

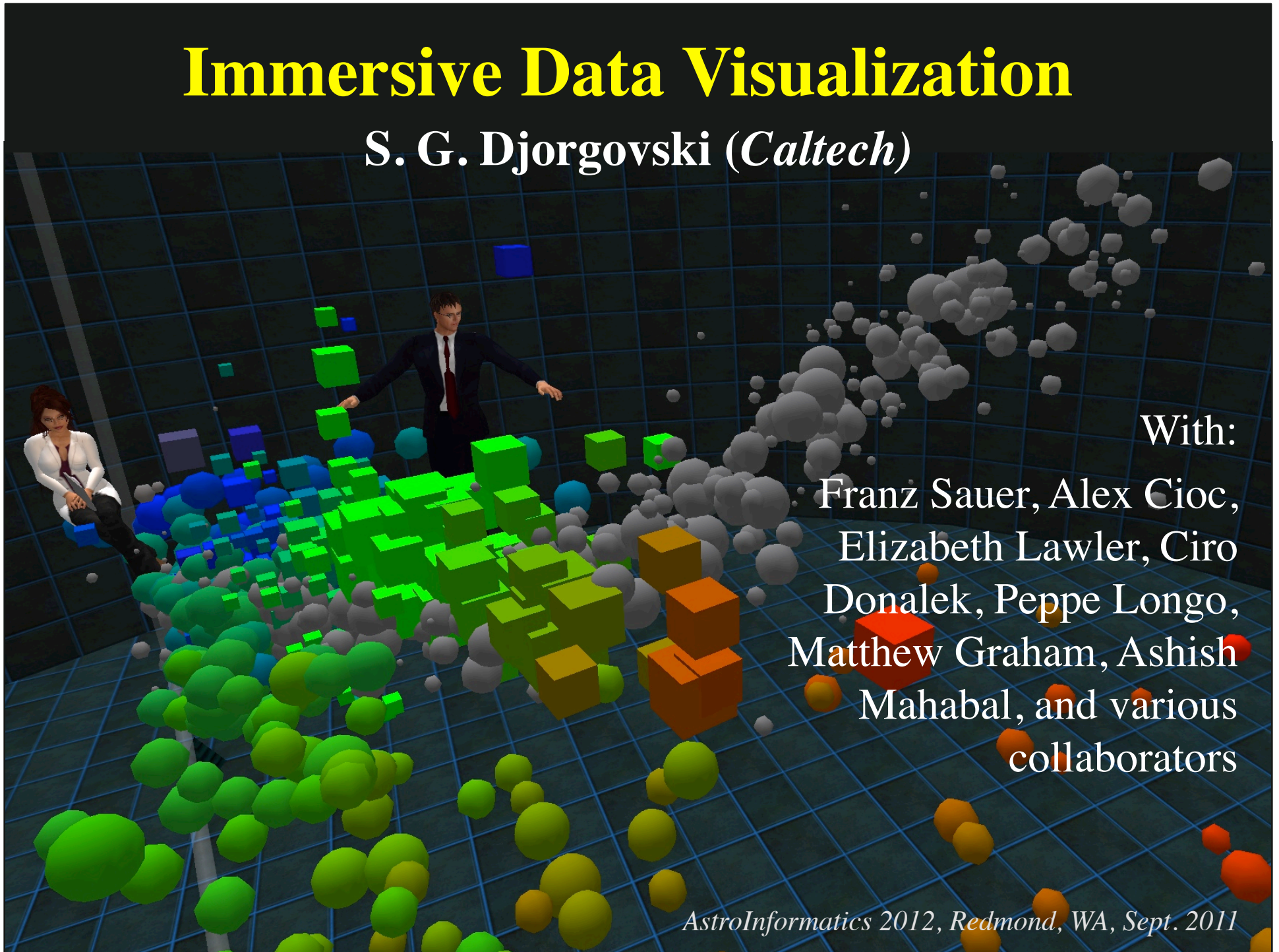
Immersive Data Visualization

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With:

