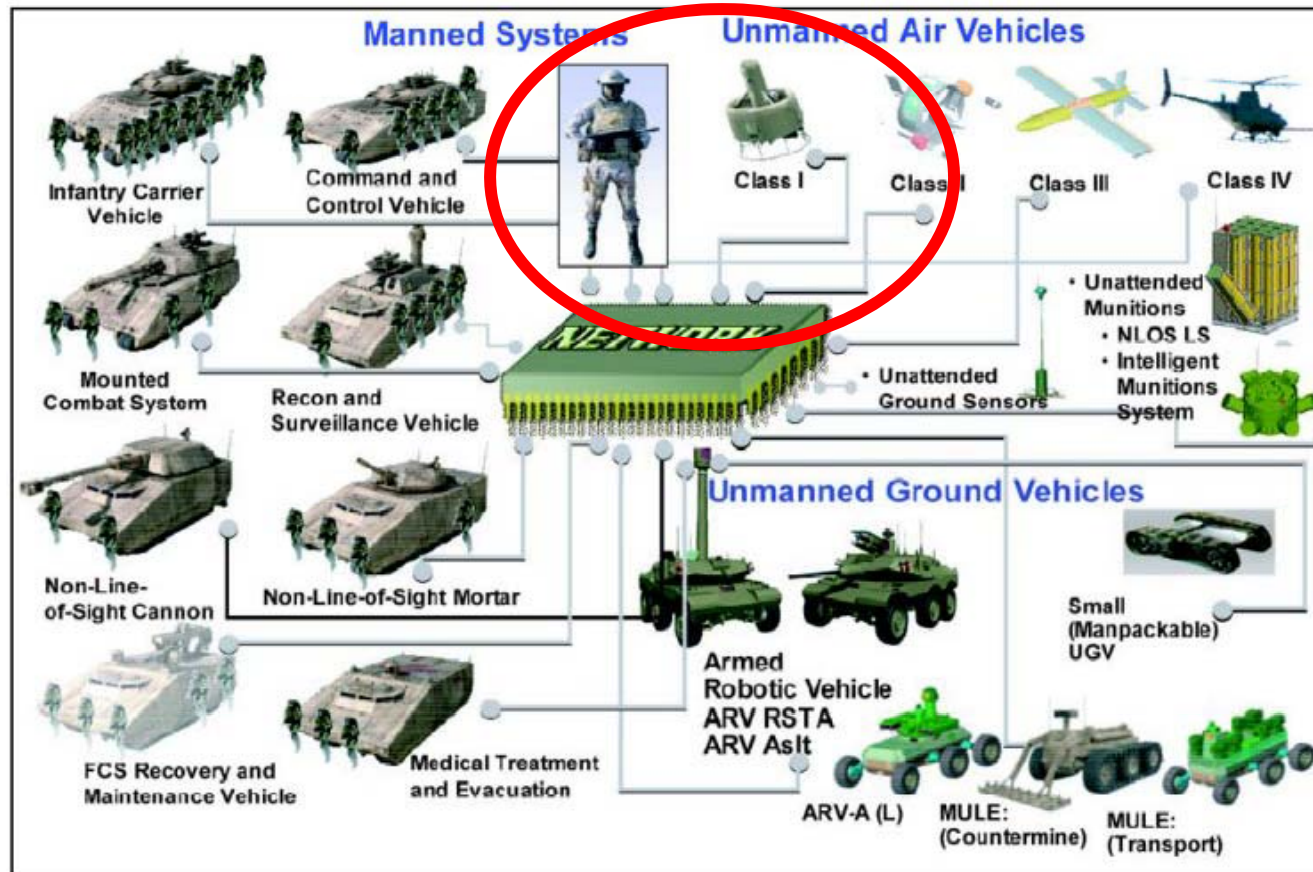
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➤ **Motivation:**

Will need to quickly and reliably train operators.

Human-system interface must be intuitive and easy to master.

Structured training scenarios + performance measures required.



