



Calhoun: The NPS Institutional Archive
DSpace Repository

Center for Edge Power

Faculty and Researchers Collection

2011-06

Understanding the potential of virtual environments for improving C2 performance

Hudson, Ken; Nissen, Mark E.

<http://hdl.handle.net/10945/31236>

Downloaded from NPS Archive: Calhoun



Calhoun is a project of the Dudley Knox Library at NPS, furthering the precepts and goals of open government and government transparency. All information contained herein has been approved for release by the NPS Public Affairs Officer.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>



Understanding the potential of virtual environments for improving C2 performance

Ken Hudson, Loyalist College

Mark E. Nissen, US Naval Postgraduate School

16th International Command & Control Research & Technology Symposium

- Background
- Can VE improve performance?
- Initial experiment and analysis
- Aspects of VE leading to improved performance
- Current experimental approach
- Next steps



Background

- ELICIT: multiplayer online game
 - Counterterrorism intelligence domain
 - Like game *Clue*: ID fictitious terrorist plots
- Used for C2 experimentation
 - Examine org forms, learning, trust, culture, others
 - Very thin, textual interface
- Interested in extending into immersive VE



What is a Virtual Environment?

- Customizable platform for interaction
- Synchronous and persistent network
- People are represented as avatars
- Flexibility of usage

Virtual environment "Second Life"





Design elements to support Neutral Valence

- Interior space only free from natural world complexities
- Subtle texturing of spaces
- Constant ambient lighting
- Narrow range of environmental stimuli

Neutral space prototype



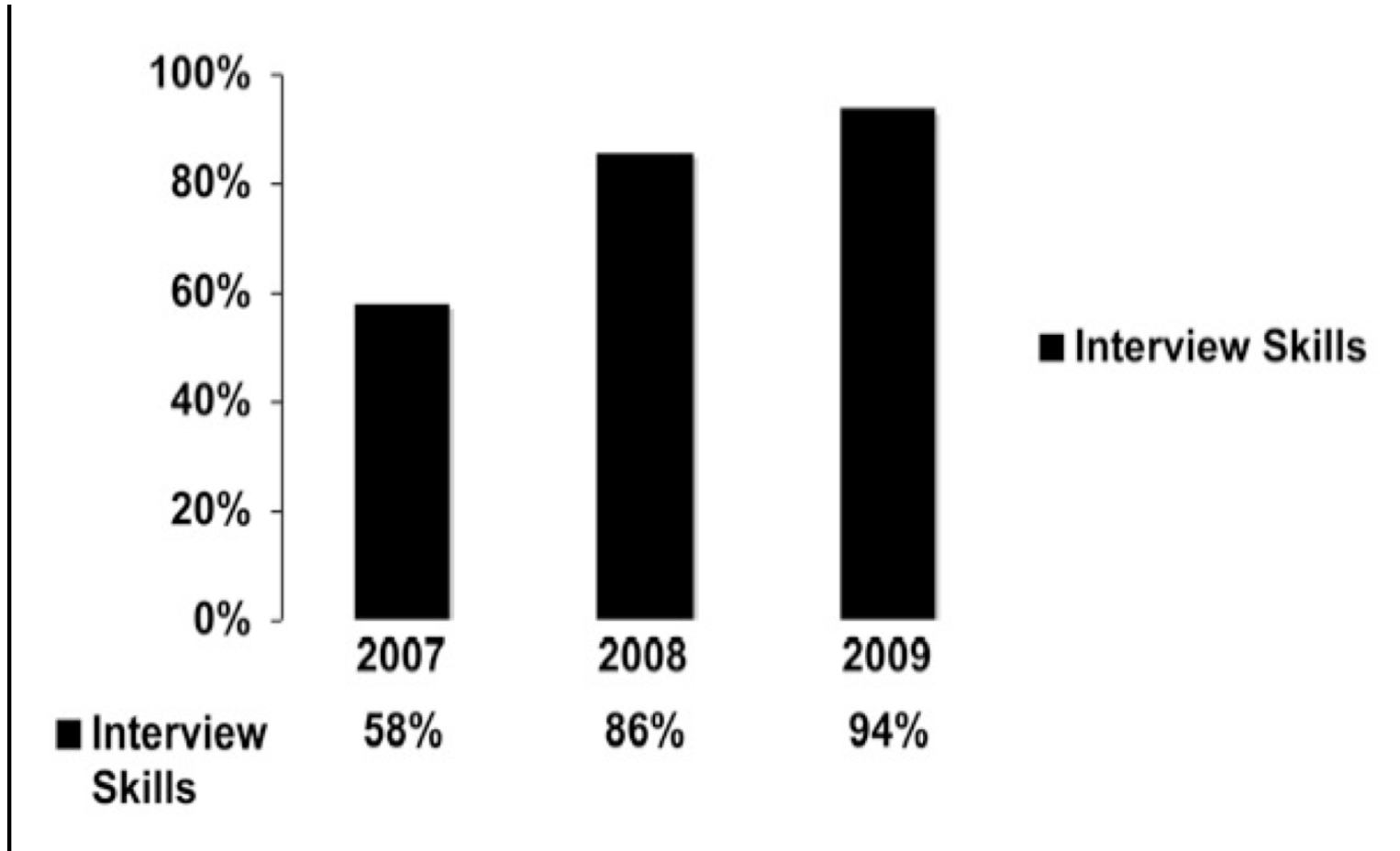
Can VE improve C2 performance?