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Matthew Graham, Ashish
Mahabal, and various
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AstroInformatics 2012, Redmond, WA, Sept. 2011



Immersive VR and the Emerging 3D Web



Video games



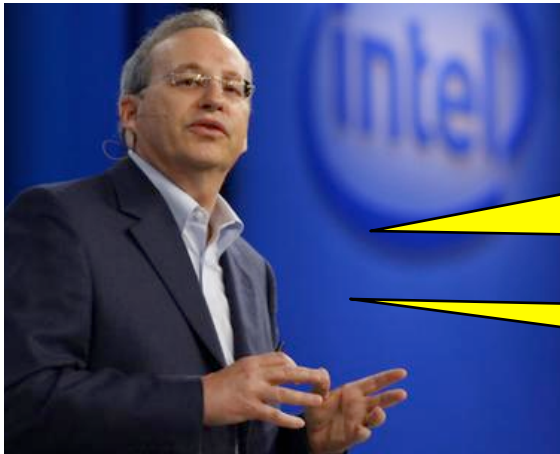
and Virtual Worlds

... and the gamer generation growing up



Hollywood going 3-D

... and the future of the Web:



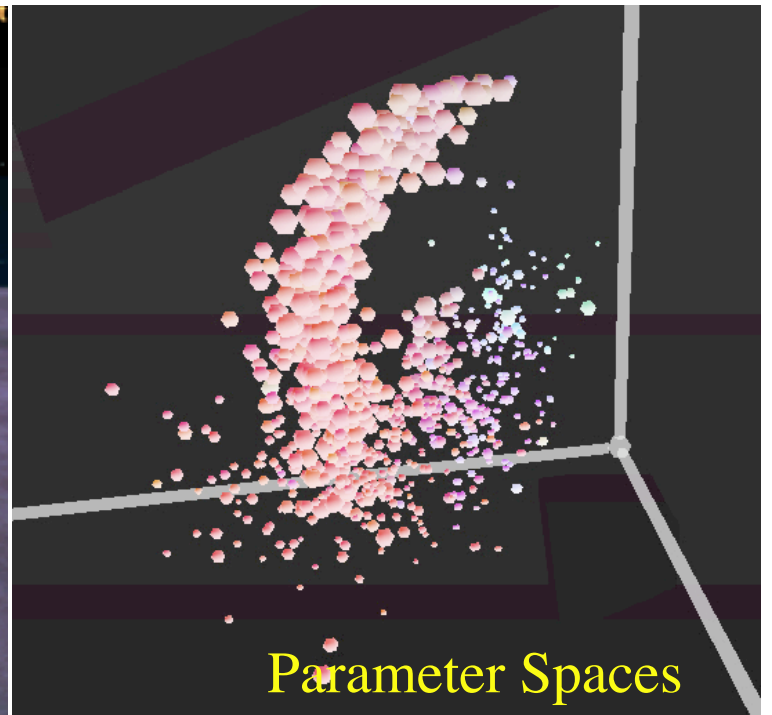
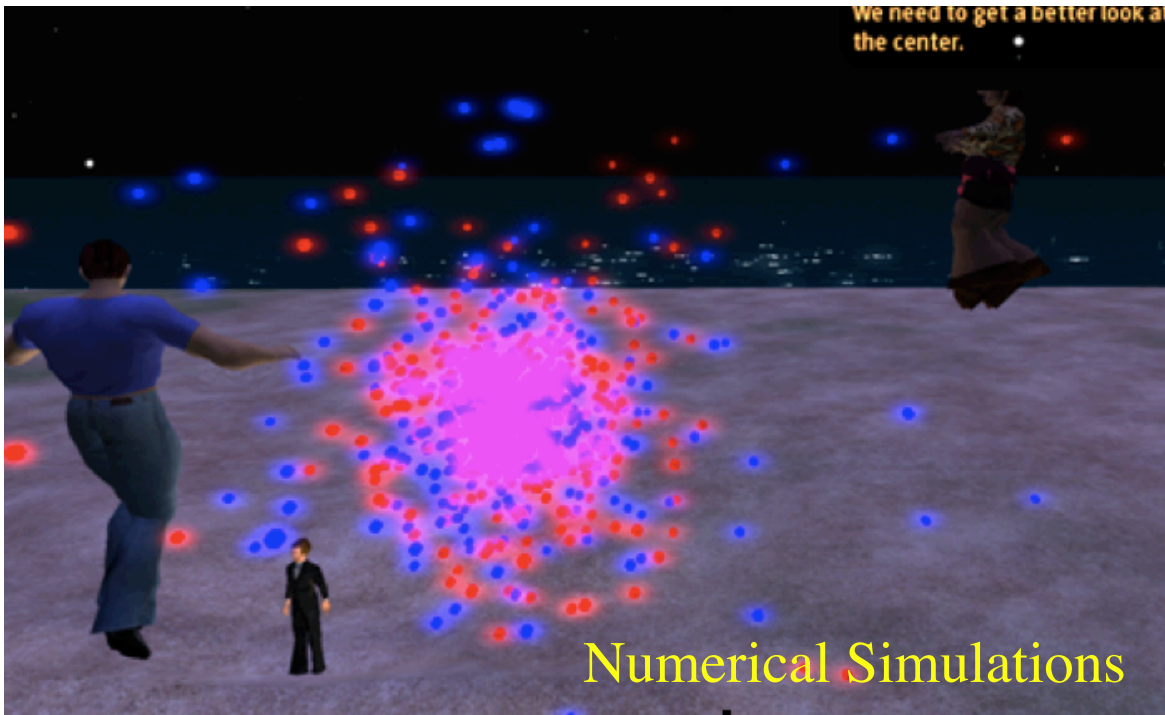
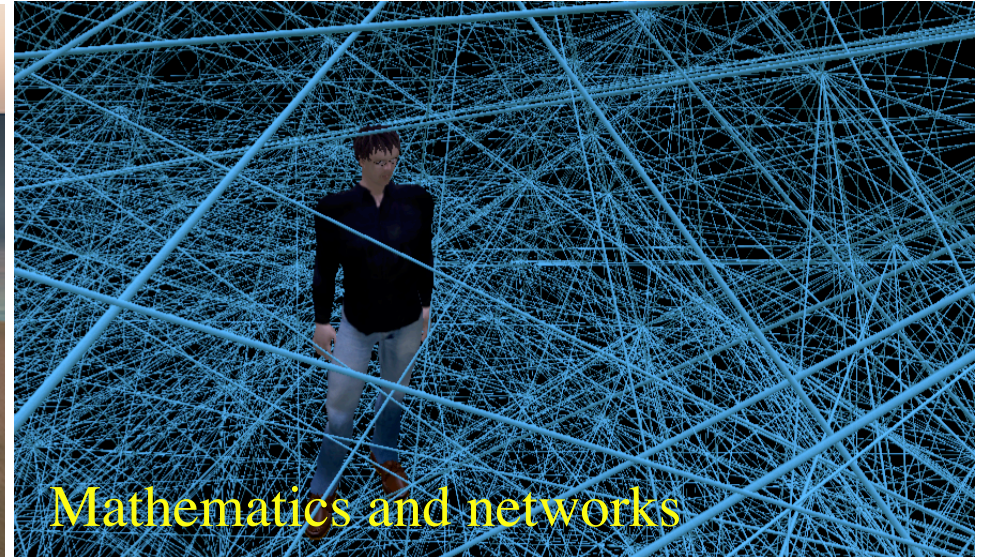
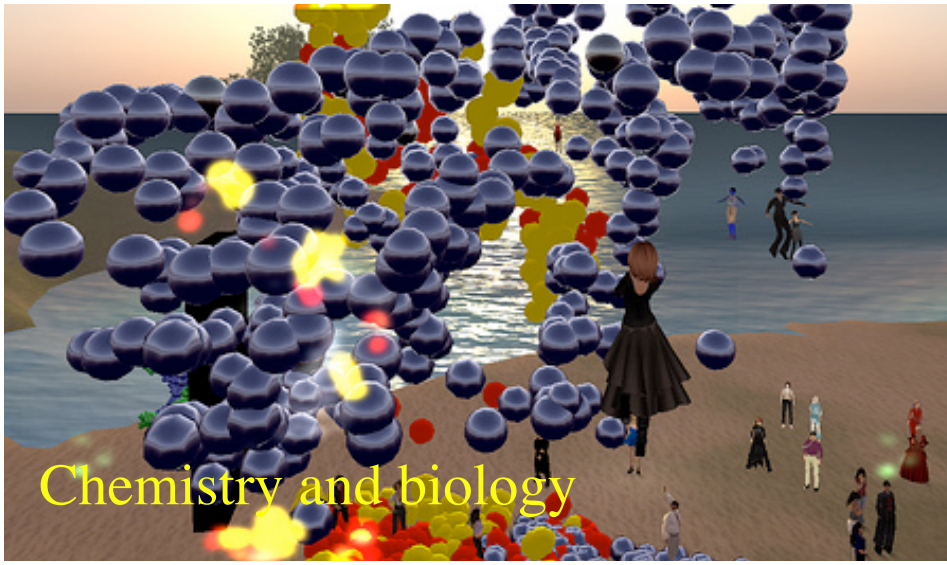
Justin Rattner, Intel CTO, in a keynote talk at the SC'09:

