

iEMSs 2014, San Diego

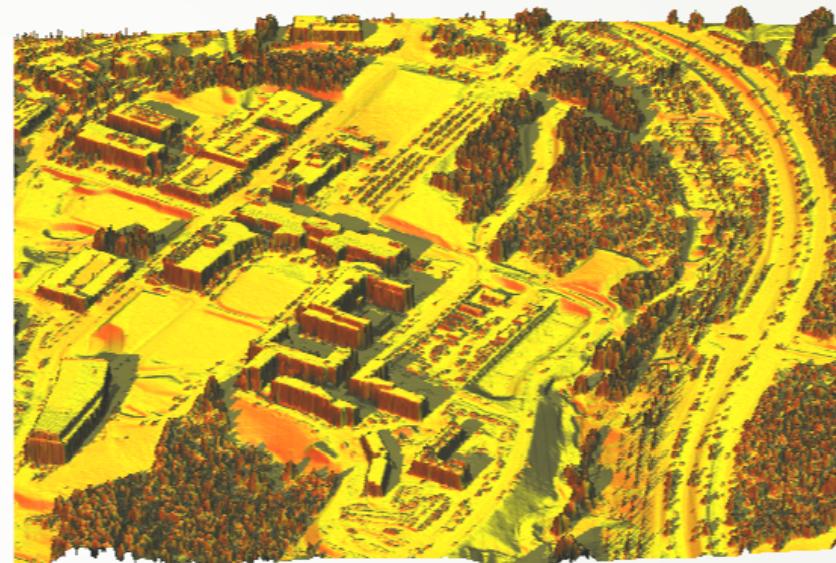
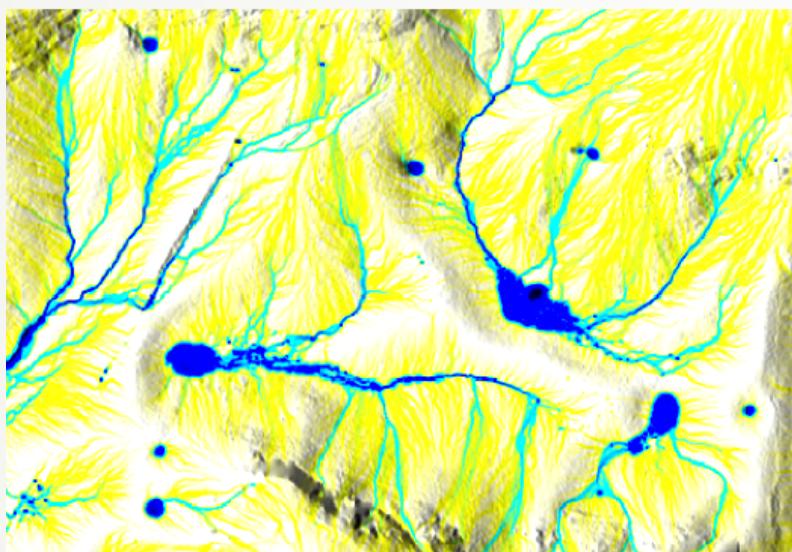
North Carolina State University, Raleigh, NC, USA

Anna Petrasova, Brendan Harmon, Vaclav Petras, Helena Mitasova

GIS-based environmental modeling with tangible interaction and dynamic visualization

