

22/01/14

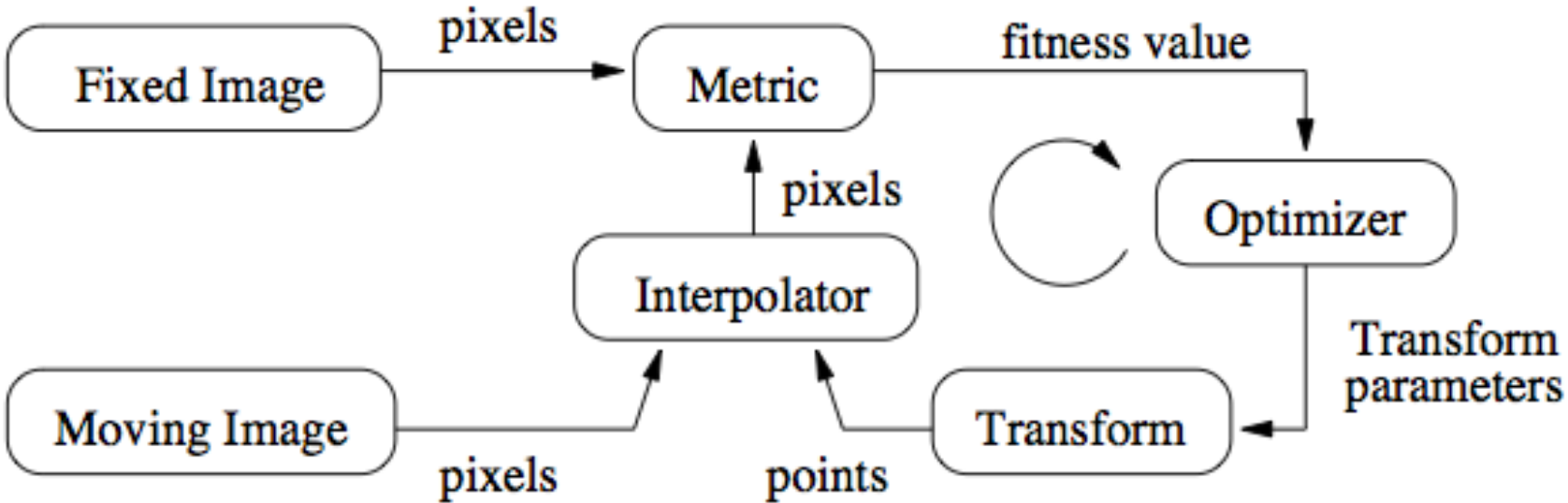
ITK Registration Framework

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Registration Overview



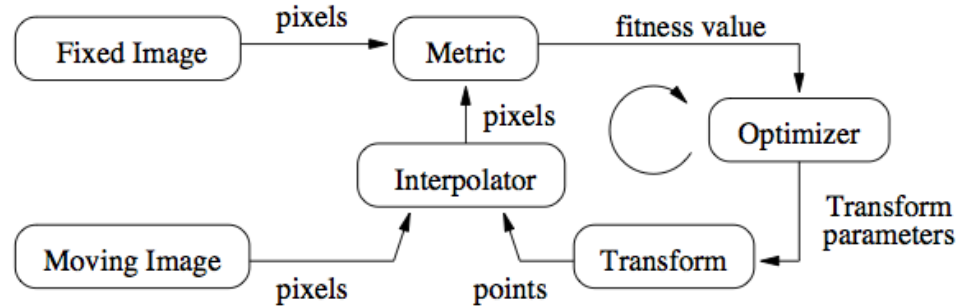
Hello World Registration (I)

```
#include "itkImageRegistrationMethod.h"
#include "itkTranslationTransform.h"
#include "itkMeanSquaresImageToImageMetric.h"
#include "itkLinearInterpolateImageFunction.h"
#include "itkRegularStepGradientDescentOptimizer.h"
#include "itkImage.h"

const unsigned int Dimension = 2;
typedef float PixelType;

typedef itk::Image< PixelType, Dimension > FixedImageType;
typedef itk::Image< PixelType, Dimension > MovingImageType;
```

