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# THE IMPORTANCE OF OPEN ACCESS IN SCIENTIFIC PUBLICATIONS

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A TEMPLATE FOR MYST MARKDOWN ARTICLES IN THE INSIGHT JOURNAL

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Monday 27<sup>th</sup> October, 2025

## Abstract

This document describes a new algorithm implemented using the Insight Toolkit ITK ([itk.org](http://itk.org)).

This paper is accompanied with the source code, input data, parameters and output data that the authors used for validating the algorithm described in this paper. This adheres to the fundamental principle that scientific publications must facilitate reproducibility of the reported results.

**Keywords** open science, reproducible research, image processing, ITK, scientific computing, MyST markdown

Using filters from the Insight Toolkit, we develop an algorithm for detecting and tracking the movement of solar spots. As it is widely known, celestial objects such as the sun are ethereal and perfect, and therefore can not harbor artifacts such as spots. However, observations performed with our open source telescope have revealed the presence of such spots. The spots seems to continuously change positions on the solar surface.

Automatic detection and tracking of the solar spot movements are of fundamental importance for allowing the authors to dedicate more time to perfecting optical instruments and less time to the supervised acquisition of reliable data.

### Warning

The reader should be warned that direct observation of the sun without proper equipment may result in personal injury, loss of vision and burned brains.

## 0.1 Principles of Solar Spot Detection

Solar spots can be classified as the darkest objects present on an image of the solar surface. Algorithms such as watersheds, statistical classification and mathematical morphology are suitable for automatically detecting these features in images of the solar surface.

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## 0.2 Why Image Processing Papers must include Source Code, Images and Parameters

Modern Image Processing is most of the time performed with computers. An attempt to replicate the results of an algorithm described in a paper entails to reimplement the algorithm into source code. This task is far from trivial and consumes months of work. The final result can not be guaranteed to be equivalent to the actual code that was used for testing the algorithm when the paper was written, and therefore it cannot be considered a baseline for comparing the algorithm with other algorithms available to the reader.

Papers to the Insight Journal are written in the spirit of facilitating and encouraging readers to perform replication of work. In this sense, the Insight Journal is compliant with essential concepts of the scientific method.

Since the code is included with the paper, less time has to be spent in describing the code, and more time can be used for describing how to use the algorithm in particular types of images.

For questions on the basis of the scientific method the reader is referred to [Popper \[2002, 1971\]](#).

## 0.3 Pointing to other material

The format of this MyST file allows authors to include code snippets, like the following:

```
typedef itk::Image< unsigned char, 3 > ImageType;
```

```
ImageType::Pointer image = ImageType::New();
```

and to cite the online documentation of the Insight Toolkit, for example, the link to the doxygen documentation of the [ImageToImageFilter](#).

MyST markdown also supports inline code formatting for method names like `SetNumberOfIterations()`.

### 0.3.1 Including Figures

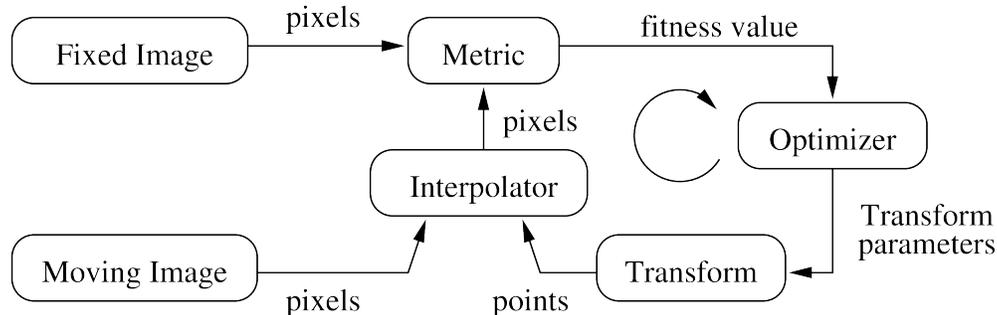


Figure 1: The basic components of the registration framework are two input images, a transform, a metric, an interpolator and an optimizer.

### 0.3.2 Mathematical Equations

To support shape-guidance, the generic level set equation ((1)) is extended to incorporate a shape guidance term:

$$\xi(\psi^*(\mathbf{x}) - \psi(\mathbf{x})) \tag{1}$$

## 0.4 Appendix: Working with MyST Markdown

To create an appendix in a MyST document, simply use additional sections.

### 0.4.1 Code Examples

Here's an example of how you might structure code in your MyST document:

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```
# Python example
import itk

# Load an image
image = itk.imread('data/img1.png')

# Process the image
processed_image = itk.median_image_filter(image)

# Save the result
itk.imwrite(processed_image, 'output.png')
```

### 0.4.2 Cross-References

You can reference figures like Figure 1 and equations like (1) throughout your document.

## References

- Karl R. Popper. *The Logic of Scientific Discovery*. Routledge, 2nd edition, 2002. ISBN 0415278449.
- Karl R. Popper. *The Open Society and Its Enemies*, volume 1. Princeton University Press, 5th edition, 1971.