An initial study on the line orientation patterns of a 3D printed specimen and its resistance to stress placed onto a specimen

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The purpose of this project is to determine the best line orientation pattern and material for a printed three-dimensional specimen to reduce the stress being applied. Investigations have been carried out by graduate students and researchers in the engineering department who are analyzing newer line orientation patterns. The proposed problem statement for the investigation is that the 3D-printed specimen that is made from CF-PLA (Carbon Fiber - Plastic) material and has parallel line patterns aligned with the loading will be more resistant to any tensile stress placed onto the specimen which tests the tensile strength and tensile stiffness of the specimen than any specimens made from PLA material with these same line patterns. The methods conducted in this investigation are that of 3D printing specimens using a 3D printer with different G-codes or geometry codes, and tensile stress testing using stress equipment. Data was collected by a student with a similar project for line orientation patterns and recorded that a maximum force of around 470 lbf was achieved by a specimen before pulling apart. The conducted study concludes that the horizontal line orientation pattern with CF-PLA material is the most resistant to stress placed on a specimen. In a future study, we would investigate a new line orientation pattern developed by a graduate student. Another future direction would be of making the prints with a clamping area rather than by gluing clamps on the ends of the print to hold in place of the tensile stress machine.