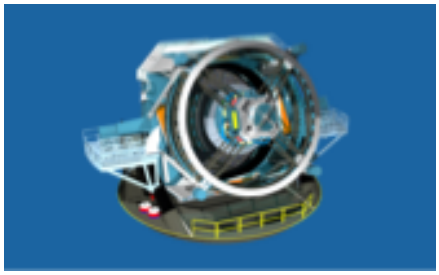

Contribution ID: **32** Type: **not specified**

Advances in astronomical image processing - Solving the problems of image coaddition and image subtraction

Wednesday, 14 June 2017 10:00 (30 minutes)

While co-addition and subtraction of astronomical images stand at the heart of observational astronomy, the existing solutions for them lack rigorous argumentation, are not achieving maximal sensitivity and are often slow. Moreover, there is no widespread agreement on how they should be done, and often different methods are used for different scientific applications.

I am going to present rigorous solutions to these problems, deriving them from the most basic statistical principles. These solutions are proved optimal, under well defined and practically acceptable assumptions, and in many cases improve substantially the sensitivity, robustness and speed of both coaddition and subtraction.

For coaddition, I will present a coadd image that is:

a) sufficient for any further statistical decision or measurement on the underlying constant sky, making the entire data set redundant.

b) improves both survey speed (by 5-20%) and effective spatial resolution of past and future astronomical surveys.

c) improves substantially imaging through turbulence applications.

d) much faster than many of the currently used coaddition solutions.

For subtraction, I will present a subtraction image that is:

a) optimal for transient detection under the assumption of spatially uniform noise.

b) sufficient for any further statistical decision on the differences between the images, including the identification of cosmic rays and other image artifacts.

c) Free of subtraction artifacts, potentially allowing (for the first time) robust automatic transient detection in real time, opening new avenues for scientific exploration.

d) more sensitive than previous transient detection methods

e) orders of magnitude faster than past subtraction methods.

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