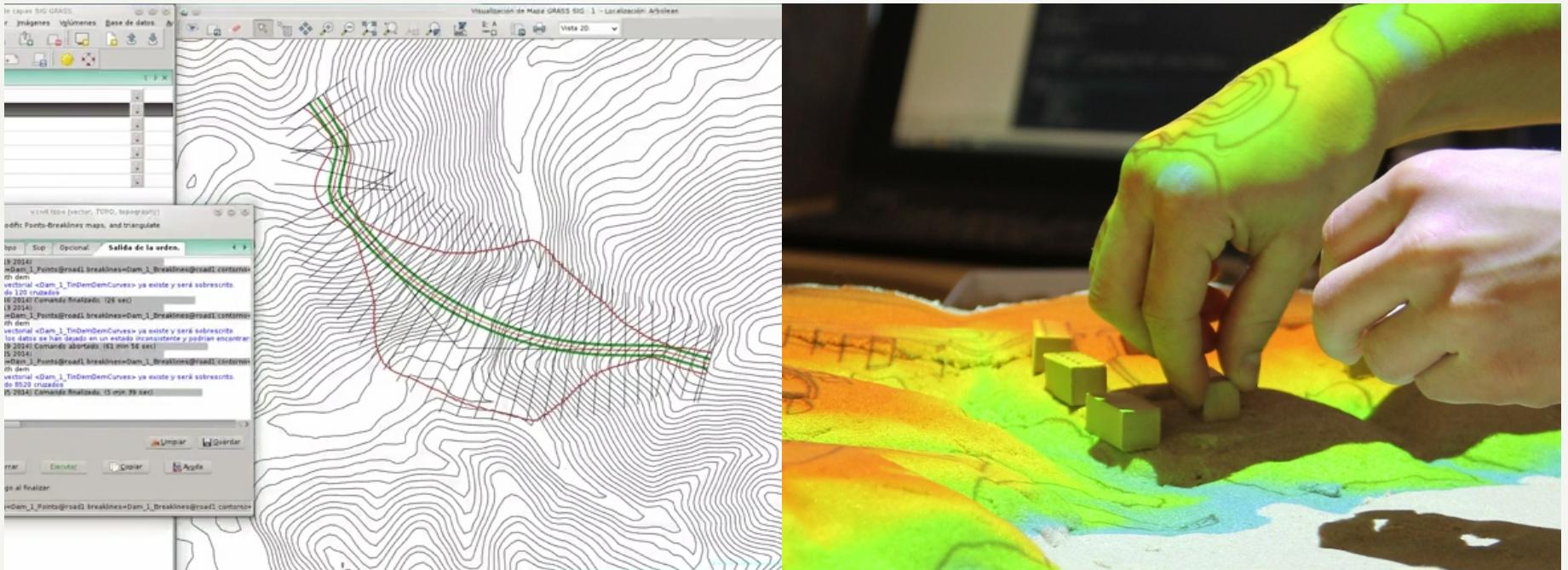
Landscape as a driving force

Topography controls water flow, sediment transport, inundation, landslides, and determines solar irradiation and viewshed





Modifying DEM

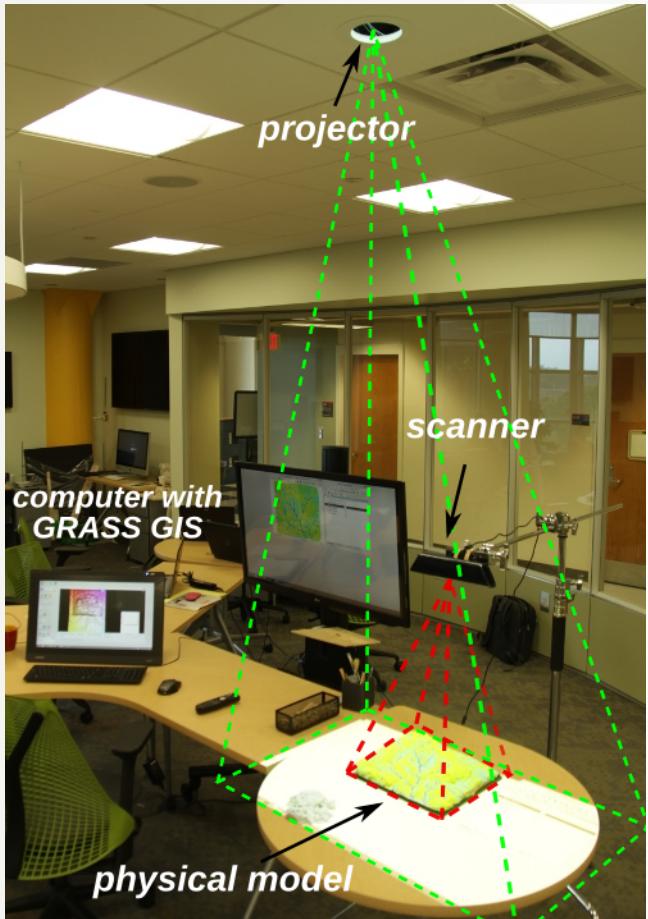


TanGeoMS

Tangible geospatial modeling and visualization system enables us to interactively explore how landscape modifications affect various phenomena by combining powerful capabilities of GIS with tangible interface.



