Subject: stereo triangulation in IDL
Posted by derkleinepilz on Sat, 15 Sep 2012 17:31:41 GMT
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Hey,
I want to calculate the top height of a cloud using pictures of two satellites, but I'm kinda new to this stuff and figured that stereo triangulation should do the trick. Does anyone know if there already is a procedure doing stereo triangulation out there? That would be great, 'cause it looks really complicated. I wouldn't know how to programm something like this.

regards, Haiko

Subject: Re: stereo triangulation in IDL
Posted by derkleinepilz on Tue, 18 Sep 2012 06:53:17 GMT
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Am Montag, 17. September 2012 23:52:03 UTC+2 schrieb Klemen:
> On Thursday I will submit the discussion paper for ACP, then I can post the link here. But a shorter version is: everything is based on parallax. :)
>
>
>
> I have both datasets in the same projection plane. I use moving window analysis that correlates both datasets. The pixel pair with the highest correlation is the one I am interested. Shifts are then just the differences i the array indices. For each pixel in the array I know the lon, lat, I know the satellite position, so I can generate two lines. From the intersection point between these lines I can computethe height.
>
>
>
> Processing over pyramids is faster and it considers the larger scale features and the small scale features. Correlation is first analysed on the coarse level data. Once I have the indices I can just proceede to more detailed pyramid, where the previously determined shifts are the basis for the mowing window analysis.
>
>
>
> So much in short, if you need more details, I can provide them in the following days!
>
> Klemen

That would be great. My plan was to use epipolar lines in my stereo matching process, because it would be faster than cross-correlating the whole datasets. But it seems like I need a lot of camera parameters for this. Like you I have the lons and lats for each pixel and the satellite position. And that is where I'm stuck. I just don't know how to compute the height with that intersection point. Maybe it's just trivial (because on all the papers I've read about that topic, it's all about that correspondence point problem not about the heightcalculations- most of them just end with "and

now we can compute the height". So I decided to do it like this:
http://solarphysics.livingreviews.org/open?pubNo=lrsp-2011-5 &page=articlesu6.html

Well anyways, I'm looking forward to your discussion paper.

Subject: Re: stereo triangulation in IDL
Posted by Klemen on Tue, 18 Sep 2012 08:45:17 GMT
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In short it is something like described in that link. You convert your pixel coordinates to lon,lat and then into 3D Cartezian geocentric coordinates. Once you have also coordinates of satellites you generate two lines, intersect them and convert the XYZ coordinates back to lon,lat,h. Basics geodesy...

Another approach based only on zenith angles is described by Prata:
Prata, A.J. & Turner, P.J. 1997. Cloud-top height determination using ATSR data. Remote Sensing of Environment, 59, 1–13.

Subject: Re: stereo triangulation in IDL
Posted by Klemen on Wed, 26 Sep 2012 07:34:18 GMT
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ACP discussion paper is online:
http://www.atmos-chem-phys-discuss.net/12/25617/2012/acpd-12 -25617-2012.html
Klemen

Subject: Re: stereo triangulation in IDL
Posted by George[2] on Sun, 01 Jun 2014 19:32:21 GMT
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Hi! Its interesting. Depth/height can be calculated via measuring the parallax in two (or more) overlapping images of the same object. This will give you the result, if the the measured object does not move in time (because the two images taken in different time. Clouds are moving in fact. The question is how much noticable is this movement compared to the satellite altitude, and also as clouds are not solid objects their extension in object space is not strict, you cannot model this. Cheers.
