geovisualization applications

research / teaching

demonstration / evaluation / reflection

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geovisualization research priorities?

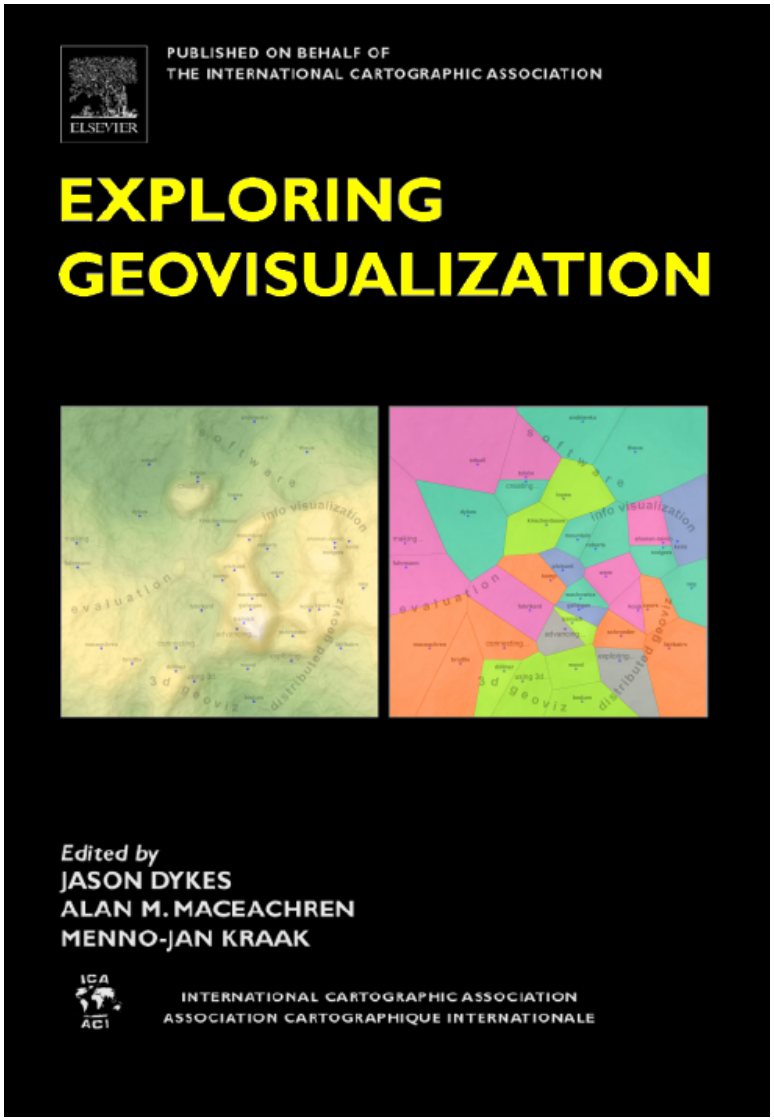
ica commission on visualization and virtual environments