INPUT DEVICES



touch screen & stylus

Point at & Click on symbols on screen

Less Portable

More reliable



mouse

The 2 input devices
used in the
experiment



game controller

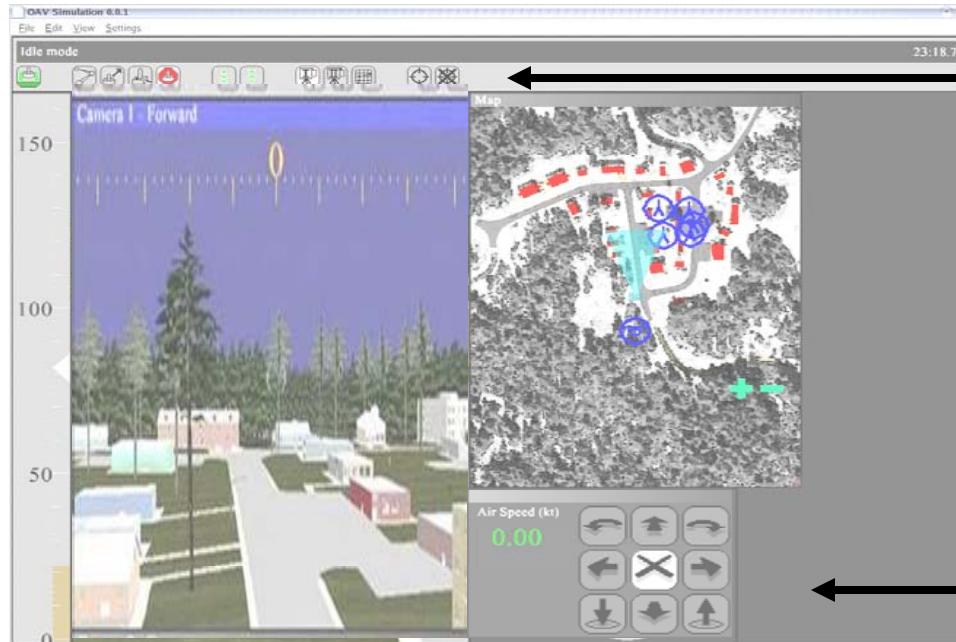
Popular for navigating through
virtual 3-D space

Design

- 2 x 2 x 2
 - Input Device (Mouse vs. Game Controller)
 - Input Control Display (Discrete vs. Continuous)
 - Number of Simultaneous Camera Views (1 or 2)
- Covariates
 - Spatial Ability
 - Video Game Experience (VGE)
- Simulated Vehicle
 - Vertical lift / land / hover / rotate in place
 - Simple inertial model
 - Velocity limited to 6 knots



1 Camera view at a time



Icons for:

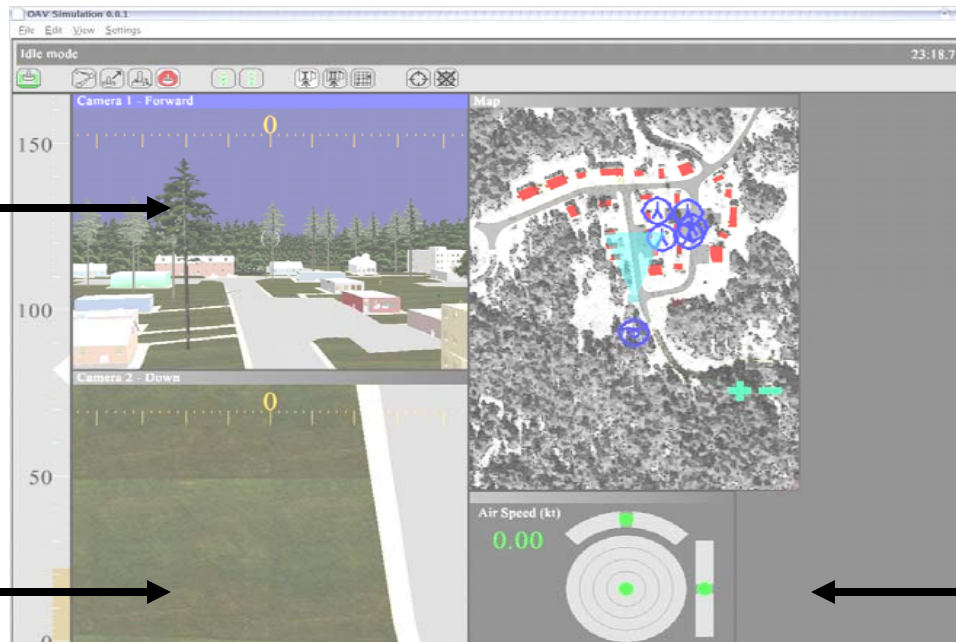
Take off/Land
Switching/Selecting views
(Others disabled)

