



U.S. Army Research, Development and Engineering Command



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Keystroke Level Modeling for UAV Ground Control Stations

Jeffrey T. Hansberger, Ph.D.



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MANPRINT



The Soldier is Our Mission

Fit the Equipment to the Soldier
Not the Soldier to the Equipment



Which instills more confidence and motivates action?

- HFE General Concern – Human-Computer Interaction. The interface requires the user to interact with several dialog boxes on a 30” screen and to go three menus deep to conduct simple actions like take a picture.
- Recommendation: Consider providing physical hot keys for simple and often used actions.
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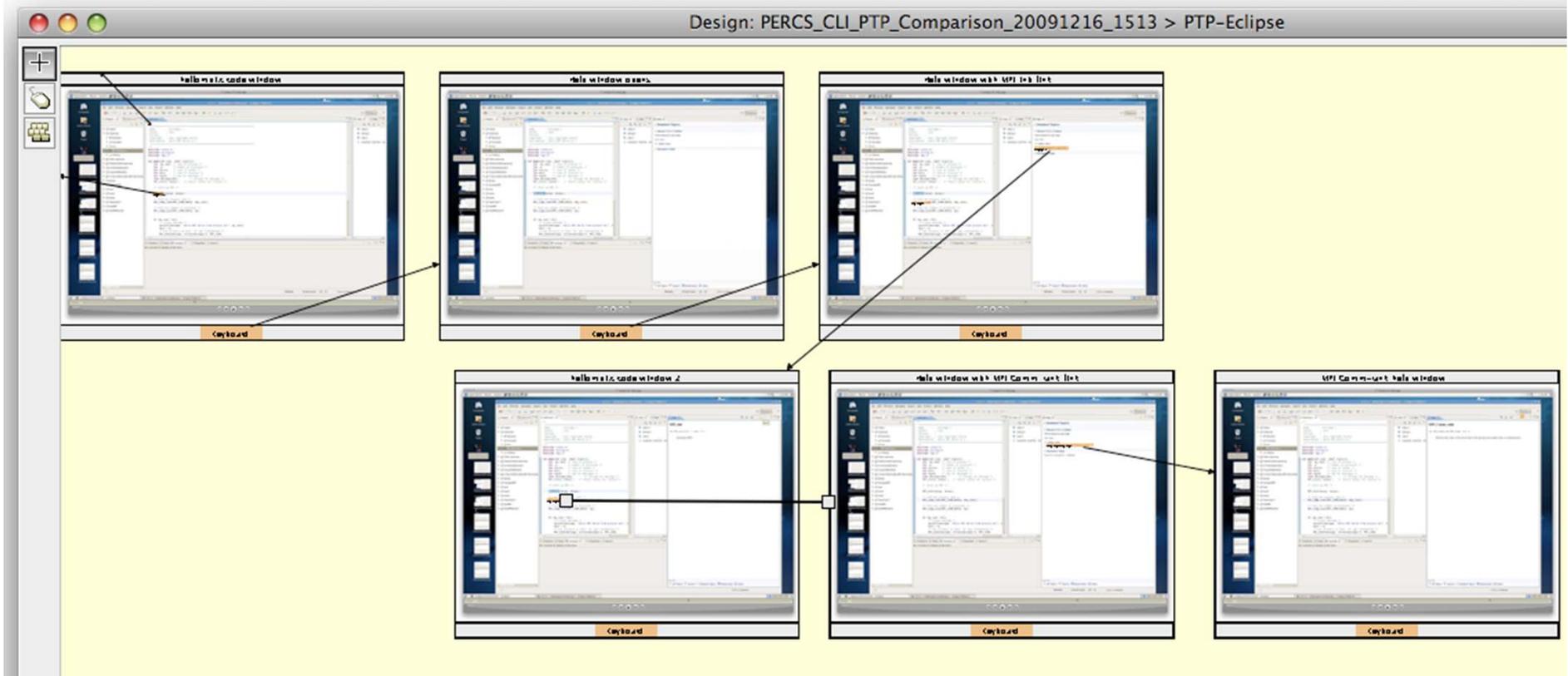
Normally:

