Adaptable Meshes: A Dynamic Approach to the Construction of Membranes

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Abstract

The fabrication of thread-based membranes and panels is typically constrained by the limitations of the underlying scaffold in which it is constructed. In this paper we present an alternative method of developing fiber-based meshes that are the result of ongoing research with the *Bombyx mori* silkworm done by the group and explored previously [1][2].

This new method consists of a system that uses a heat bonding thread comprised of a polyester core coated in PLA that is deposited by a custom end effector responsible for laying the thread and creating anchor points by heating up and fusing the threads together. This research shows how we can reduce the complexity of the scaffold while increasing the ability to create anchor points within the mesh itself, allowing for a more intricate and adaptable behavior of the system. In this paper we present (1) the mechanism and development of the end effector; (2) the approach for toolpath pre-planning; (3) a real-time approach for live toolpath generation; and (4) a demonstration of how living organisms can be integrated into this system by describing how it reacts to them and accommodates for their movement and interference.

References

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