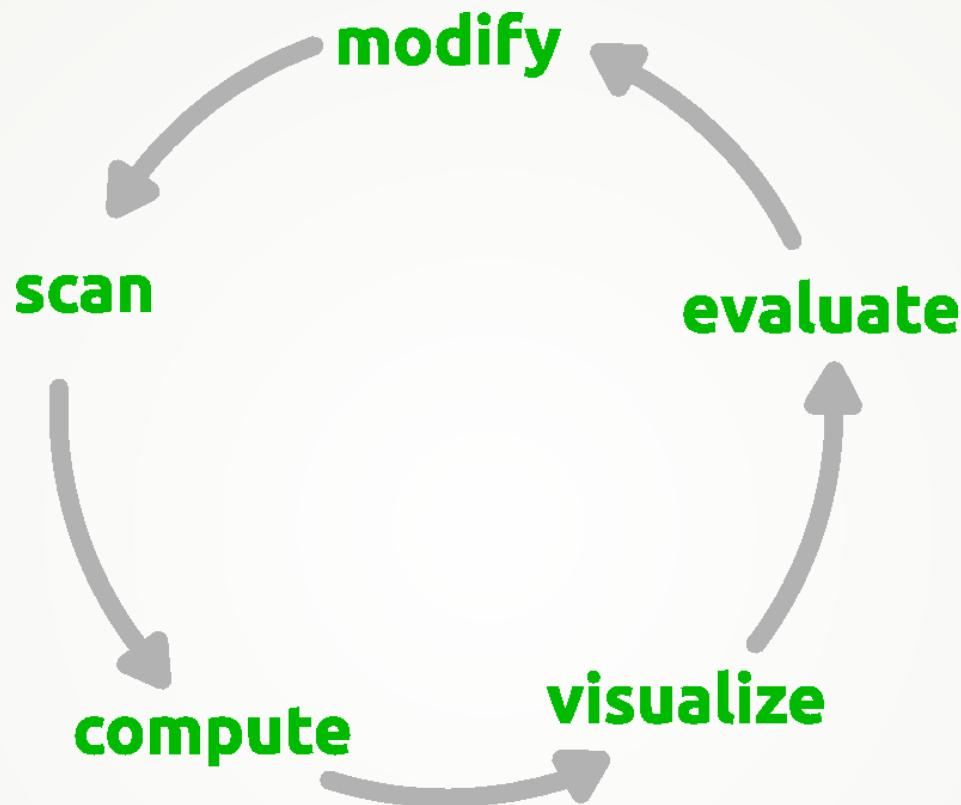
Physical setup



TanGeoMS couples a *physical model*, *scanner*, *projector* and *GIS* software.