1. Design and program prototype
2. Obtain experts or train novices
3. Run study
4. Analyze data

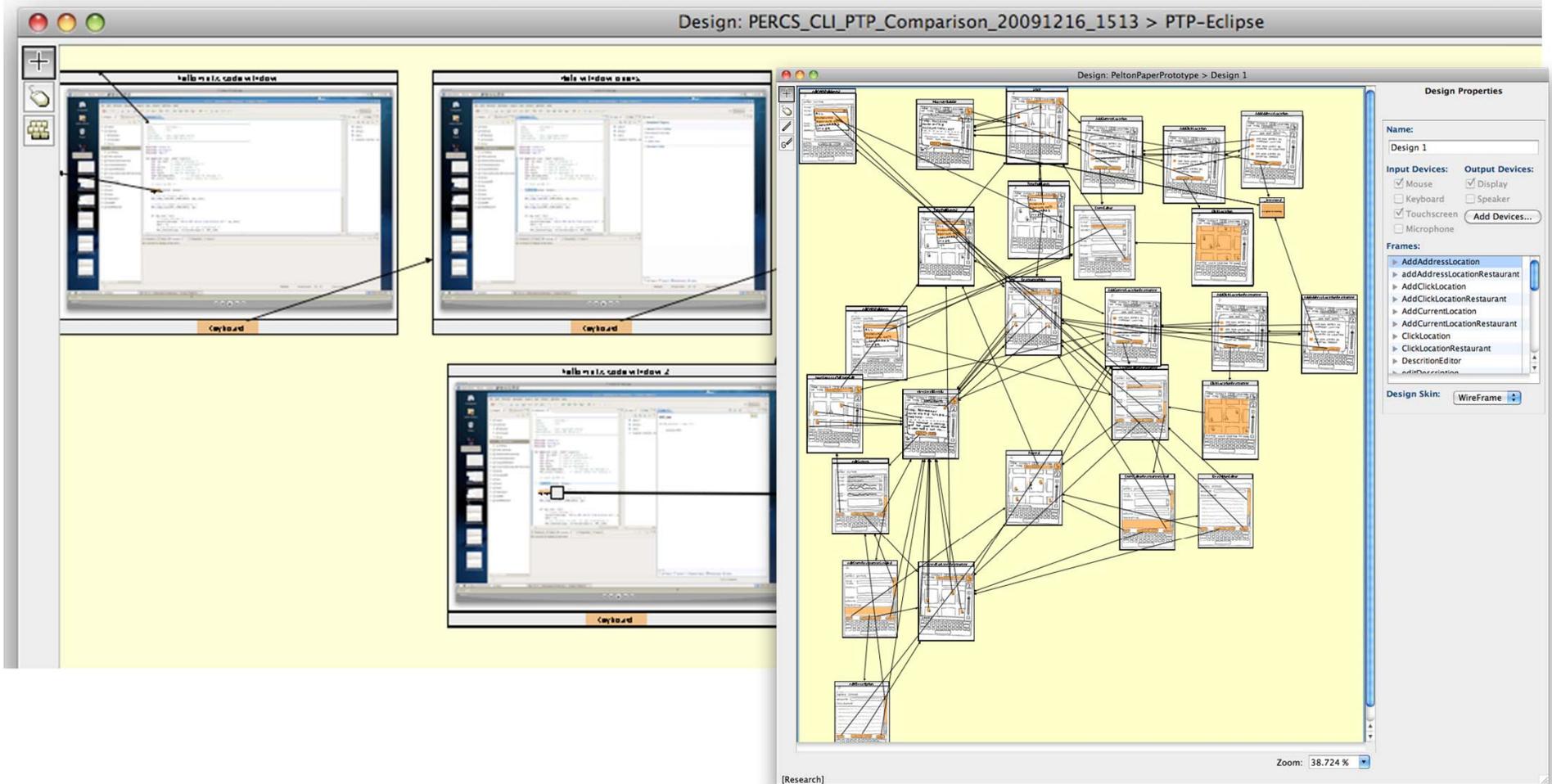
Modeling:

1. Build prototype
2. Specify tasks and methods
3. Predict behavior

CogTool is an open source tool that describes an environment in a storyboard...