“... There is nothing more important to the long-term health of the HPC industry than the 3D Web...”

“... the 3D Web will be the technology driver that revitalizes the HPC business model ...”

We are exploring these emerging technologies for scientific purposes, data visualization in particular

Immersive Data Visualization



Interactive Data Visualization

Experiments in Intel's
ScienceSim world

Data points linked to web resources

The screenshot displays the ScienceSim world interface. On the left, a 3D visualization shows a cluster of red cubes representing data points. A yellow arrow points from one of these cubes to a detailed view on the right. The detailed view shows the SDSS object J094705.50+004204.0, which is a GALAXY. The view includes a table of data points, a small image of the galaxy, and a list of links to related resources. A yellow arrow points from the 3D visualization to the detailed view.

SDSS J094705.50+004204.0

Type	RA,dec		ObjID
	Decimal	Hexagesimal	
GALAXY	146.77292149,0.70112893	09:47:05.5,+00:42:04.06	5888489009718888

Column names link to glossary entries. Move mouse over a column name to get its units.

mode: PRIMARY

status: TARGET PRIMARY OK_STRIPE OK_SCANLINE PSEGMENT RESOLVED OK_RUN GOOD SET

flags: DEBLEND_NOPEAK STATIONARY MOVED BINNED1 NOPETRO NODEBLEND CHILD BLENDED

PrimTarget: TARGET_GALAXY

SecTarget:

u	g	r	i	z		
19.55	18.29	17.82	17.59	17.34		
err_u	err_g	err_r	err_i	err_z		
0.07	0.01	0.01	0.02	0.04		
run	rerun	camcol	field	obj	rowc	col
756	44	5	207	181	258.4	718
fiberMag_r	petroMag_r	devMag_r	expMag_r	psfMag_r		
19.84	17.92	17.26	17.82	20.15		
extinction_r	petroRad_r	parentId	nCl			
0.42	7.084	588848900971888819				

cube:
Identifier: 587725074458804431
Spatial Location: < 6.259955, 3.655669, 2.316938 >
Size: 0.264872
Color: < 0.681749, 0.050000, 0.050000 >
Opacity: 0.904609
Website: <http://cas.sdss.org/astrodr6/en/tools/explore/obj.asp?id=587725074458804431>