i. creating software instruments

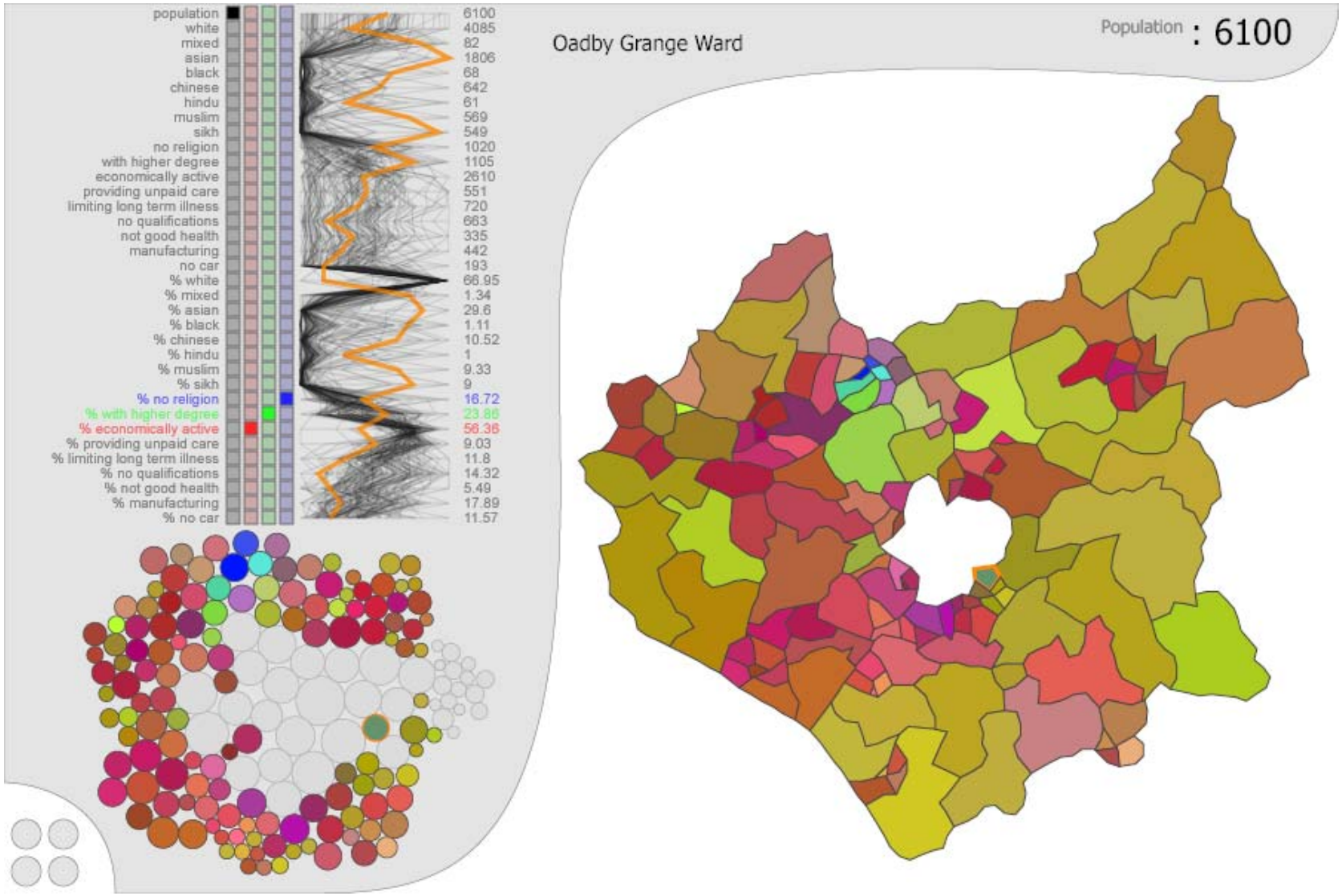
ii. using 3d

iii. collaboration / mobile

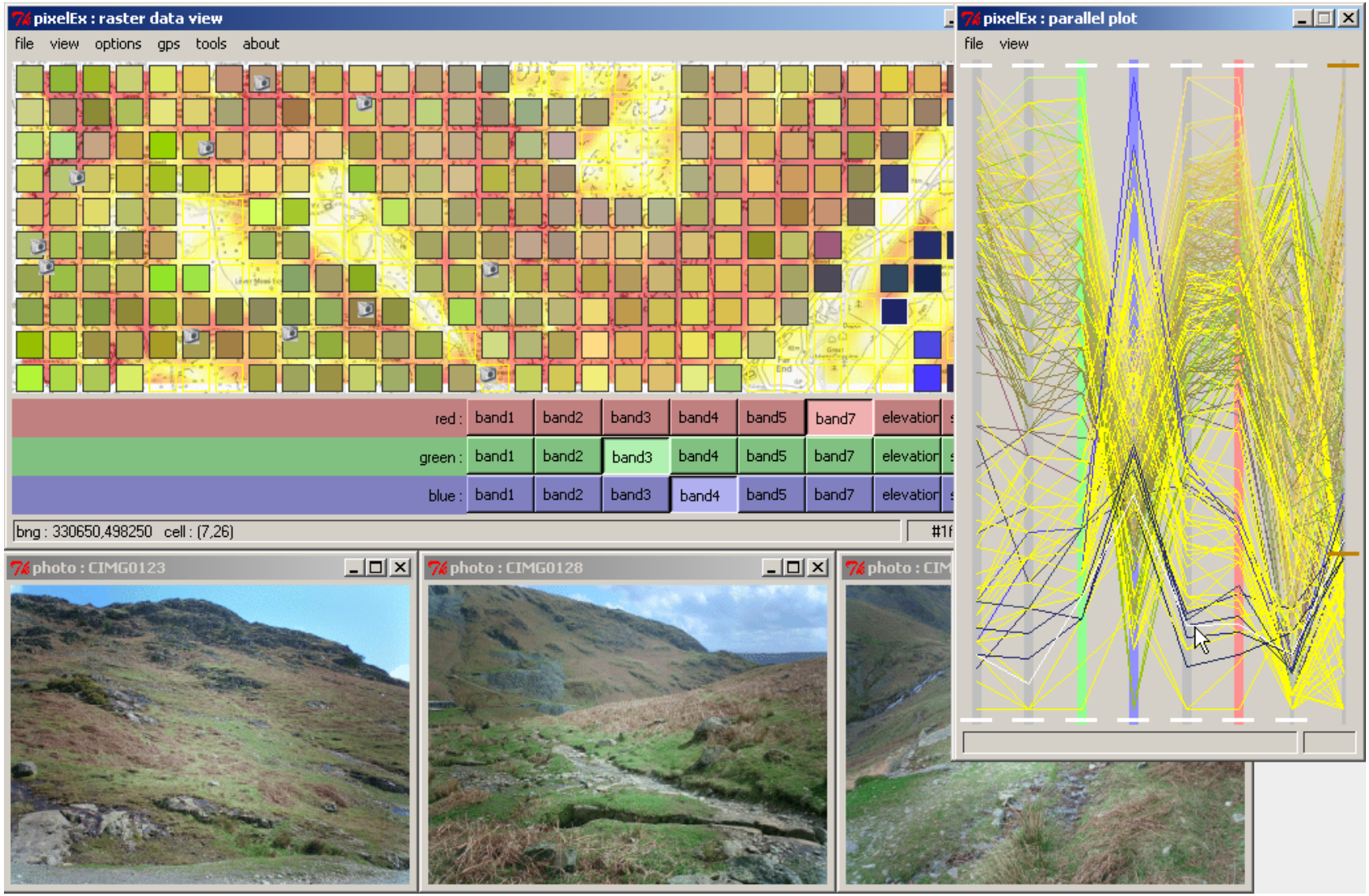
iv. usability / testing



research example : lcc prototype



teaching & learning example : pixelEx prototype



questions

1. is geovisualization useful at all?
   i. in research
   ii. in learning

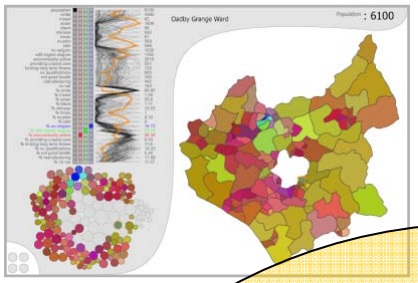
2. do human-centred techniques work or help?
   i. which? how? when?
   ii. can we develop specific methods?
   iii. do we get consistent results?
   iv. can we develop particular views / interactions for particular
      - data / tasks / groups / scenarios

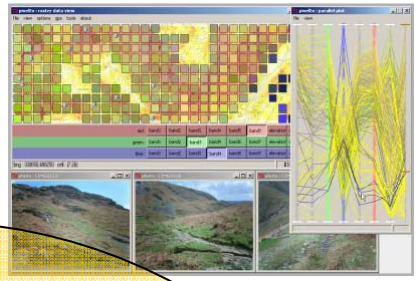
3. can we ...
   - gather and interpret empirical evidence
   - improve geoviz
   - apply geoviz

