Popular Description - Parameter Analysis and Future Development of the Periodic Shadowing Concept

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Each element there is shines with its own set of colors, has its own special fingerprint. If we want to identify unknown elements, for example if we want to know what element a distant star consists of, we can look at the light coming from the star and identify its content by finding out which special set of colors the star shines with.

One way of doing this is by looking at the light through a spectrometer. A spectrometer is an apparatus that uses mirrors and a reflective grating to take light and divides it into its component colors, called spectral lines, These component colors are the special fingerprint of whatever created the observed light. When doing this, however, there are a series of distortions and unwanted effects that can affect these measurements. If the mirrors or the grating in the spectrometer is faulty for example, colors can be mixed up, blurred together or sparated the wrong way. Periodic Shadowing is a technique used on measurement data after going through a spectrometer that specifically counteracts accidental blurring of colors.

Periodic Shadowing creates a known pattern of shadows onto these spectral lines before the light enters the spectrometer so that any faults that are created inside the spectrometer lacks this shadow pattern. By using a mathematical concept called the Fourier transform we can easily distinguish between light with a pattern of shadows, light for our measurement, and other, unwanted light. The unwanted light can then be removed, leaving a clearer image that is easier to analyze. This bachelor thesis analyzes the Periodic Shadowing process, looking at how the pattern of the shadows affects the outcome of the process. Furthermore, variables used in the Fourier transform and removal of the unwanted light are also analyzed for the same reason.

Periodic Shadowing is a so-called post-processing technique, which means it is applied onto the measurement data. If the technique could be introduced into the actual measurement it would potentially give clear measurement results without the need for post-processing, either speeding up the measurement or allowing for other post-processing techniques to further improve the results. This Bachelor project also incorporates a first test to see if this software-to-hardware conversion is at all possible, using the knowledge gained about the pattern of shadows and the variables in the Fourier transform earlier.