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140-year-old mathematics problem solved in UK

Aside | Sarju Kaul

London: A British mathematician has solved a 140-year-old maths problem.

The breakthrough relates to the field of conformal mapping, a key theoretical tool used by mathematicians, engineers and scientists to translate information from a complicated shape to a simpler circular shape so that it is easier to analyse.

Conformal mapping has a wide range of applications: In aeronautics, it is used to model airflow patterns over intricate wing shapes and in neuroscience it is used to visualise the complicated structure of the grey matter in the human brain.

Conformal mapping is based on a formula, called the Schwarz-Christoffel mapping, which was developed by two German mathematicians, Elwin Bruno Christoffel and Hermann Amandus Schwarz, in the mid-19th century.



Prof. Darren Crowdy, chair in applied mathematics, Imperial College London, has managed to solve the 140-year-old deficiency in this formula. The Schwarz-Christoffel mapping only worked for shapes that did not contain any holes or irregularities.

In a major breakthrough, the British mathematician has made additions to the Schwarz-Christoffel formula so that it can be used for these more complicated shapes, according to the study published in the journal *Mathematical Proceedings of the Cambridge Philosophical Society*.

"This formula is an essential piece of mathematical kit which is used the world over. Now, with my additions to it, it can be used in far more complex scenarios than before. In industry, for example, this mapping tool was previously inadequate if a piece of metal or other material was not uniform all over - for instance, if it contained parts of a different material, or had holes," Prof. Crowdy said.

The enhanced formula, according to Prof. Crowdy, will open up many new opportunities for conformal mapping to be used in diverse applications. "With my extensions to this formula, you can take account of these differences and map them onto a simple disk shape for analysis in the same way as you can with less complex shapes without any of the holes," he said.



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