FEASIBILITY OF APPLYING 4D PRINTING TECHNOLOGY USING WOOD-BASED FILAMENTS

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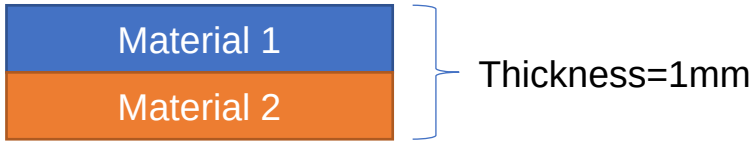
Wood and polylactic acid (PLA) has their sensitivity to a particular stimulus. Is it possible to use PLA and wood-fill PLA for 4D printing to make objects which can change shape when exposure to a stimulus?

- This project is to build a duo-material object which can be added with the fourth dimension, via the use of heat or moisture as a stimulus, to achieve 4D printing.
- After printing one layer using material 1, material 2 is used by changing the filament to continue to print the second layer. The thickness of each layer can be set as the same or different depending on the design.
- While printing is finished, put the printed specimen in water for 8 hours. Take out the saturated specimen and dry in the air until the mass reaches a constant.
- Then, put the specimen back in the water.
- The changes in deformation and shape in the specimen can be captured and analyzed use the digital image correlation technique.



The preliminary results showed that the moisture impacted the shape and dimensions of a 2-later specimen printed. The left picture below is the completely wet specimen, and the right picture is the same specimen but was dried in the air. After the specimen was placed back to water, it could absorb moisture again allowing to restore the shape.

In conclusion, the moisture can be the stimulus in the duo-material system object to achieve 4D printing.

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