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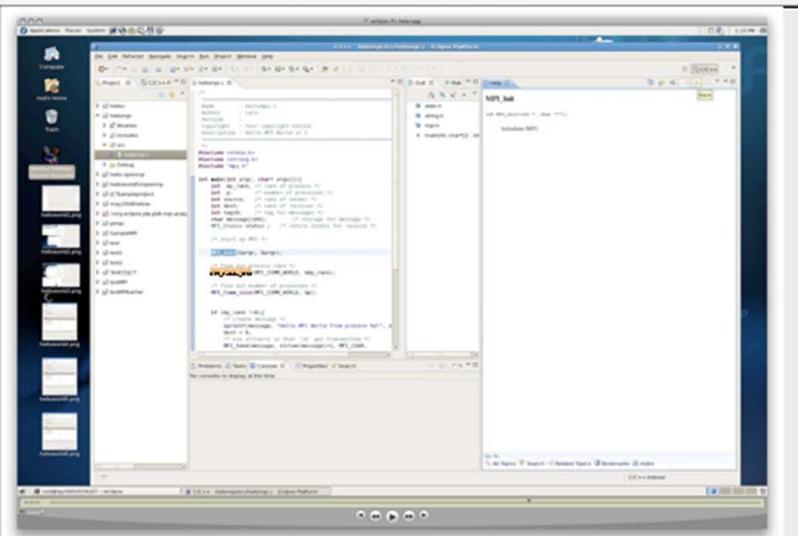




...and demonstrate a task

Script: PERCS_CLI_PTP_Comparison_20091216_1513 > PTP-Eclipse > F1 Help with mouse

hellompi.c code window 2



Prediction: 10.462 s Show Visualization

Script Step List

Frame	Action	Widget/Device
hellompi.c code window	Look At	MPI_Init (Text MPI_Init)
hellompi.c code window	Think for 1.200 s	
hellompi.c code window	Move Mouse	MPI_Init (Text MPI_Init)
hellompi.c code window	Left Click	MPI_Init (Text MPI_Init)
hellompi.c code window	Think for 1.200 s	
hellompi.c code window	Type '*f1'	Keyboard
Help window opens	Type '*f1'	Keyboard
...with MPI_Init link	Think for 1.200 s	
...with MPI_Init link	Move Mouse	int MPI_Init(int*, char***) (MPI_Init help link)
...with MPI_Init link	Left Click	int MPI_Init(int*, char***) (MPI_Init help link)
hellompi.c code window 2	Move Mouse	MPI_Comm_rank (MPI_Comm_rank text)
hellompi.c code window 2	Left Double-Click	MPI_Comm_rank (MPI_Comm_rank text)
...th MPI_Comm_rank link	Think for 1.200 s	
...th MPI_Comm_rank link	Move Mouse	...MPI_Comm, int *) (MPI_Comm_rank text)
...th MPI_Comm_rank link	Left Click	...MPI_Comm, int *) (MPI_Comm_rank text)
...rank help window		

Keyboard Zoom: 24.389 %

Look at Widget Think

[Research]

Mouse hand Right

Initial hand location Mouse

Delete Step

Compute

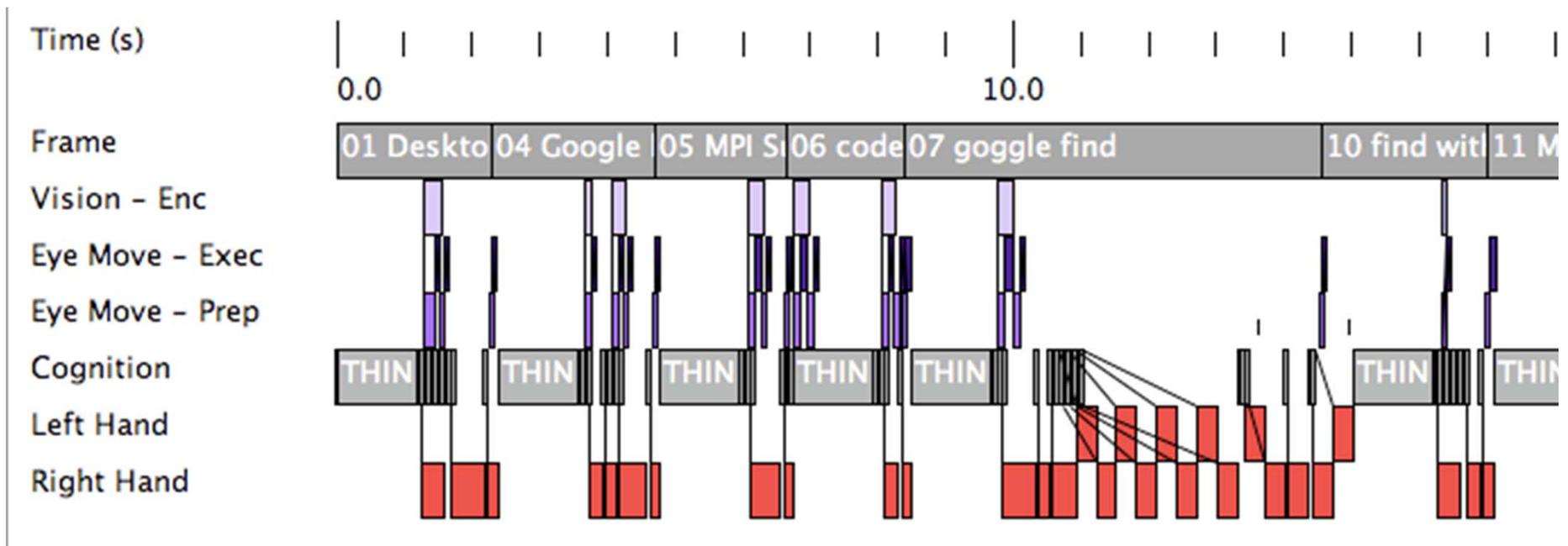
- CogTool automatically creates a Keystroke-Level Model of a skilled person doing this task and produces predictions of task execution time.*

