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The UCL 3D Image Maker system for automated differential SAR interferometry

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Abstract

The authors are developing a SAR interferometric processing system. This system generates the following products from either raw or focussed SAR input: Focussed complex image with amplitude and phase suitable for interferometry; Amplitude image; Interferogram; Coherence map; DEM (Digital Elevation Model) or ellipsoid flattened interferogram; Differential interferogram; Unwrapped flattened or differential interferogram; Geocoded versions of these; DEM; Map of vertical surface displacement. Under development are the following products: Shadow map; Layover map; Map of 3D surface displacement.

Phoenix Systems has provided two of the components, PulSAR and DRAIN. PulSAR is the SAR processor, that focusses raw images. DRAIN is the interferometry processor, that generates interferograms and optionally performs ellipsoid flattening. The other components have been developed and are being developed at UCL (University College London), and basically concern the phase unwrapping, and the geometric aspects, such as geocoding and the conversion of unwrapped phase to vertical or 3D surface displacement.

A particular concern has been to simplify the interface to the user as much as possible, and so common tasks are reduced to a single command, driven by automatically generated parameter files. The interface between each DRAIN output product and the UCL software has been reduced to a single parameter file, understood by both items of software.

The system has been applied to many different datasets now, featuring different types of terrain, and ascending and descending image pairs. The results are promising, and as far as georeferencing accuracy is concerned, it appears that if one uses DLR's PRC (Precise) platform state vectors, then one can probably do without GCPs (Ground Control Points).

The system has been delivered to NPA (Nigel Press Associates) for use in their CivInSAR project.

Keywords: SAR, Interferogram, Differential interferogram, Phase unwrap, Geocode, DEM