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Design of a Small Scale Roll to Roll Device

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ABSTRACT

In the soft robotics field, hyperelastic polymer films are used in conjunction with eutectic gallium indium to create flexible strain gages. However, rapid large scale manufacturing methods of such sensors have yet to be developed.

Developing new manufacturing methods will allow for researchers to build and test new soft sensor concepts faster but also pave the way for future mass-production of these sensors for consumer or industrial consumption.

One of those methods would be a Roll to Roll System (R2R) similar to those used to in the publication industry. In this context, Polyethylene terephthalate (PET) film rolls will be used as a medium upon which hyperelastic polymer films and eutectic gallium indium will be deposited on. This research paper will discuss the design of a small scale roll to roll system used in the Purdue Fabrication Laboratory.

After designing and building a scaled down R2R prototype system, we found that this system must be able to adequately control the PET web tension, and web position to ensure the accuracy of the printed of the soft sensor.

Due to an absence of a readily available and economical R2R device made specifically for soft robotics, our laboratory built one that would be able to interface with laboratory equipment and that enabled an efficient manufacturing of flexible sensors. This device will serve as a step towards the development of large scale soft robotics printing.

KEYWORDS

R2R, Roll to Roll, soft robotics, manufacturing