
Subject: Re: Phase Unwrapping Algorithms?

Posted by [Christian Soeller](#) on Wed, 20 Nov 1996 08:00:00 GMT

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wsryu@fas.harvard.edu (William Ryu) writes:

> I am interesting in phase unwrapping algorithms which can handle noisy
> data. I understand this to be a common procedure when doing FFT analysis
> of interference patterns, and was wondering if anyone has implemented such
> routines in IDL.

First of all, it is definitely a non-trivial problem in the presence of noise. When I was doing phase shift interferometry I came across a very clever paper on the subject in which the authors makes use of the (again clever) observation that the phase unwrapping problem can be formulated in a way that is formally similar to the digitized poisson equation. It can therefore be solved with the same methods used for numerically solving the poisson equation. A colleague of mine implemented the algorithm in C and found it to work well with noisy data.

The reference is (in Bibtex format):

```
@Article{Ghiglia94,  
  author = {D. C. Ghiglia and L. A. Romero},  
  title = {Robust two-dimensional weighted and unweighted phase  
    unwrapping that uses fast transforms and iterative methods},  
  journal = {J. Opt. Soc. Am. A},  
  year = 1994,  
  volume = 11,  
  pages = {107-117}  
}
```

I am not aware of an IDL implementation but it should be worthwhile implementing as it uses FFTs and similar stuff that is easily done within IDL.

There are many more articles on the subject which is important in the automated analysis of phase shift interferograms, etc. Journals of special interest are JOSA and Applied Optics. Another reference is:

```
@Article{Huntley89,  
  author = {J. M. Huntley},  
  title = {Noise-immune phase unwrapping algorithm},  
  journal = aop,  
  year = 1989,  
  volume = 28,  
  number = 15,  
  pages = {3268-3270}  
}
```

Hope this get's you started,

Christian

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