Hello World Registration (II)



```
typedef itk::TranslationTransform  
    < double, Dimension > TransformType;
```

```
typedef itk::MeanSquaresImageToImageMetric  
    < FixedImageType, MovingImageType > MetricType;
```

```
typedef itk::LinearInterpolateImageFunction  
    < MovingImageType, double > InterpolatorType;
```

```
typedef itk::ImageRegistrationMethod  
    < FixedImageType, MovingImageType > RegistrationType;
```

```
typedef itk::RegularStepGradientDescentOptimizer  
    < FixedImageType, MovingImageType > OptimizerType;
```

Hello World Registration (III)

```
registration->SetMetric( metric );
registration->SetOptimizer( optimizer );
registration->SetTransform( transform );
registration->SetInterpolator( interpolator );

registration->SetFixedImage( fixedImageReader->GetOutput() );
registration->SetMovingImage( movingImageReader->GetOutput() );

fixedImageReader->Update();
movingImageReader->Update();

//Improve Speed
registration->SetNumberOfThreads( n );

registration->Update();
```

ITK 4 Registration Changes

- Optimized Metrics e.g.

```
#include "itkMeanSquaresImageToImageMetricv4.h"
```

```
#include "itkNormalizedCorrelationImageToImageMetricv4.h"
```

```
#include "itkMutualInformationHistogramImageToImageMetric.h"
```

Registration – Set your parameters!

- Set a maximum number of iterations

```
optimizer->SetNumberOfIterations( 200 );
```

- Set optimizer step length

```
optimizer->SetMaximumStepLength( 4.00 );
```

```
optimizer->SetMinimumStepLength( 0.01 );
```

- Set initial transform parameters

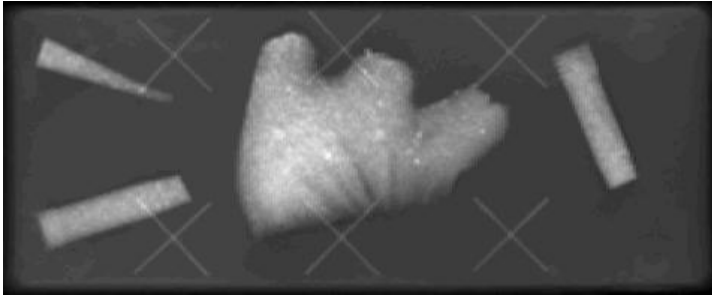
```
registration->SetInitialTransformParameters( initialParameters );
```

Available Registrations

- Rigid
 - Rotate
 - Translate
- Affine
 - Rigid +
 - Shear
 - Scale
- Deformable
 - Affine +
 - Vector field
- 3D / 3D
- 2D / 3D

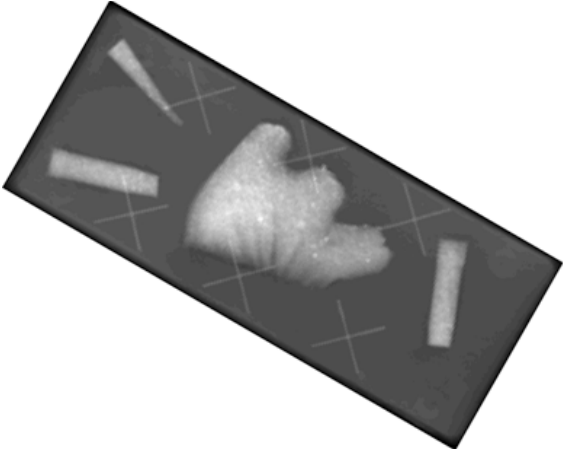
Registration – Example (I)

Fixed Image



Moving Image

- Rotated 30 deg
- Skaled 80%



Results:

Iterations	= 206
Scale	= 0.798888
Angle (deg)	= 30.0123
Time	= 15.27 s