



## Logically decomposing the real world

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These images represent 'cylindrical algebraic decompositions' and they were calculated to investigate when a particular mathematical simplification is true – shown here by the green areas. Engineers can then use these to verify when a mathematical model may be simplified safely - achieving efficiency without compromising reliability.

The decompositions are computed relative to logical formulae – each formula is either true or false throughout each segment - which means we can identify solutions by testing just one point in each segment. The bottom image shows the output from a new algorithm developed in the Department of Computer Science in Bath, and the top image shows the output from a previous approach. The new algorithm establishes that the dashed lines only affected the truth of the formulae when they touched the solid lines, meaning a neater decomposition - less segments to test. This decomposition is closer to the actual behaviour of the application.