Canadian border simulation



Border simulation results



Initial experiment



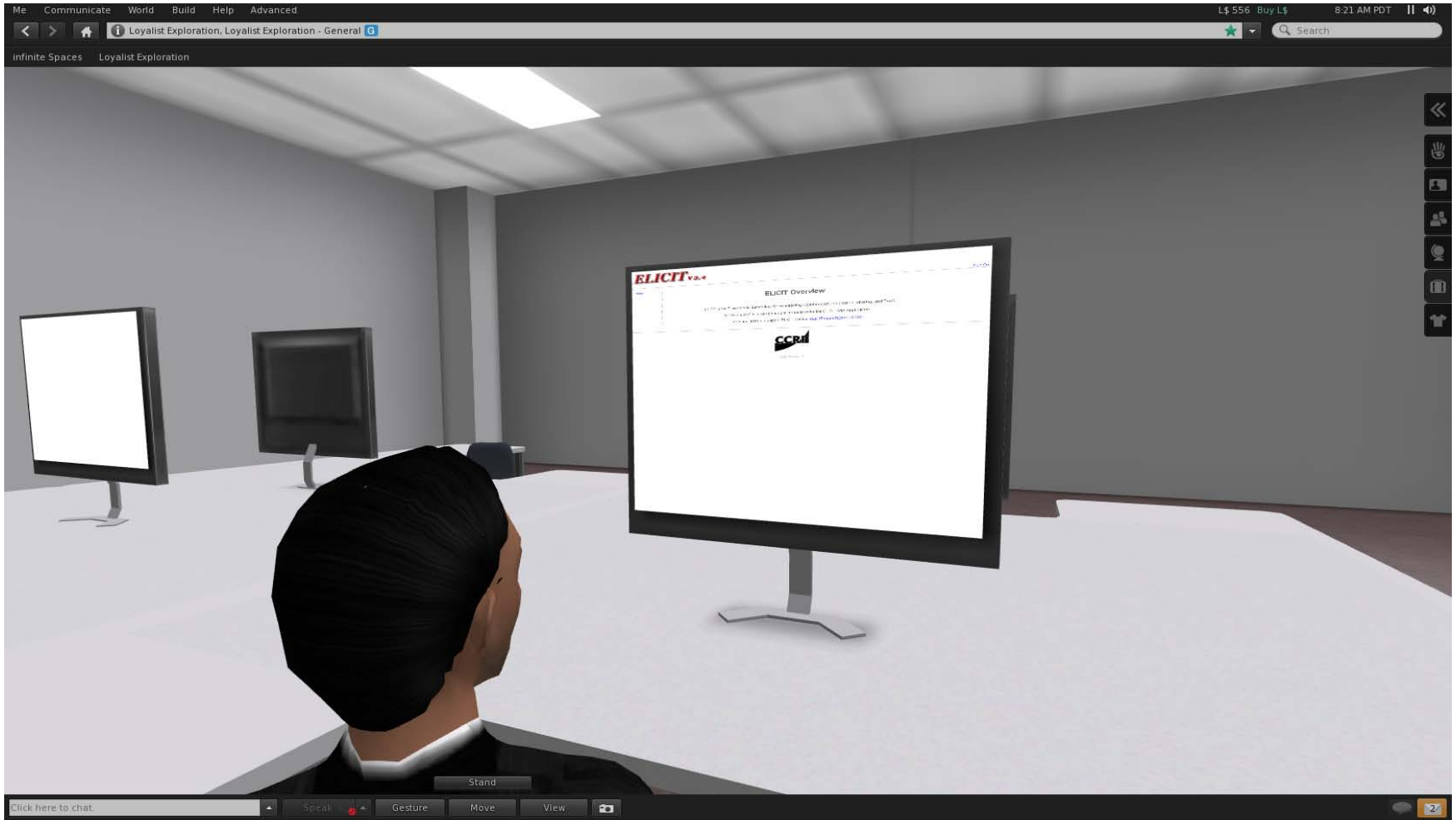


Hybrid Room

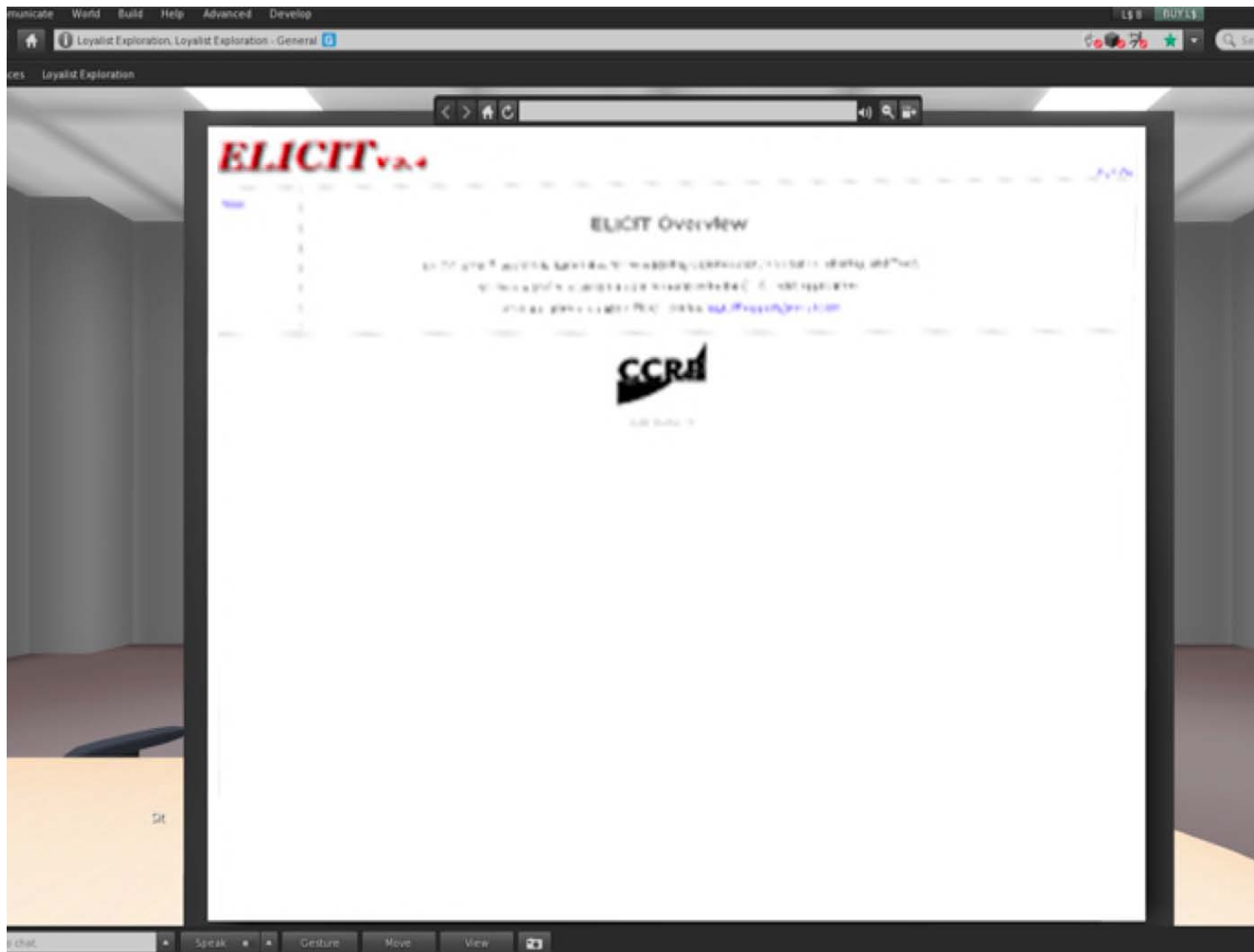




Second Life Viewer 2.0



Participant perspective



ELICIT results FTF vs. CM

Variable	Mean	N	Standard Deviation	Standard Error
ID Time CM (in seconds)	2685	14	219	58
ID Time FTF (in seconds)	2554	14	279	74
Who Score CM	.140	14	.363	.097
Who Score FTF	.790	14	.426	.114
What Score CM	.321	14	.249	.066
What Score FTF	.536	14	.365	.098
Where Score CM	.570	14	.514	.137
Where Score FTF	.790	14	.426	.114
When Score CM	.262	14	.297	.079
When Score FTF	.333	14	.320	.086
Identify Composite CM	.324	14	.206	.055
Identify Composite FTF	.610	14	.327	.087