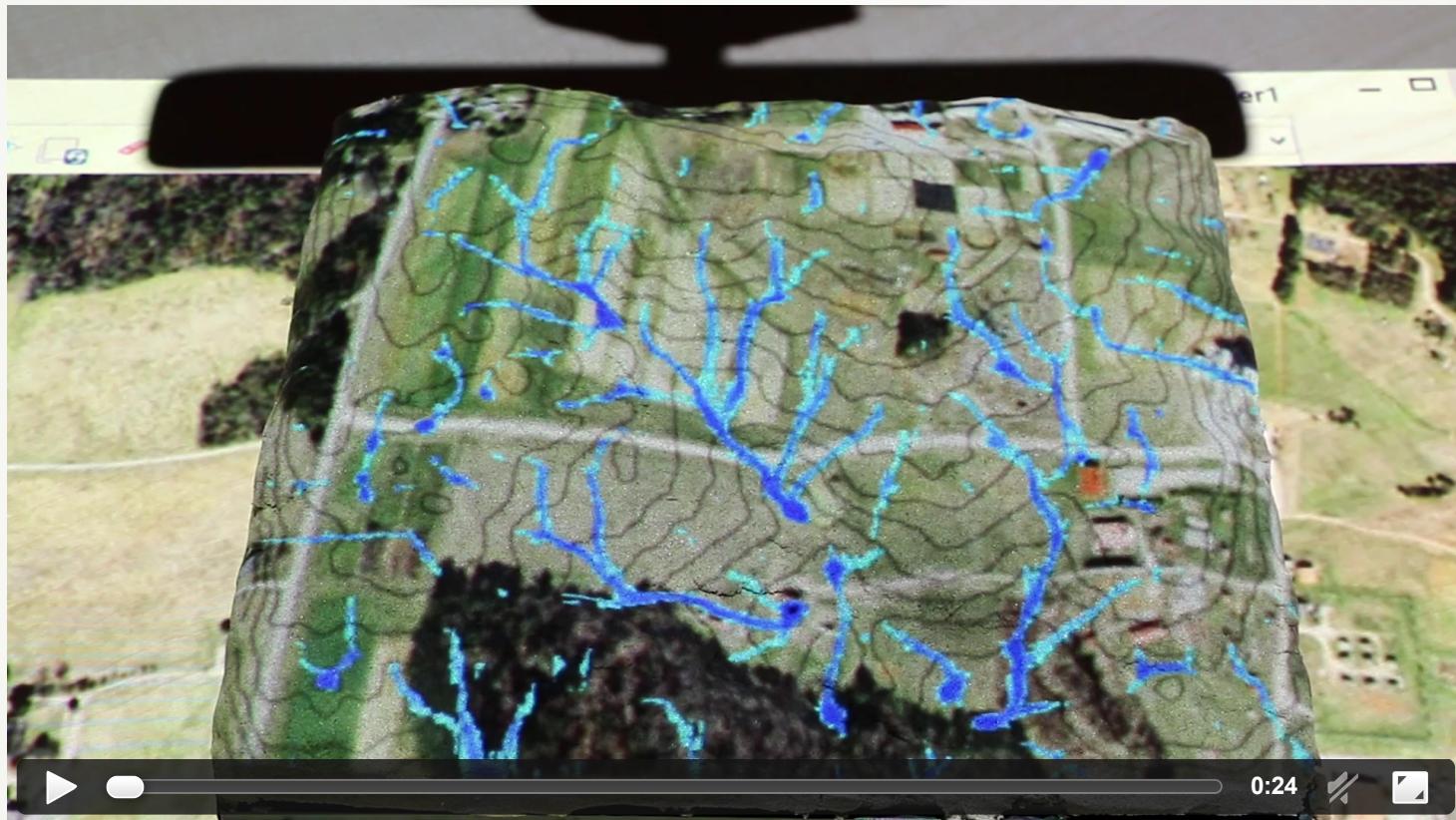
Using *Kinect* sensor instead of laser scanner and coupling TanGeoMS with free and open source *GRASS GIS* makes the system more financially accessible.

TanGeoMS: concept



Real-time feedback loop

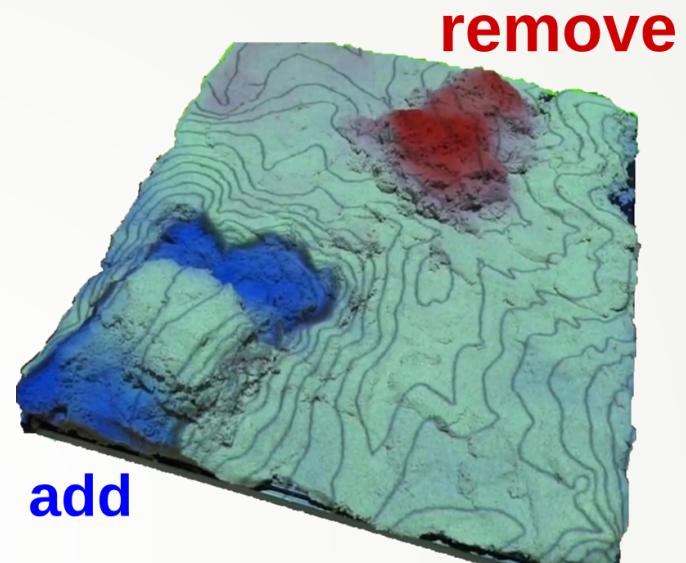
Scanning with Kinect and integration with GRASS GIS enables to model land surface processes in real-time.



