



RESTORING IMAGES, FROM ANCIENT ARTEFACTS TO MODERN MEDICINE

Industrial Mathematics KTN
TakeAIM Competition 2011
Winning entry

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An intricate scene is painted on an ancient vase. Over thousands of years, the vase has become chipped, and paint has gone missing. What did the original picture look like? We're using maths techniques to reconstruct a digital copy of the image. Using a mathematical approach known as inpainting, we solve differential equations to 'flow' the paint over the surface. The pieces that are still intact are used to restore and reconstruct the damaged regions.

The same process can be used to restore old photographs, or to analyse medical scans. Modern medical imaging can give a detailed view of the surface of, say, the heart, but can sometimes suffer from missing or damaged data. Doctors want to be able to study a clean, restored version of the image. Treating these scans in a similar way to the painted vase, we can solve equations over the surface, and fill in missing areas. Previous techniques could only handle a flat 2D image. We're adapting this to the curved surface of organs such as the heart or brain, giving much more information from a single scan.

This method works in the same way on any shape, which means that the same mathematical tools can be used to reconstruct objects as diverse as historical artefacts, brain surfaces, and perhaps many more applications in between.

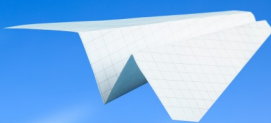
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TakeAIM:
ARTICULATING THE INFLUENCE OF
MATHEMATICS



The use of mathematics has profound consequences in all walks of life, but the opportunities that it opens up often go unrecognised or underexploited. The Industrial Mathematics KTN, enabled by the generous sponsorship of NAG, ARM and Unilever, ran the TakeAIM competition in 2011 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition was open to all undergraduate and postgraduate students working in the mathematical sciences who wished to convey the potential influence of their work. Authors of the best two entries each received an iPad 2 as their prize.