Weekly Report

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1 Final star tracking method?

This week I created a method for tracking stars that I am fairly certain will be reliable, as it uses the existing `geo_aim__define`methods for obtaining the azimuth and zenith angle coordinates for each star. These coordinates allow me to draw an image mask defining the region each star is expected to be found, and setting pixels outside of the region to zero. Provided that the region contains exactly one star, the star's position should be possible tofurther narrow pinpoint by selecting the maximum pixel as before.

The trouble with this method is determining how exactly the azimuth and zenith coordinates translate to Cartesian coordinates as defined on the image. Zenith angle is evidently linear with pixel distance from the zenith, so the conversion can be done the same way polar coordinates are converted to Cartesian coordinates, with azimuth angle being the angle and zenith angle equivalent to radius by some ratio. The trouble is in determining three parameters that pertain to this conversion: The position of the zenith, which cannot simply be assumed to be one of the centre pixels; the angle between the line vertical to the zenith and the north celestial pole, which adds an offset to the azimuth angle; and the ratio used to convert zenith angle to pixel distance.

For this purpose I also built a procedure that would allow me to manually adjust these parameters with keyboard input. The procedure draws a handful of image masks for different stars, and the parameters are modified through keyboard input as the masks are updated accordingly. I've found that doing this once for a long, clear data set produces sufficiently reliable parameters for the rest of the data obtained from that site, provided that I ensure the masks fit on every frame for that single data set.

Aside from this I continued the task of gathering star brightness data over time, a process made significantly quicker by the new star tracking method.