Future Trends in Geospatial Information Management

Technical Trends

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Graphic 1.
Five drivers will advance change in the global geospatial information management landscape over the next 5 to 10 years.

Five prevailing drivers and an underlying set of trends:
- Technological advancements
- Rise of new data sources & analytical methods
- Industry structural shift
- Evolution of user requirements
- Legislative environment
New opportunities for data gathering
Vehicles as sensor platforms

Example system: Tata Elxsi’s ‘Autonomai’ (2017)

From: https://gaadiwaadi.com/tata-elxsi-autonomous-driving-tech-autonomai-793733/
Sensors and HD Mapping

Courtesy of Ordnance Survey’s E-CAVE team
OS-Mobileye two ways of seeing the world

Relative - A car centric view of the world

Absolute - Eastings, Northings or GPS lat-lon
Neutral georeferenced data

4.2.6 To ensure consistent accurate data good metrics about data quality are imperative. Displaying data quality indicators will enable the user to consider the level of confidence they should have in the underlying information.

Connected Autonomous Vehicles

Seamless indoor/outdoor experience
Modelling framework

1. Archetype modelling for energy attribution
   - Ordnance Survey MasterMap
   - Addressable Buildings
   - Energy attributed housing stock
   - English Housing Survey

2. Urban Scene Modelling
   - AddressBase Plus
   - Geometric simplification
   - CityGML

3. Simulation
   - Energy Features Construction Database
   - CityGML EnergyADE
   - Energy Simulation (CitySim)
   - Visualisation

- Simulation results
An Ontology-Based Modelling Framework for Detailed Spatio-Temporal Population Estimation

WZ E33037533 Major Hospitals

- Modelled Population in WZ
- Mobile Devices in WZ
- Mobile Devices in All WZ in this COWZ Class

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Quantum computing
Quantum computing

Based on “qubits” – rather than a traditional bit which holds a 0 or 1 value only.

Qubits actually store the superposition of every possible quantum state, so a single qubit can hold two binary values at once, meaning a single operation can be carried out on $2^n$ values simultaneously, where $n$ is the number of qubits. The power of the quantum computer storage scales exponentially with the number of bits.

A quantum computer uses other quantum physics laws such as entanglement (the “spooky” at-a-distance connection between quantum objects) and interferences to operate.

Qubits & quantum computers currently require very specialised hardware – ions at microkelvin temperatures or superconductors. They are not very fault tolerant, and the qubit state (the 0 vs 1 condition) cannot be indefinitely maintained (decoherence of the state).
Example uses of quantum computing

Optimisation problems
• Not usually suitable for brute-force algorithms, testing permutations of options one at a time
• The superposition scale-up in quantum computers should allow much larger scaling up in algorithms
• An example optimisation problem is planning in logistics

Machine learning
• ML techniques allow big data analysis to find patterns in large datasets, e.g. using cloud computers
• “Lately, because of the rapid growth of the size of datasets, the dimensionality of the input and output space, and the variety and structure of the data, conventional learning techniques have started to show their limits.” L.Oneto, S.Ridella, D.Anguita 2017
• Quantum computers show promise for exponential speedup of clustering algorithms, e.g. “q-means” to replace k-means: https://towardsdatascience.com/quantum-machine-learning-a-faster-clustering-algorithm-on-a-quantum-computer-9a5bf5a3061c
Example resource

“We’re either at the vacuum tube or transistor stage [...] trying to invent the integrated circuit”
Concluding thoughts
THANK YOU

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