* Project: PERCS_CLI_PTP_Comparison_20091216_1513

Tasks	Command Line	PTP-Eclipse
▼ HellowWorld_mpi	Min: 114.405 s	Min: 40.090 s
HelloWorld_mpi with keyboard	161.111 s	
HelloWorld_mpi with mouse	114.405 s	40.090 s
▼ F1Help	Min: 30.726 s	Min: 10.462 s
F1 Help with keyboard	30.726 s	
F1 Help with mouse	31.247 s	10.462 s
▼ Code Folding	Min: 5.780 s	Min: 3.563 s
Code folding with keyboard	10.490 s	
Code folding with mouse	5.780 s	3.563 s
Barrier Analysis	40.149 s	11.833 s

* Based on Card, Moran and Newell's Keystroke-Level Model (1980)

And you can look under the hood to see what the model is doing.





Beauty of Cogtools is all the model and theory details are hidden.

Tasks	UGCS baseline
▼ Mark, Image, & Laser	Sum: 31.191 s
Mark, Image, and Laser - Current	22.786 s
Mark, Image, and Laser - Hot keys	8.405 s



The screenshot displays the UGCS (UGCS: GUI vs. Hot Keys) interface. It features a 3D terrain view at the top left, a 2D map at the bottom left, and several control panels on the right.

3D Terrain View: Shows a top-down view of a terrain with a green sensor footprint. The interface includes controls for 'AUTO', 'LDFF_OFF', 'EMRT', and 'ED'. It also displays 'P3800', 'FOV 8.5', and a scale bar.

2D Map: Shows a topographic map of the region around Bagram, Afghanistan. Key locations include 'DO ABI GHOWR BAND', 'BAGRAM 4695', 'DAKOW YE PAYSAN 10180', 'KABUL', 'SAROBAT', 'JALEZ', 'SHEKHABAD', and 'PAKHYAB-E SHANEH'. The map includes a grid and various labels like 'VD WD VC WC' and 'KE'. A large '15°' label is visible on the map.

Control Panels:

