

The Integrated Geoprocessing, Workflows, and Provenance Cycle

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Abstract

What will be the most significant development in GIS as an integrating technology over the next decade? It may be argued that such a development will address the fractured nature of GIS-assisted problem solving across an increasingly broad array of timely domains (e.g., food and agricultural security, climate change, forest management, heritage preservation, urban and regional planning, etc.). In the tradition that so many geospatial innovations are reported in journals, books, forums, etc. (and not easily transferable to software users), any single expert may only have limited practical access to the detailed GIS methodologies suitable to address a given problem statement. In every GIS application, reliance is made upon the geoprocesses and workflows associated with geospatial artifacts produced. What is still missing in GIS, and is related to intense emerging interest within computer systems and cyberinfrastructure, is a common framework for machine-queryable geospatial provenance (or lineage). Remarkably, the need for such provenance was the rationale behind the first GIS patent in the U.S. more than two decades ago. In a future GIS developmental cycle with cyber-enabled provenance exchange, GIS-assisted decision support and related geoprocessing and workflows will be far more open to scientific reproducibility, comparison, deduplication, trust, and innovation. This presentation highlights the latest examples of provenance exchange in GIS and related cyberinfrastructure, and identifies top-down system framework, standards and specifications development, and usability challenges that are solvable within 5-10 years.

Keywords

geoprocessing, workflows, provenance, reproducibility, usability



Design

- Ancillary, in situ, and remote sensor data
- Geoprocesses, workflows, and metadata

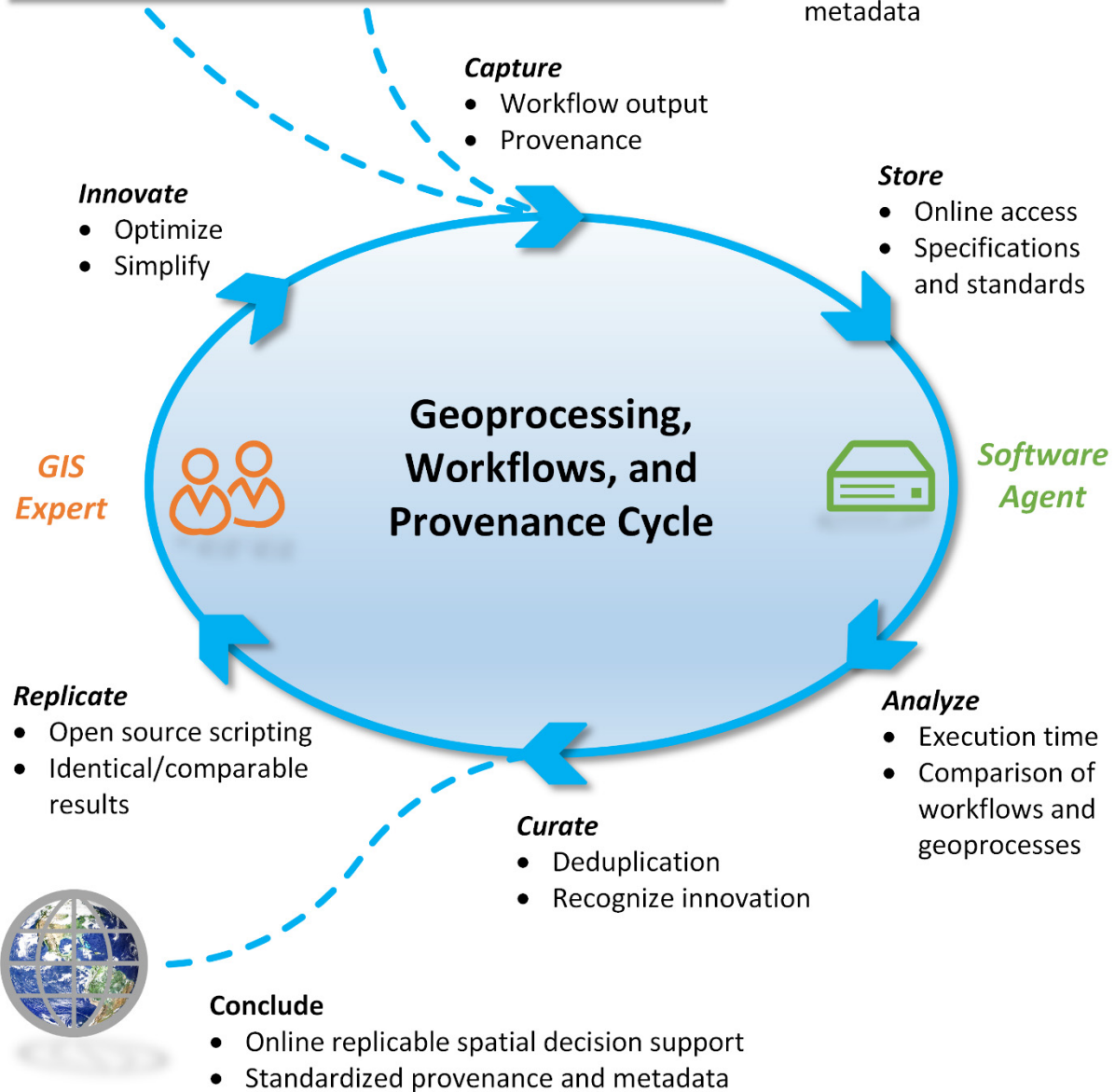


Figure 1. Integrated geoprocessing, workflows, and provenance may be conceptualized as a positive developmental cycle used to refine GIS knowledge before decision support is communicated. Highlighted aspects of this cycle suggest a capacity of GIS experts, in conjunction with software agents, to cooperatively capture, store, analyze, curate, replicate and innovate GIS-assisted decision support methods.