Aspects of VE leading to improved performance

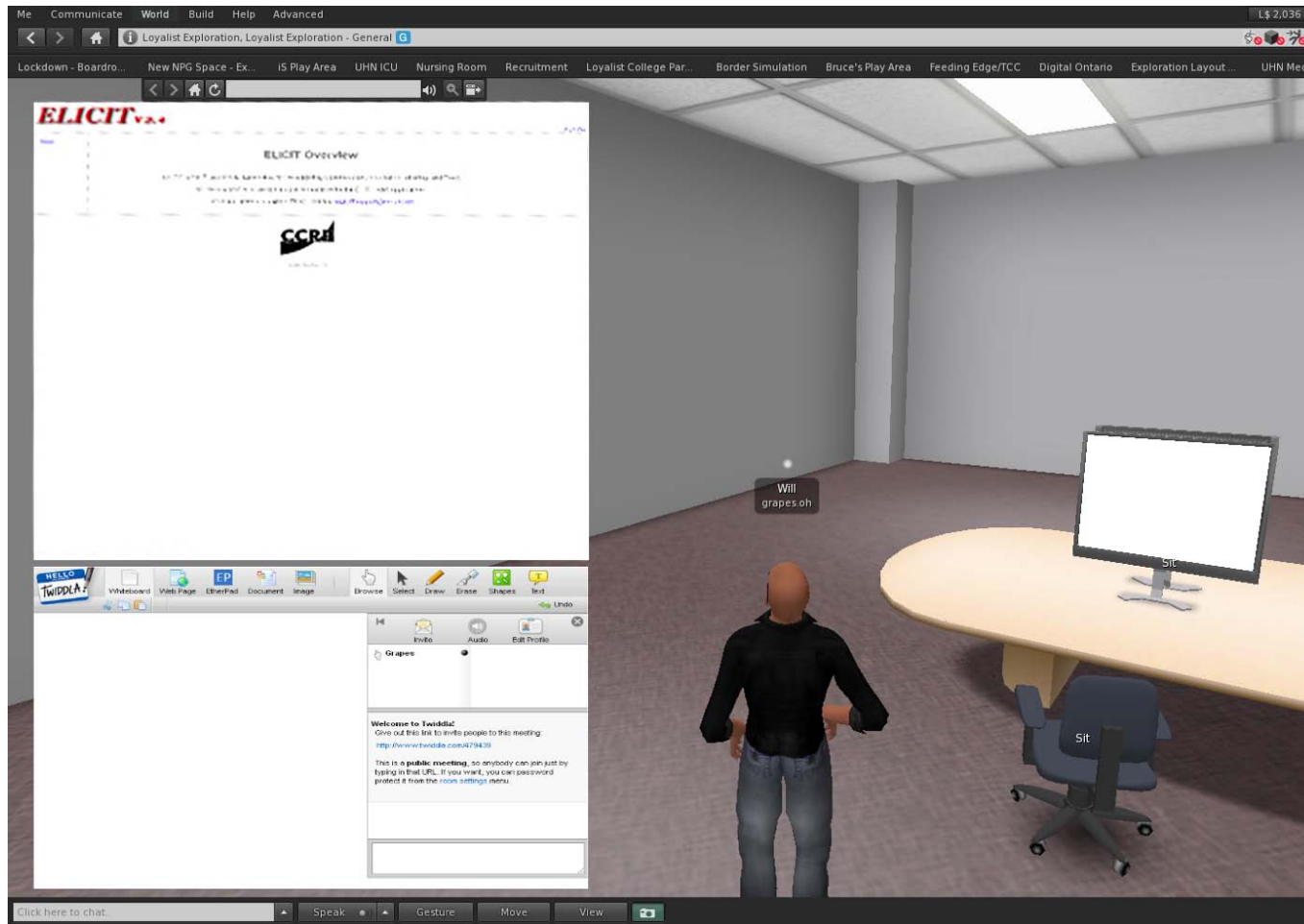
- Participant centered experience
- Contextually situated learning
- Fully utilize VE style of interactions
- Identification of self with avatar
- Sense of being in environment (presence)
- Sense of sharing environment with others (co-presence)



Current experimental approach

- Seeks to harmonize native attributes of virtual environments that lead to enhanced performance by augmenting user interface and allowing for a broader range of interactions than the initial experiment.

ELICIT in HUD



'Paper' clue version of ELICIT



The screenshot shows a virtual world interface with a clue selection menu on the left and a 3D environment on the right. The menu includes seven clues, each with an icon: Clue #1 (envelope), Clue #2 (magnifying glass), Clue #3 (megaphone), Clue #4 (two people), Clue #5 (question mark), Clue #6, and Clue #7. A 'Select Who Receives Clue' panel shows a 4x4 grid of numbers 1-16. In the 3D environment, a character named 'Will grapes oh' is visible, and there are 'Sit' labels on chairs.

Clue Selection Menu:

- Clue #1
- Clue #2
- Clue #3
- Clue #4
- Clue #5
- Clue #6
- Clue #7

Select Who Receives Clue Grid:

1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16

3D Environment:

- Character: Will grapes oh
- Chairs: Sit
- Table: Sit
- Monitor: Sit

Interface Elements:

- Me Communicate World Build Help Advanced
- Loyalist Exploration, Loyalist Exploration - General
- Lockdown - Boardro... New NPG Space - Ex... iS Play Area UHN ICU Nursing Room Recruitment Loyalist College Par... Border Simulation Bruce's Play Area Feeding Edge/TCC Digital Ontario Exploration Layout... UH
- Click here to chat
- Speak
- Gesture
- Move
- View

Next steps

- Proceed with experimentation with ELICIT game-play through HUD
- Enhanced experimentation using 'paper clue' version of ELICIT in both F2F and CM
- Explore potentialities of integrated abELICIT within virtual environment