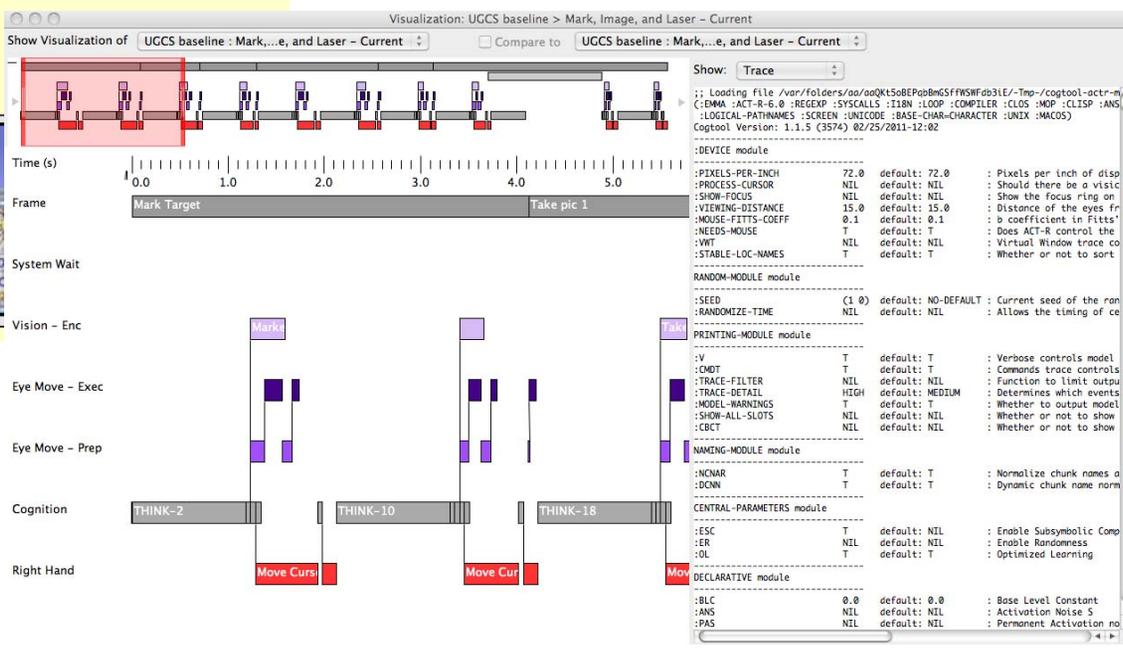
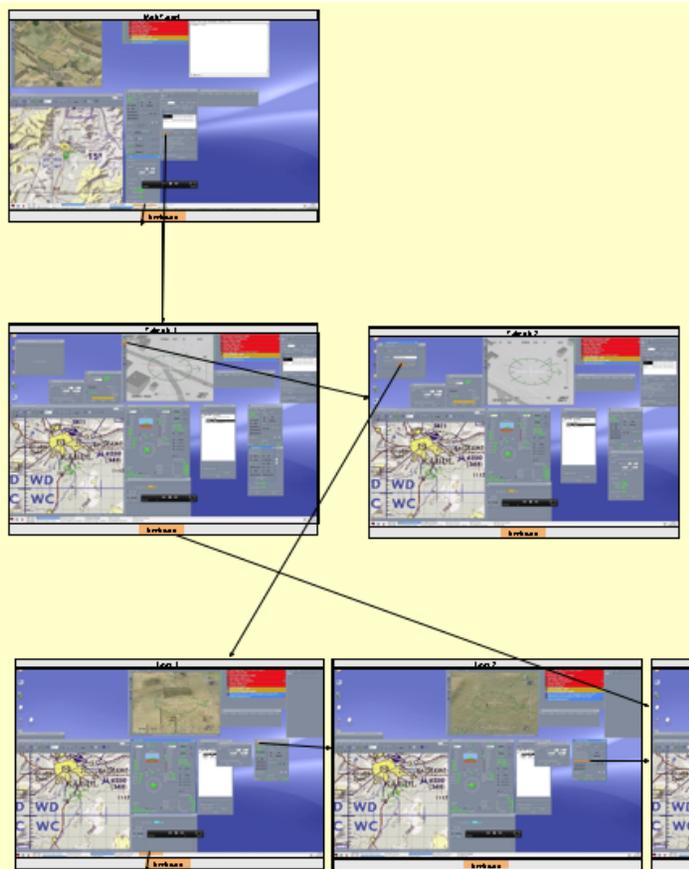
- Sensor Control:** Includes 'Control modes' (Search, H-Hold, P&C, Autotrack, Track Search, Track Offset), 'FOV (deg)', 'Polarity' (Black, Green), 'Focus' (Auto, Manual), 'Brightness' (Auto, Manual), 'Contrast' (Auto, Manual), and 'P&C' (Auto-Hold with coordinate selections, Marks zone, Datum, Mission, Altitude (ft), Report led, MGS zone, Datum, Altitude (ft)).
- Marked Targets - Mission Manager:** Includes 'Manual Targets', 'Target List', 'Import List', 'Export List', 'Target marking' (Mark, Update, Manual, Delete), 'Laser range finder averaging' (Sampling time, Standard deviation, Location calculated by VCS-Home), 'Sensor on target' (Page), and 'Tactical messaging' (Default).
- Shell:** A terminal window showing the command 'tcrew2bcs2 -15'.

Status Bar: At the bottom, it shows 'MGS zone 150', '22297 11908', 'Datum WGS84', and 'Altitude (ft) 6295'. A playback control bar is also visible at the bottom center.



Project: UGCS

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Questions

jeff.hansberger@us.army.mil