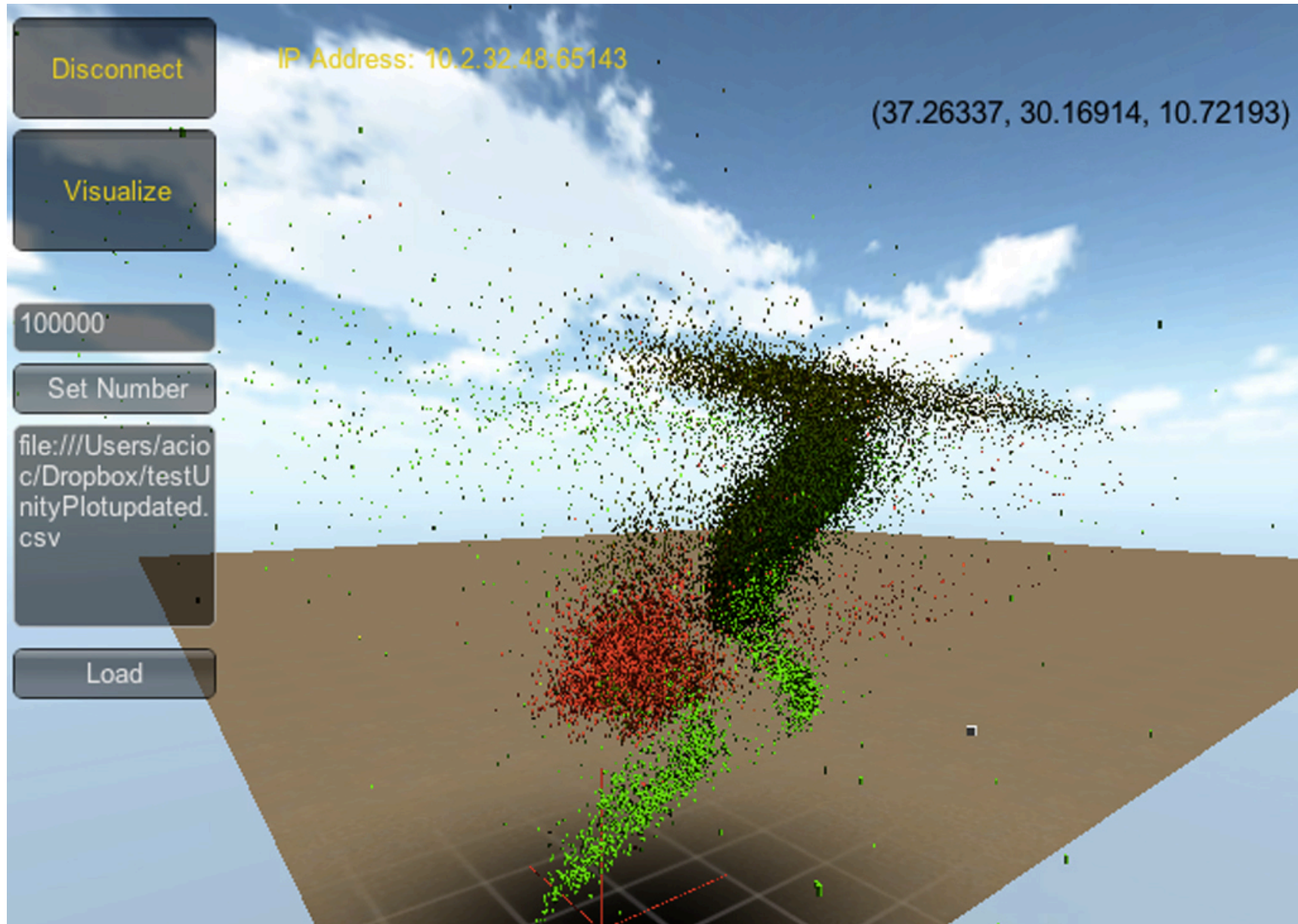
Curious George

Data Point

Touch F

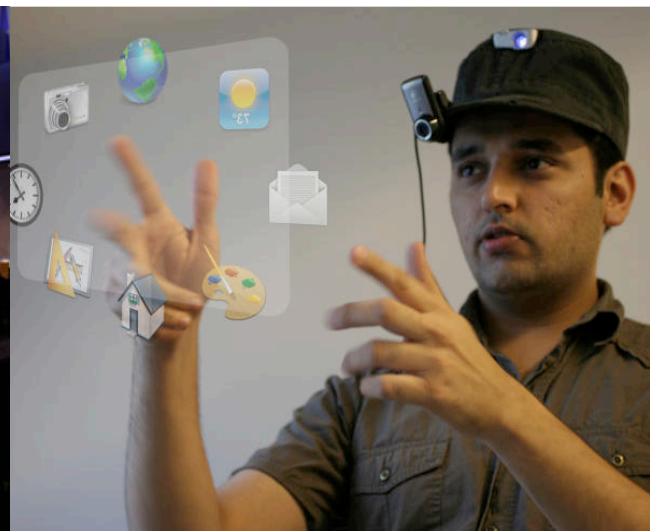
Editor **Sky** **Map** **Mini-Map** **Inventory**

Data Browser Using Unity 3D

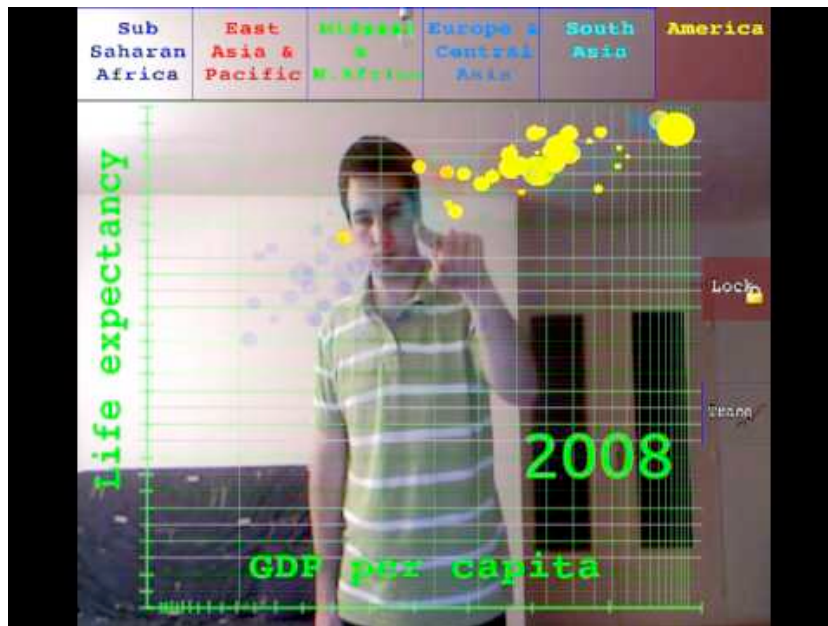


3D Interfaces

- 3D displays (multiple technologies)
- Haptic interfaces (Kinect, Sixth Sense, ...) to capture expressions, body language
- Increasingly photorealistic avatars
- Now driven by the games/movie industry, but likely to become a standard interface to the immersive/augmentative VR web



From Science Fiction to (Virtual) Reality



Summary

- Visualization is a key need for discovery and understanding
- The 3D Web is coming, and probably sooner than you think

Enabling technologies: 3D video, games, virtual worlds, haptic interfaces

- 3D, interactive, collaborative visualization is far more intuitive than the traditional 2D approaches – greater insights?
- Up to a dozen dimensions can be encoded effectively (more if we add sonification to visualization)
 - That is still not enough for the hyperdimensional data spaces that we are dealing with – a key limitation
- Working tools already on the *OpenSim/SL* platform; Unity 3D based, web-browser data visualization tool coming soon
- Cost is very low (hardware); zero cost for virtual worlds