Wide-field Infrared Survey Explorer (WISE)

WSDS Pointing Offset Test

Version [1.0]

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Revision History

Date	Version	Author	Description
N/A			Initial Draft

Table of Contents

1.0 Introduction

The purpose of the Pointing Offset test is to simulate flight system pointing accuracy errors by running the Scan/Frame pipeline on existing simulated data with increasing offsets between the simulated frame centers and the commanded positions that would have been passed from the navigation files. Offsets should range from a few arcseconds up to 23.5 arcminutes (1/2 the WISE FOV). This test will verify that sfprex can reconstruct the frame positions with large pointing knowledge errors, and if time permits, and to determine the largest offset that can still be reconstructed.

2.0 Test Scenario

R. Beck adjusted CRVAL1 and 2 in all the level 0 (l0) fits headers for /wise/fops/scans/8a/01248a. The original l0 files are named *.orig in the l0 directories. This is the same as the 30-orbit sim scan 00448a, with only the header changes. There is also a band 4 l0 missing for frame 259 that is expected to produce errors in WSFPipePost, described in 4.0 Analysis below. Scanqa was also expected to error looking for missing files.

The header adjust script (perl) below selects a random CRVAL1 and 2 adjustment between 0 and 12.5 arcminutes and updates the CRVAL1 and 2 leaving the RA0 and DEC0 correct in the header.

```
#! /usr/bin/perl
#
#

 $x = rand(12.5);
 $y = rand(12.5);

 print (" rand: $x $y \n");

#exit;

foreach $fits (@ARGV) {

#$new = $fits . ".new";
 $new = $fits;
 $new =~ s/\.orig//;

 if (!(open (IN, $fits))) {
  print (" ERROR: can not open $fits ... \n");
  exit;
```

```
 }

 if (!(open (OUT, ">$new"))) {
  print (" ERROR: can not open $new ... \n");
  exit;
 }

 while (1) {
  read (IN, $line, 2880);
  if (length ($line) == 0) {
   close (IN);
   goto outs;
  }

  @nums = unpack ("a80" x 36, $line);

# print (int(@nums),"\n");

  $found = 0;

  for ($i=0;$i<@nums;$i++) {
   if ($nums[$i] =~ /^CRVAL1/) {
    print ("$nums[$i]\n");
    print ("$nums[$i+1]\n");
    @rwords = split(/\s+/, $nums[$i]);
    @dwords = split(/\s+/, $nums[$i+1]);
    $odd = $words[2] % 2;
    if ($odd) {
     $newra = sprintf("%13.12f", ($rwords[2] + ((1/60) *
$x/cos((3.141592654/180) * $dwords[2]))));
     $newdec = sprintf("%13.12f", ($dwords[2] - (1/60) * $y));
    } else {
     $newra = sprintf("%13.12f", ($rwords[2] - ((1/60) *
$x/cos((3.141592654/180) * $dwords[2]))));
     $newdec = sprintf("%13.12f", ($dwords[2] + (1/60) * $y));
    }
    $nums[$i] =~ s/$rwords[2]/$newra/;
    $nums[$i+1] =~ s/$dwords[2]/$newdec/;
#   print ("after: $nums\n");
    print ("$nums[$i] after\n");
    print ("$nums[$i+1] after\n");
    goto writit;
   }
  }
```

```
writit:

# exit;

   $out = pack ("a80" x 36, @nums);
   syswrite (OUT, $out, 2880);
 }

outs:

 close (IN);
 close (OUT);

#system("mv $fits $fits.orig");
#system("mv $new $fits");

}
```

3.0 Test Results

All frames worked except frame 122 which failed with:

/wise/base/deliv/dev/bin/wsfpipe/MYSYSTEM: Exec wawaic wawaic failed with RC=1, SIGNAL=0.

/wise/base/deliv/dev/bin/wsfpipe/SPAWN: Spawn of 'wawaic' dying with status 1

/wise/base/deliv/dev/bin/wsfpipe/Cconv: Bad position (-0.076782042046,-0.147362072037) passed at /wise/base/deliv/dev/lib/perl/WISE/CoUtils.pm line 122.

/wise/base/deliv/dev/bin/wsfpipe/Cconv: Bad position (-0.076782042046,-0.147362072037) passed at /wise/base/deliv/dev/lib/perl/WISE/CoUtils.pm line 122.

END: Writing to meta-table './01248a122-meta-sfpipe.tbl' ...

<< End of WSFPipe >> status=1

NOTE: Everything worked for the 30-orbit 00448a.

4.0 Analysis

H. McCallon has reviewed the 01248a pointing offset test outputs to verify the performance of the pattern matcher. Intentional a priori errors of up to 12.5 amin in RA and in DEC had been placed into the FITS headers for this test. For all 250 frames where SFPRex was executed, a successful pattern match was found and the match counts look good.

In order to verify that these were not false indications of success, for 10 frames selected randomly, H. McCallon manually examined the refined FITS image with a posref overlay using ds9. In all of the hand-checked frames the final alignment was good. His conclusion was that all is well with the pattern matcher.

H. McCallon further commented "Despite the fact that the pattern matcher looks good on this test, we still need to develop additional tools to aid manual pattern matching. As learned from recent pipeline tests, even a small amount of blurring can cause dropped extractions resulting in failure of the automated pattern matcher. Having tools to aid manual matching could make a big difference during IOC, when we may not know which way is up and time will be short".