Terrain models

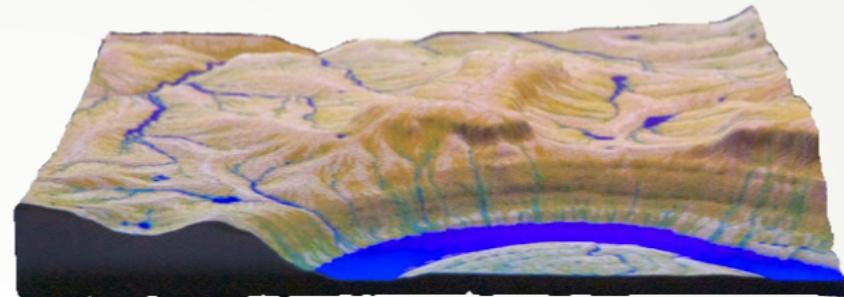
We create 3D physical models *manually*, using *automated* ways and the combination of both.

Sand models



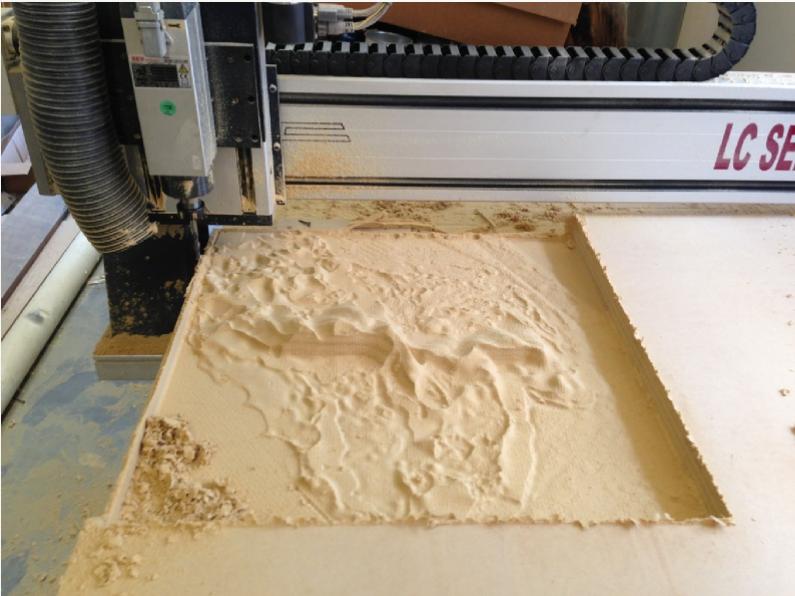
- sand enriched with polymer
- built by projecting elevation colors, contours, or the difference between the scanned surface and the desired digital elevation model

Printed models



Printed on a 3D printer, high resolution but limited size.

Carved models



Carved with CNC router from MDF (medium-density fibreboard)

Combined carved models with sand



To make carved models malleable, we put sand layer on top of the model. We carve inverted DEM to use it as a mold.

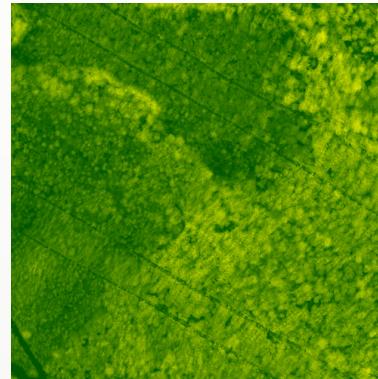
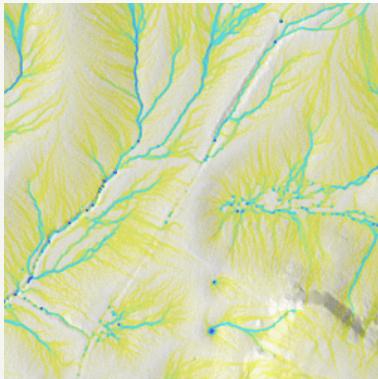
Software

- scanning using *Kinect for Windows SDK*
- *GRASS GIS* for creating DEM, geospatial analyses and modeling
- software integration and real-time loop with *Python*