Discrete ICD

2 Camera views at a time

Forward

Downward



Continuous ICD



Initial Training

- To minimal standard
- Complete exercises to
 - Temporal criteria
 - No collisions
- Final 2 exercises
 - “Racetrack” – max 5 tries
 - “Slalom” – max 5 tries

Missions

(performance measured)

- 1) Racetrack – no waypoints / no restrictions
- 2) Church – find and report personnel inside
- 3) Slalom – no waypoints / no restrictions
- 4) Reconnaissance – find, photo, & recall targets
- 5) Racetrack repetition
- 6) Slalom repetition

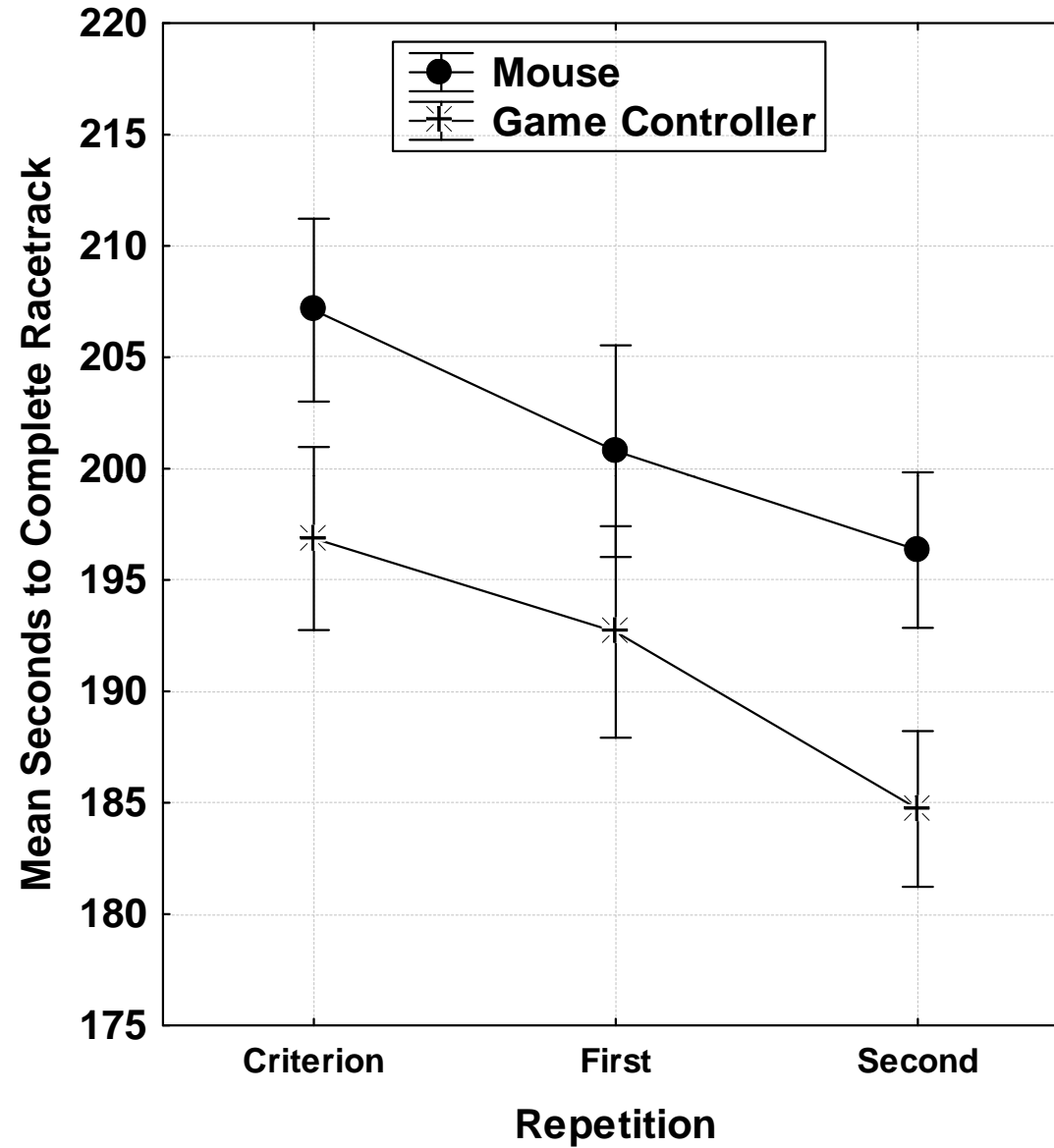
Measures

- Time to complete
- Collisions
- Workload
- Targets detected / photo'ed / recalled

