

Signal Processing Overview

Images are collections of photon traces that can yield information about the stars and the universe. Those same images can be thought of as collections of signals along arbitrary axes that take the one-dimensional photon dot to a two-dimensional sequence. This allows the data to be processed by any number of the vast world of signal processing algorithms. The data can be integrated and averaged to enhance the brightness and contrast. If data is used from many images, this process can add detail that cannot normally be seen by the naked eye. In some cases, these images take a sufficiently long period of time to collect that it cannot be done in one session, in one night. This creates a new problem that different collections need to be aligned with each other because it is impossible to align equipment to the exact same orientation and still be affordable to the amateur astronomer.

Fortunately, the world of signal processing allows image processing to be performed via correlation algorithms. This can be enhanced by transforming the images to amplify the most identifiable features in each of the collections. Orbiting space telescopes often do this because of the need to collect data over periods of time that may span multiple years.

Consequently, I will reveal one way of aligning and integrating images taken with a very inexpensive digital camera. This method is embodied in two programs, one that enables processing visual signals and one that processes features of images. These two programs use a common data format that allows them to work together.