

Image Mosaicing Using Fourier Shift Theorem

By-

Harsh, Khushhall
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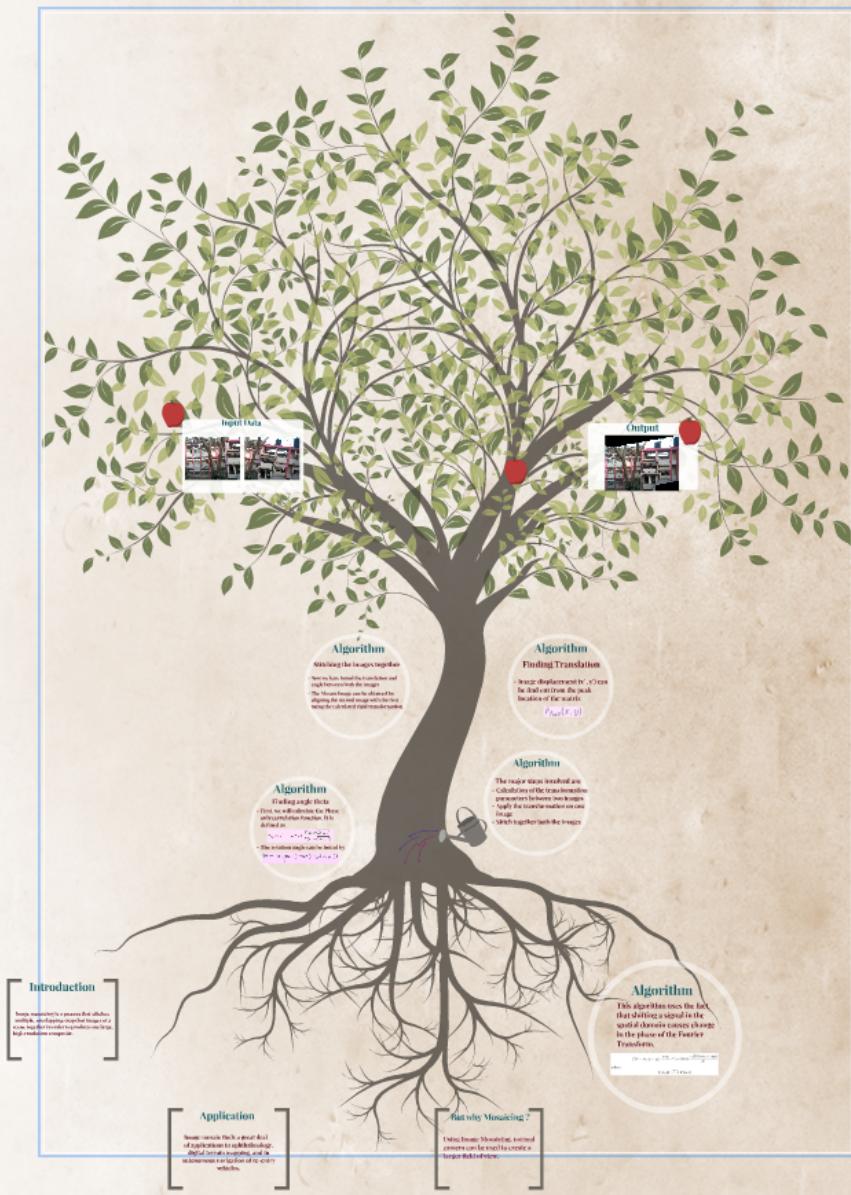


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Introduction

Image mosaicing is a process that stitches multiple, overlapping snapshot images of a scene together in order to produce one large, high resolution composite.

Application

**Image mosaic finds a great deal
of applications in ophthalmology,
digital terrain mapping, and in
autonomous navigation of re-entry
vehicles.**

But why Mosaicing ?

Using Image Mosaicing, normal camera can be used to create a larger field of view.