Racetrack
Missions

VGE marginal
covariate of
time

VGE
significant
covariate of
workload

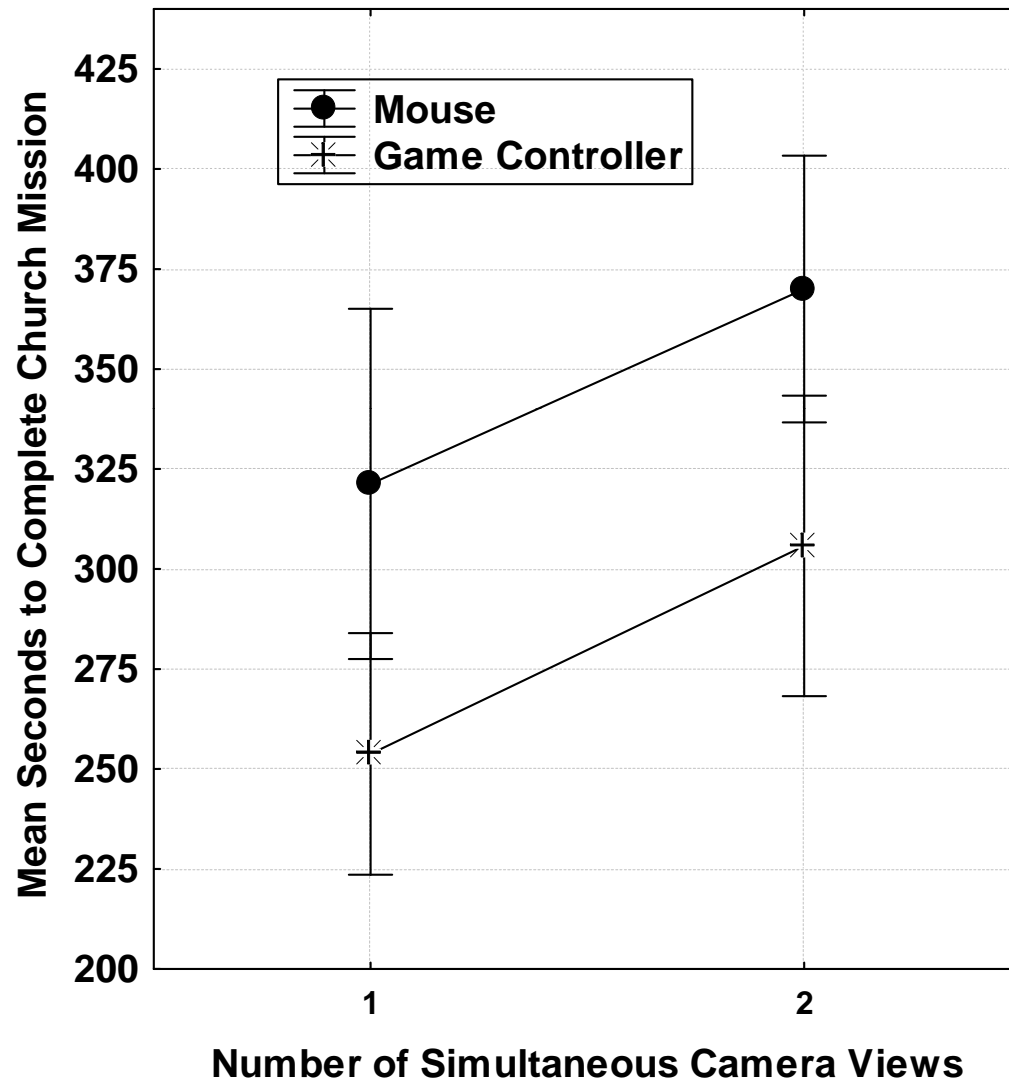


Church Mission

VGE significant
