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Math Problem Solved By Researcher

in: Breakthrough Thinking, People Making a Difference

A problem which has defeated mathematicians for almost 140 years has been solved by a researcher at Imperial College London.

Professor Darren Crowdy, Chair in Applied Mathematics, has made the breakthrough in an area of mathematics known as 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 analyze.

This theoretical tool has a long history and has uses in a large number of fields including modeling airflow patterns over intricate wing shapes in aeronautics. It is also currently being used in neuroscience to visualize the complicated structure of the grey matter in the human brain.

A formula, now known as the Schwarz-Christoffel formula, was developed by two mathematicians in the mid-19th century to enable them to carry out this kind of mapping. However, for 140 years there has been a deficiency in this formula: it only worked for shapes that did not contain any holes or irregularities.

Now Professor Crowdy has made additions to the famous Schwarz-Christoffel formula which mean it can be used for these more complicated shapes. He explains the significance of his work, saying:

“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.”

Professor Crowdy’s work has overcome these obstacles and he says he hopes it will open up many new opportunities for this kind of 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 added.

Professor Crowdy’s improvements to the Schwarz-Christoffel formula were published in the March-June 2007 issue of Mathematical Proceedings of the Cambridge Philosophical Society.

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