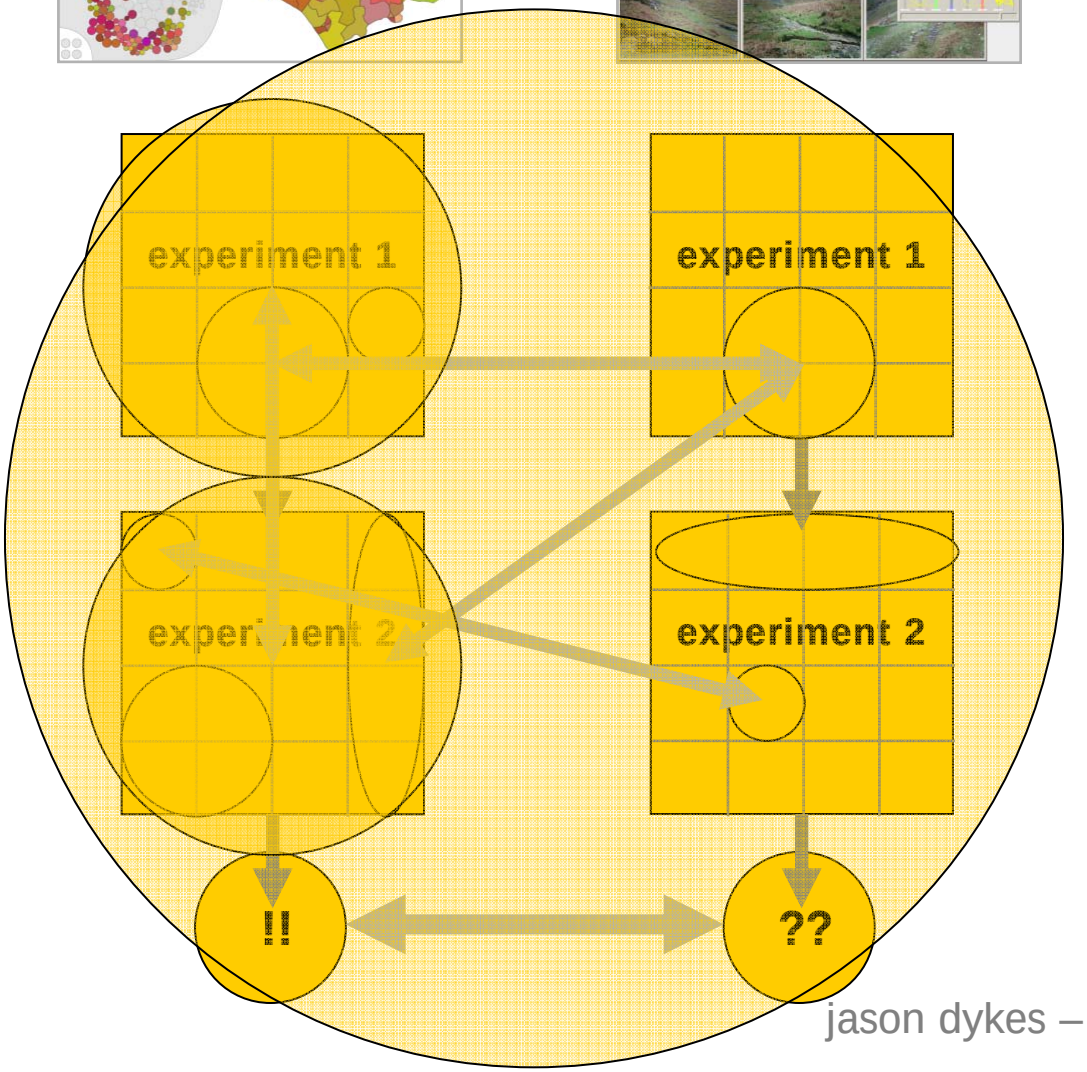
meta - issues

- small numbers – ‘experts’
- unstructured, poorly defined tasks
- unknown outcomes – capturing ideation
- multiple modes of task completion

- experimental frameworks ...