covariate of time

VGE significant
covariate of
workload

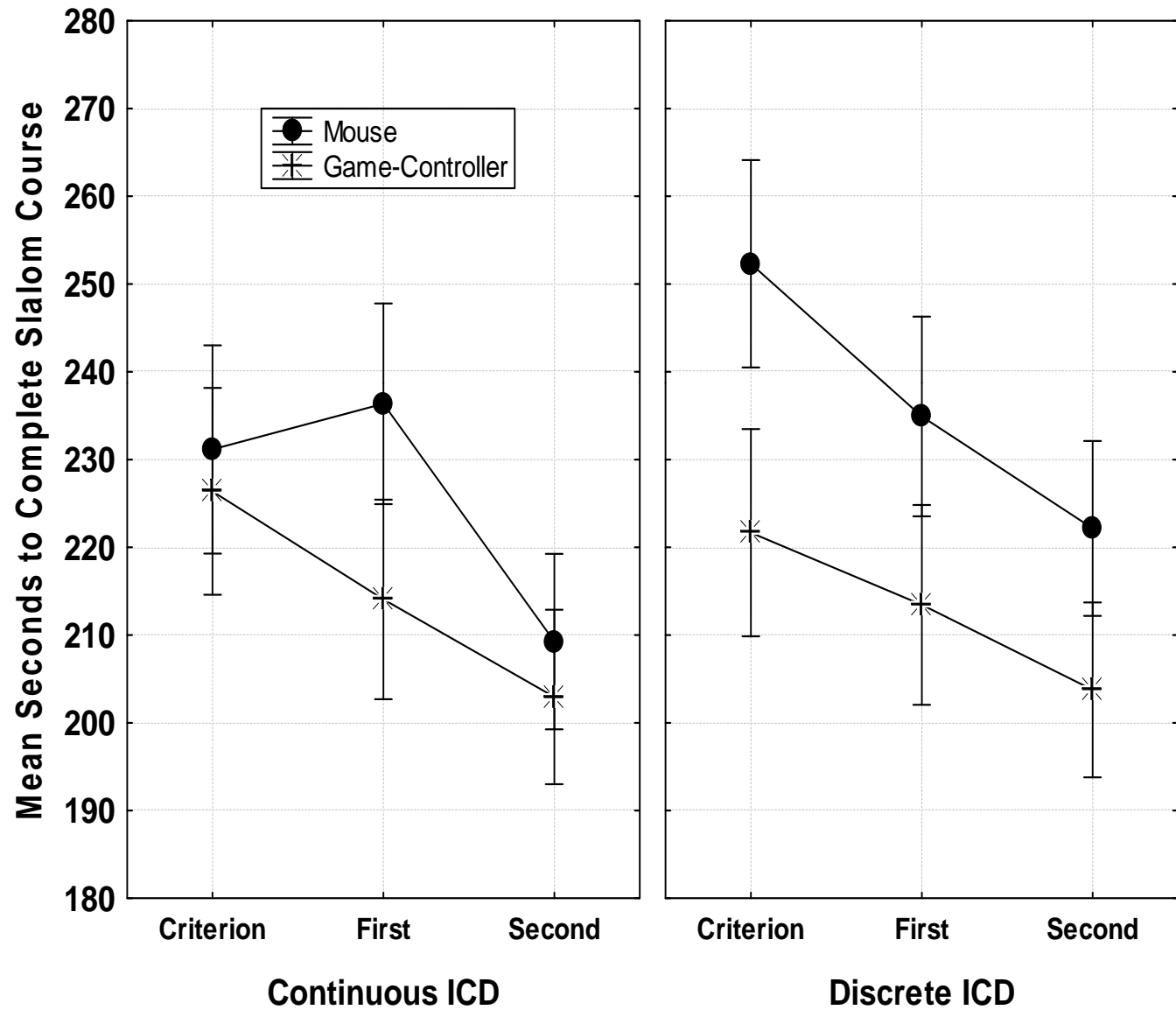
Significantly
more collisions
with mouse than
game controller
(69% vs. 30%)