Algorithm

**This algorithm uses the fact
that shifting a signal in the
spatial domain causes change
in the phase of the Fourier
Transform.**

$$f(x - x_0, y - y_0) \xrightarrow{DFT} F(u, v) \exp \frac{-j2\pi(ux_0 + vy_0)}{N}$$

where

$$f(x, y) \xrightarrow{DFT} F(u, v)$$

Algorithm

The major steps involved are

- Calculation of the transformation parameters between two images**
- Apply the transformation on one image**
- Stitch together both the images**



Algorithm

Finding angle theta

- First, we will calculate the Phase only correlation function. It is defined as

$$\hat{r}_{fg}(x, y) = IDFT\left(\frac{F(u, v)\overline{G(u, v)}}{|F(u, v)\overline{G(u, v)}|}\right)$$

- The rotation angle can be found by

$$\Theta = \operatorname{argmax}_{\theta}(\max(\hat{r}_{f_\theta g}(x, y)))$$

Algorithm

Finding Translation

- **Image displacement (x' , y') can be find out from the peak location of the matrix**

$$\hat{r}_{f \Theta g}(x, y)$$

Algorithm

Stitching the images together

- Now we have found the translation and angle between both the images
- The Mosaic Image can be obtained by aligning the second image with the first using the calculated rigid transformation.

Input Data



Output



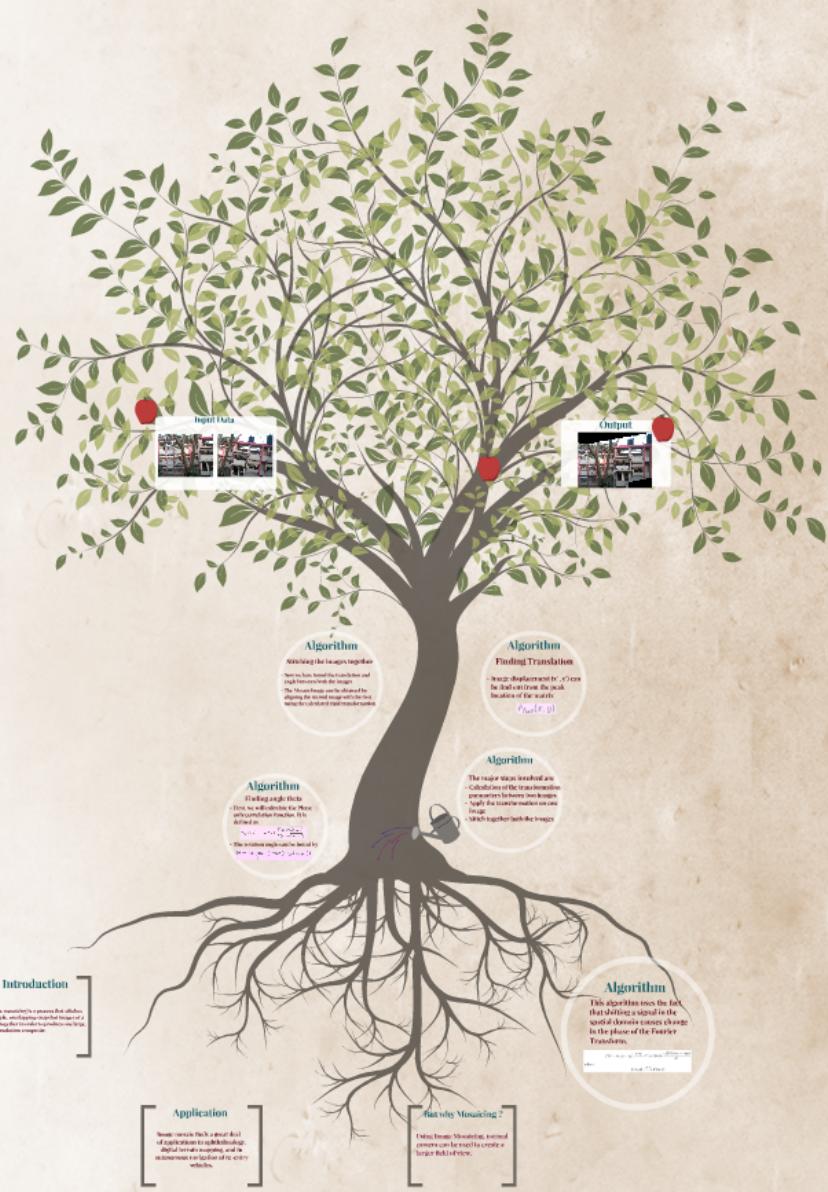


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