jason dykes – steph marsh – david lloyd

evaluation - common aspects

- focus on :
  - interaction; usability; ideation
- comprehensive :
  - multiple data collection techniques
    - eg notetaking; observation; think-aloud
- changes :
  - framework
  - different users
  - context
  - following critique of 1st evaluation
- analysis techniques
  - transcription / content analysis
- ‘meta issues’
  - small numbers of users; etc

evaluation - differing aspects

- research : lcc / svg
  - ‘controlled’
    - lab expt (typical of HCID)
    - some instructional tasks
  - researchers (experts?)
  - individual
  - local / remote
- data collection & analysis:
  - **‘ideation’**
    - think aloud / obs/ notes
    - Griffin categories
    - varied technique by task for comparison
  - **‘interaction’**
    - on-screen, observation & audio

- teaching & learning : pixelEx
  - ‘open’
    - ‘in the wild’
    - open-ended tasks
  - students (novices?)
  - groupwork
  - local
  - **‘ideation’**
    - ‘marking’
    - ANOVA
    - varied techniques for convergence
  - **‘interaction’**
    - audio & observation only
    - discussion groups

data – comprehensive!

includes :

- video
- note-taking (users/evaluator)
- vpa
- questionnaires
- interviews
- discussion groups
- performance ‘marks’

- research : lcc / svg
  - 8 users / 9 users
  - 6 tasks
  - 76 pages data
  - 15 hrs observation
  - 6 hrs video / audio
- teaching & learning : pixelEx
  - 8 users / 13 users
  - 1 day / 2 day task
  - 241 pages data
  - 30 hrs observation
  - 15 hrs audio

initial results : pixelEx - learning headlines

- ideation / knowledge : it works!
  - ideation captured
  - statistically significant (positive) difference in assessed performance after fieldwork

    (F value of 25.036)
- usability inconsistency :
  - 31 issues, 32% overlap between experiments

    general consensus (group work)
- interactions :
  - various - influenced by exercise structure & resources.

    (more varied and sophisticated with more time and resources)

initial results : lcc / svg - research headlines

- ideation : it works! ... **again**
  - ideation captured
    - ideation increased with complexity of exploratory task
    - no ideation with instructional tasks
- usability inconsistency ... **again**
  - 91 issues, 20% overlap between experiments
    65% uniquely identified
    individual work
- interactions :
  - variation in interaction facilitated by exploratory tasks
  - sophisticated interaction collected in context with screen capture
  - completion strategies varied considerably between 9 users

meta - issues

- difficult to isolate influencing factors
- however, in context of meta-issues ...

strong conclusions

- geoviz can support learning & ideation (1)
- HCID techniques can be adapted & combined effectively to geoviz (2i)
  - e.g. - continuous non-intrusive collection techniques capture best data on ideation / usability / interaction
- evaluation structure must facilitate ideation (2ii)
- inconsistencies in recording usability issues : (2iii)
  - more significant where interaction diverse
  - more diverse where more exploratory / sophisticated
- multiple views are useful (2iv)
- should support multiple means of task completion (2iv)
- some improvements suggested / acted upon (3)