Slalom Missions

VGE significant covariate of time

VGE significant covariate of workload



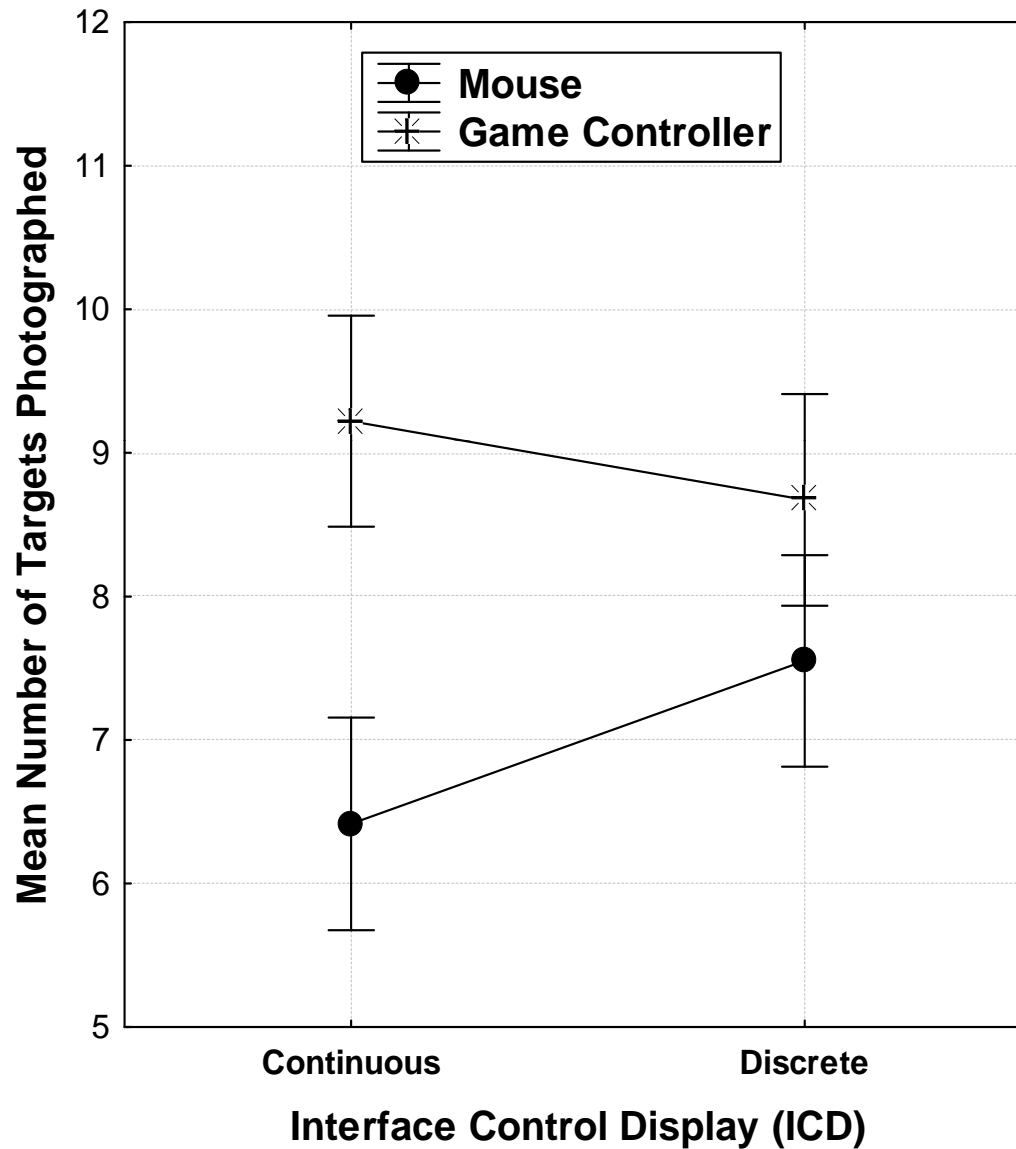
Recon Mission

VGE & Spatial
Ability

significant
covariates of
targets photo'ed
& recalled

VGE significant
covariate of
workload

Spatial Ability
significant
correlate of
number of
collisions



Summary and Issues

- Game Controller superior to Mouse
 - Why?
 - Hypothesis: Allowed more focused attention on camera view
 - Hypothesis: not physical device, but cognitive effects
- VGE predictive of performance
 - Why?
 - Hypothesis: Experience / comfort in simulation environments
 - Will it also transfer to the real thing?
- Spatial Ability predictive of performance
 - Why?
 - Substantial navigation and spatial learning required
- Performance improved over repeated missions
 - Control mastery or spatial learning?
 - Requires examination of transfer to novel environments

Questions?



More Info?

- Paula.Durlach@us.army.mil
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