The Future of Remote Sensing

“ Look into the future of the digital world and you might find the digital world is looking right back at you”.

Sarah Smith-Voysey & Mark Tabor

Current remote sensing technology

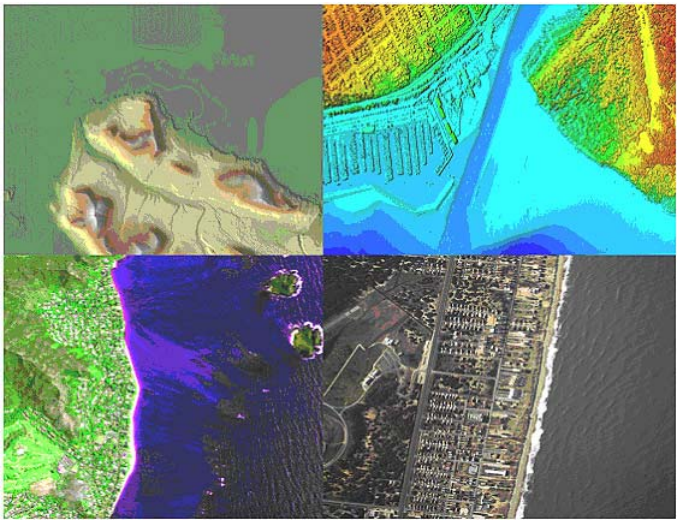


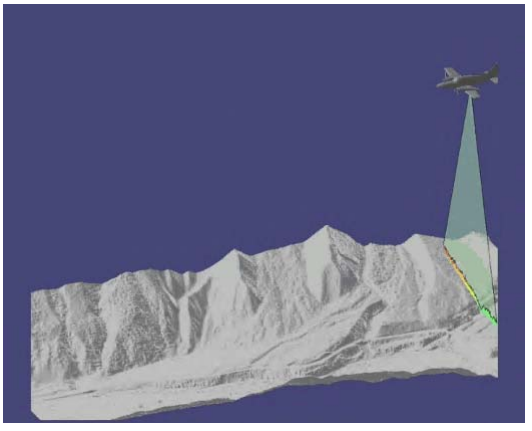
Image source: http://celebrating200years.noaa.gov/visions/remote_sensing/image1.html

The Future of Airborne Active Remote Sensing: Laser and Radar for Topographic Mapping

Dr Sarah Smith-Voysey
Research Fellow, Newcastle University

Topographic Laser Scanning

Laser scanning is an active remote sensing technique in which a pulse of laser light is emitted, the time taken for the light to return to the sensor is recorded, yielding distance between the object and the sensor

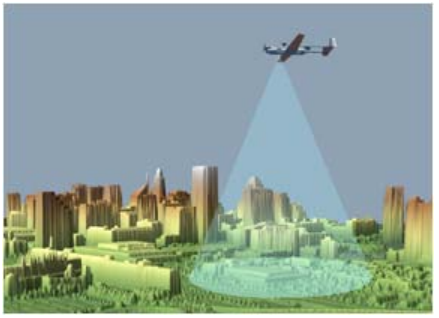


File Source: Felix Morsdorf

Laser scanning: present

Today laser scanning is one of the most attractive remote sensing techniques for:

- topographic mapping
- terrain modelling
- vegetation modelling
- biomass estimation
- bathymetry
- security
- flood prediction
- oil and gas
- transport corridors
- risk/hazard management



Future developments: Waveform laser scanning

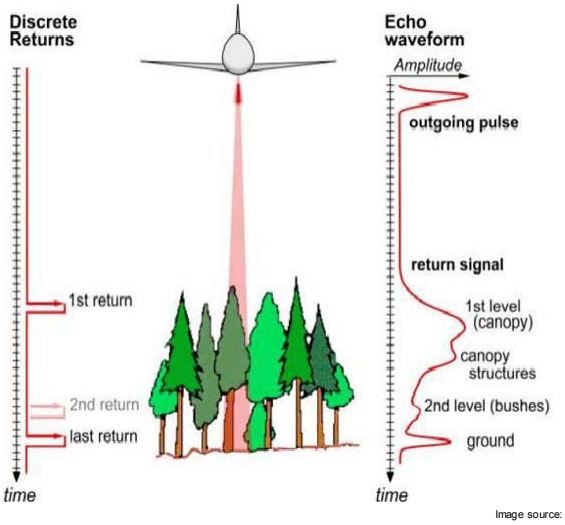


Image source: GeoLas Consulting

Future developments: Multispectral/hyperspectral laser scanning

- Used for monitoring oil spills
- Using active hyperspectral sensors it may be possible to map individual species, as well as to detect very subtle changes in wetland systems, such as early signs of stress
- Requires good knowledge of hyperspectral processing
- Larger volumes of data