GRASS GIS

- a variety of tools for geospatial analyses and environmental modeling
- open source - we are able to change and improve it for our needs
- easily scriptable, high interoperability
- spatio-temporal data handling capabilities and visualization tools

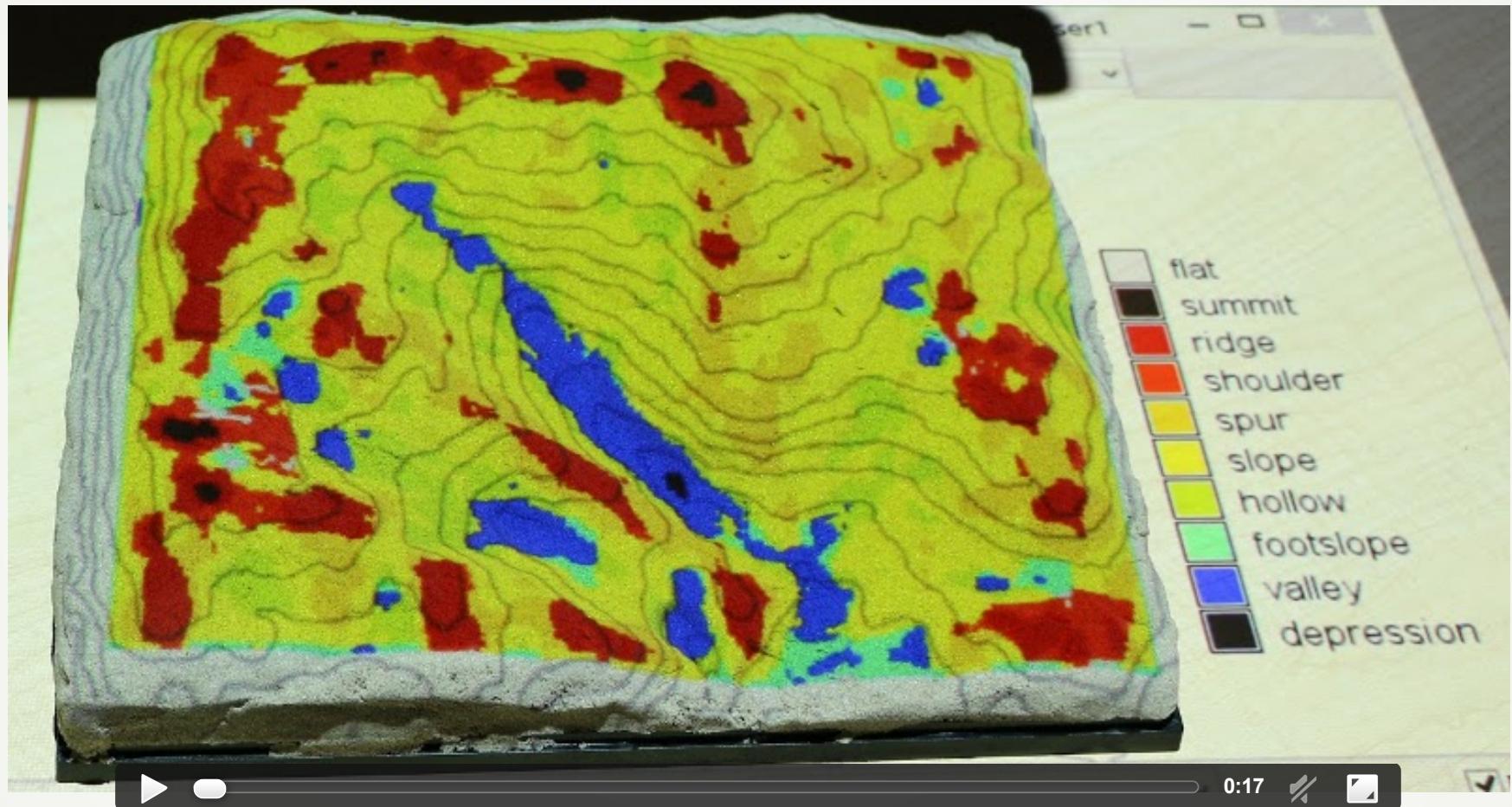


Applications

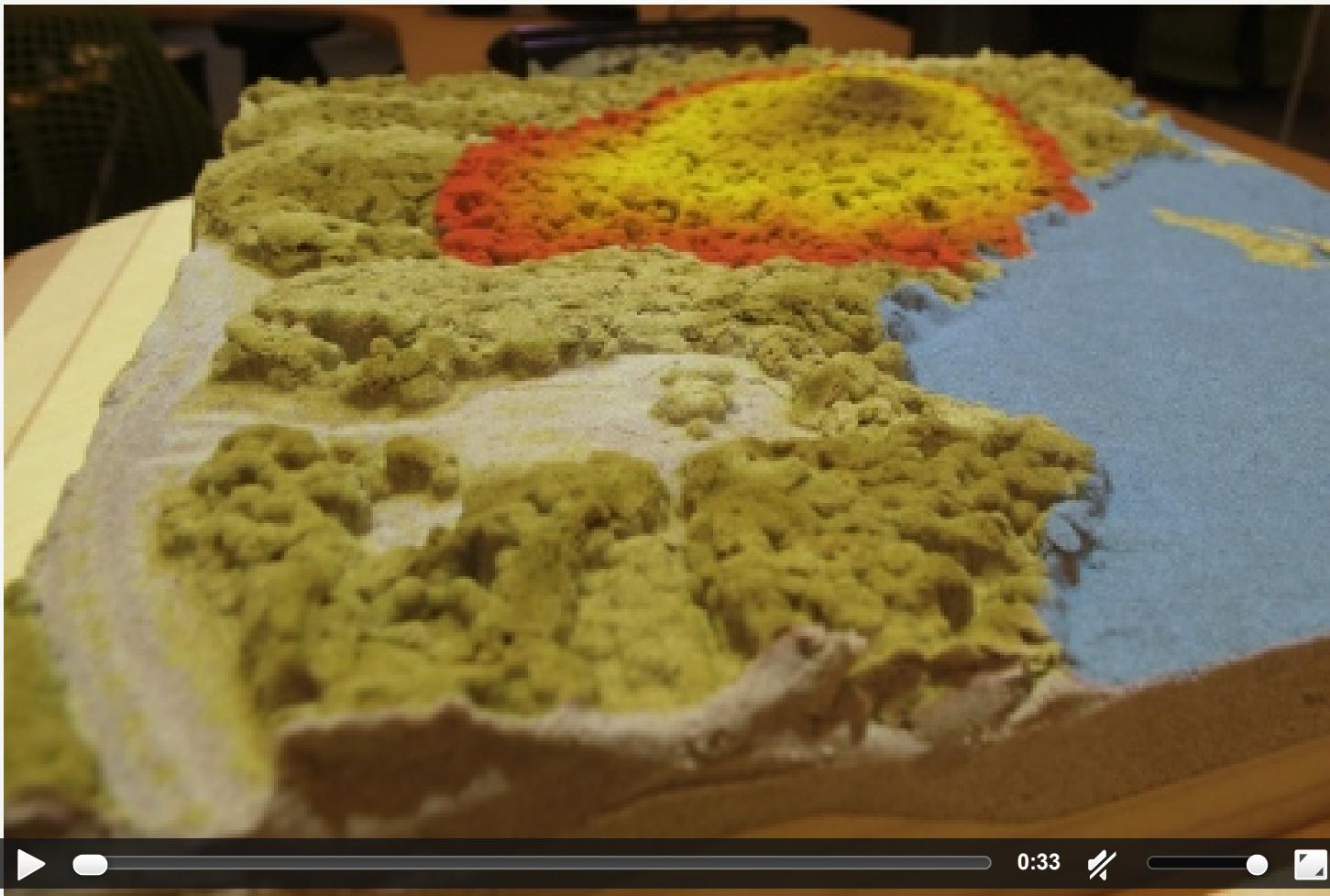
- collaborative, interdisciplinary and creative environment for decision making
- intuitive 3D sketching for design and planning
- testing of algorithms for modeling land surface processes
- GIS education



