Dijkstra's algorithm for improved imaging of defects and plies in curved composites

Callum Lanherne, Paul Wilcox

10/04/2018
Introduction

• Ultrasound in composites: current challenges
• Dijkstra’s algorithm for ray tracing
• Finite element modelling
• Results and conclusions
Ultrasound in composites: current challenges

Pros
• Can penetrate deep into components
• Powerful post processing algorithms make sizing and locating discontinuities easy

Challenges in composites
• Backscatter from plies reduces depth
• Fermat’s principle: ultrasound follows path of least time. If stiffness changes, then straight lines no longer valid
Dijkstra’s algorithm for ray-tracing

- Attempting to solve ray bending problem

<table>
<thead>
<tr>
<th>Discretise domain</th>
<th>Calculate connections</th>
<th>Calculate edge weights</th>
<th>Find shortest path in graph</th>
</tr>
</thead>
</table>

![Diagram of Dijkstra's algorithm for ray-tracing](image-url)
Dijkstra’s algorithm for ray-tracing

• Attempting to solve ray bending problem
Finite element analysis
Finite element analysis

- Pogo FEA: GPU based simulation with significant speed up
Results
Results
Future work

• Experimental validation of model
• Increase variety of defects
• Quantify sizing and SNR improvements
Any questions

C.Lanherne@bristol.ac.uk

bristol.ac.uk/composites