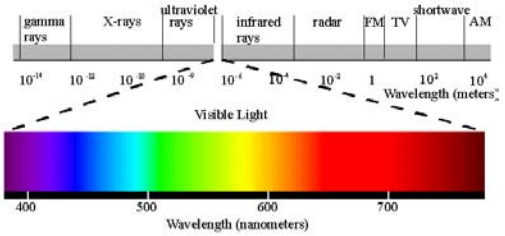


Image source: http://www.yorku.ca/eye/spectrum.gif

Future developments: Mobile mapping units and onboard processing

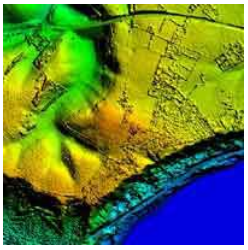
- Change detection
- Integrated transport networks
- High resolution urban mapping
- Urban vegetation monitoring
- Vegetation modelling for national/regional mapping

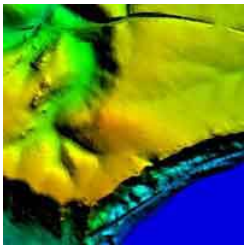
Image source: Newcastle University

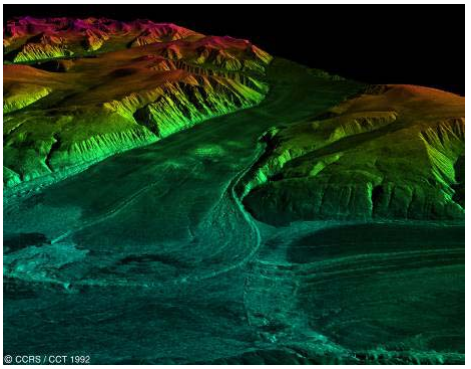
Ordnance Survey

Radar for Topographic Mapping: SAR, InSAR, PSInSAR

Current status: SAR and InSAR







- Multi-temporal, time series InSAR images
- Persistent scatterer InSAR
- Earthquake analysis
- DTM creation

Image source: NextMap Britain

Future developments for SAR and InSAR

- Longer wavelength SAR images (such as L-band ALOS) will be available that will allow InSAR deformation mapping at global scales
- Fully polarised SAR sensors (ALOS, Radarsat-2, TerraSAR-X, TanDEM-X) will allow better characterisation of vegetation structure and ground features.
- Pol-InSAR – the combination of polarimetric and interferometric analysis will offer a new capability for landscape mapping and deformation monitoring (land cover mapping, soil moisture, forest height and biomass, traffic monitoring over oceans etc)
- ScanSAR – advanced SAR imaging technique – will be used to enhance spatial coverage of conventional InSAR for large-scale deformation measurement and improve temporal sampling of InSAR deformation images
- Atmospheric delays – InSAR accuracy will be improved by better modelling of atmospheric water vapour content from CGPS network or MODIS, ASTER, MERIS etc
- Automated SAR/InSAR processing techniques
- Improvements in data capture rate

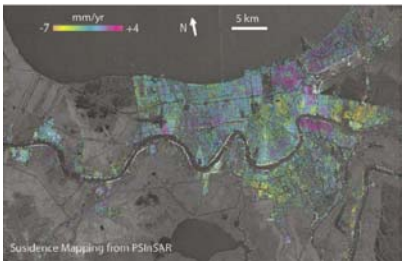
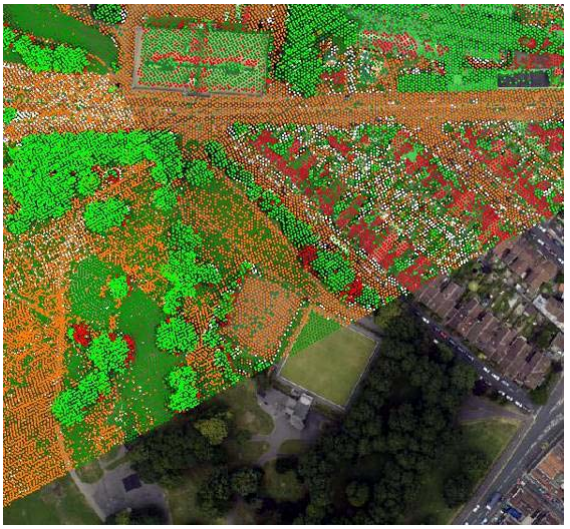


Image source: http://www.asprs.org/publications/pers/2007journal/march/highlight1.pdf

The future of laser and radar: Multisensor data fusion



Remote sensing – Digital cameras – The future