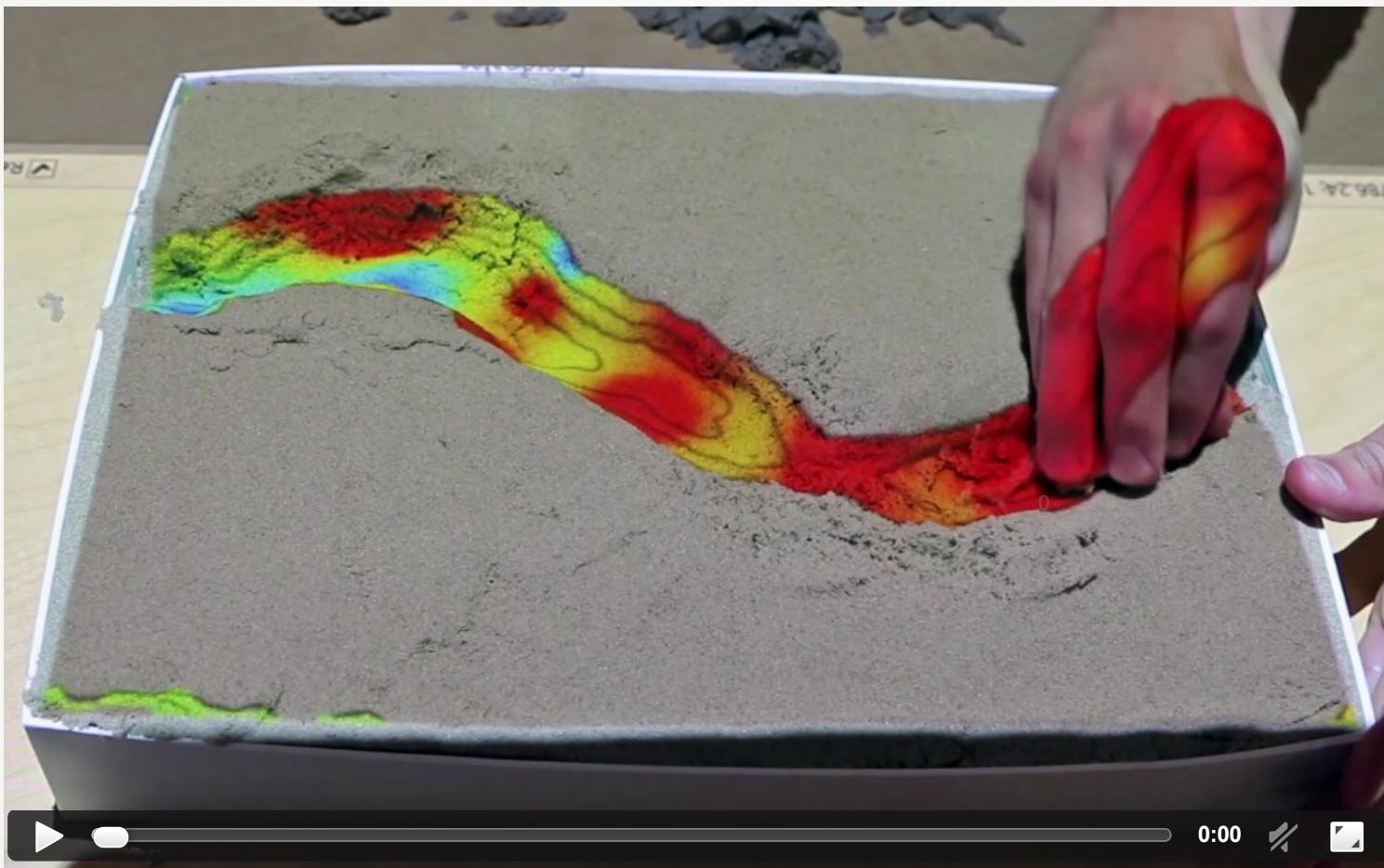
Land forms identification



Fire spread modeling



3D raster visualization



The background of the slide is a high-angle aerial photograph of a desert environment. It features large, light-colored sand dunes with darker, more textured areas of rock and scrub vegetation scattered throughout. The perspective is from above, looking down at the terrain.

Thank You!

email: akratoc@ncsu.edu

website: <http://geospatial.ncsu.edu/osgeorel/>

Research funding provided by the US Army Research Office.