weak conclusions

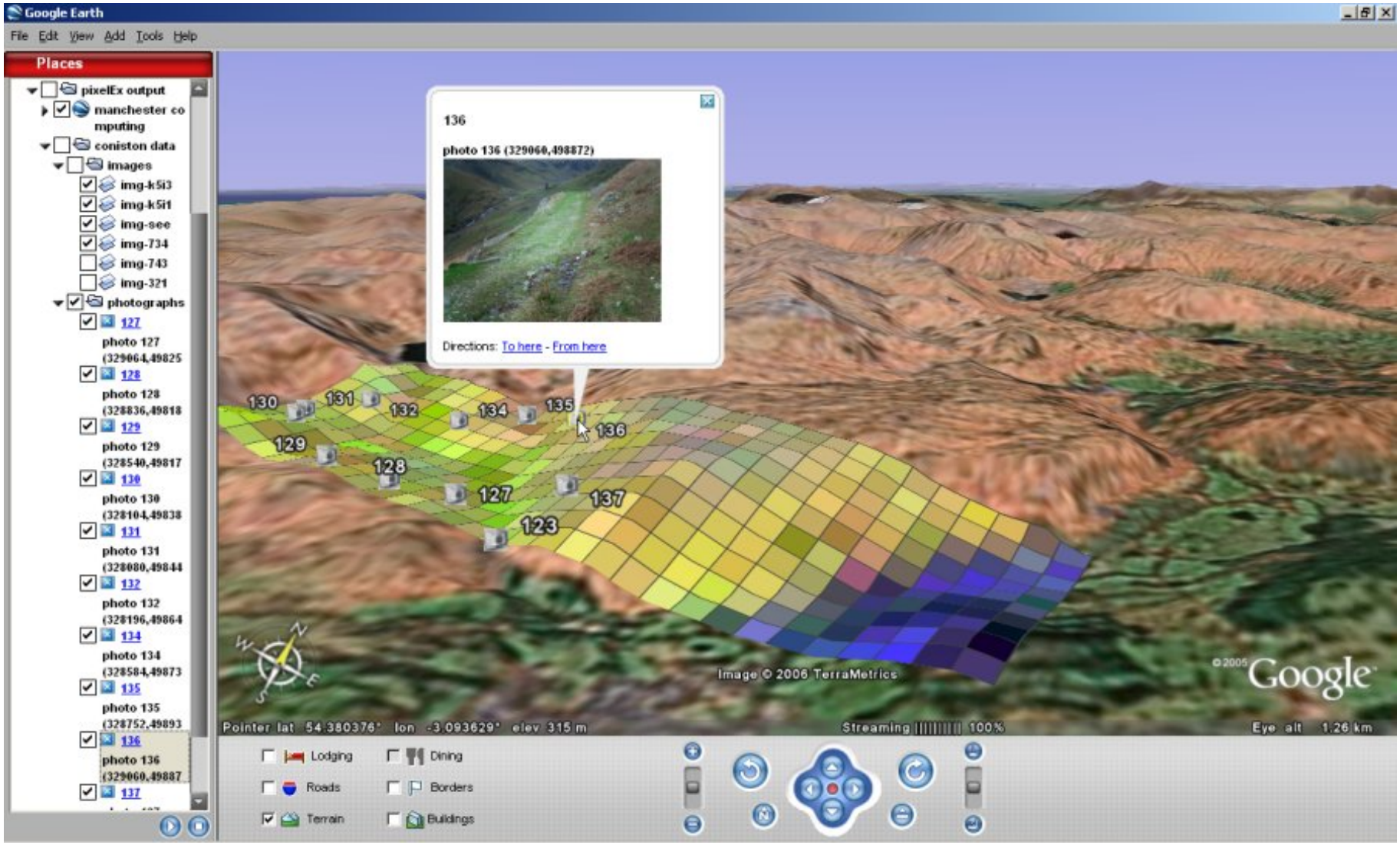
- ideation : influenced by ...
  - visual attention
  - degree of interaction
  - prior knowledge
- motivation :
  - expertise & time are important influencing factors.
- interaction, usability & ideation closely connected
- completion time not indicative
  - (negative correlation with ideation?)
- differences in results influenced by ...
  - evaluation structure
  - data collection techniques
  - user groups

reflections on evaluations

- small numbers
  - inconsistent usability results; anecdotal evidence (HCI design?)
  - suggest longitudinal study / studies?
- connections between :
  - usability; ideation; interaction
    (levels of interaction; levels of resolution of recording interaction)
- multiple means of task completion :
  - people use them - do they need them?
    (users say that multiple views are useful!)
- software design considerations re :
  - multiple task completion strategies
  - inconsistent usability results
- recording ideation :
  - complexity / number / quality
- how do we get motivated users?
- ideation and learning differ :
  - motivation; expertise; failure

suggestions : ongoing work?

- is there a mega-theory?
  - sharing results?
  - incremental / specific ... or ... mega-framework?
- teaching :
  - release - HEA-GEES
  - developments ..?
- research :
  - LCC EPSRC iCASE project
  - specific applications area – rural / crime
  - inform research and policy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