Novell Roll-to-Roll (R2R) Web Steering Concept

About CCM
CCM (member of the Sioux Group) is a well experienced innovative product development company, founded in 1969. For our customers we translate technology into applications in the field of mechatronic products and systems. Our competences in mechatronics, mechanics, electronics and software enable us to support the need of our customer’s. Please check www.ccm.nl for more information about CCM. This assignment is defined by the department of Mechatronics.

About the assignment
Roll-to-Roll (R2R) systems are widely used for transporting web made of paper, plastic or metal in printing systems. There is a growing demand for higher printing accuracies (currently already up to 1200 dpi), especially for printed electronics such as RFID, electronic paper, displays and solar cells. These state-of-the-art printing systems generally consist of multiple inkjet print heads behind each other requiring a transport accuracy of the web of less than 10 [µm], over more than 1 [m] transport distance with a velocity up to 2 [m/s]. Recently an innovative steel belt conveyor system has been developed within CCM that can fulfill these requirements. The next challenge is to develop an improved web steering mechanism to feed-in the web towards this conveyor system.

Web steering, applies in-plane bending of the web to control the lateral movement of the web. Current web steering mechanisms require relatively high web tension to prevent wrinkling of the web. This high web tension is not acceptable in high accuracy printers because it deforms the web too much. CCM has invented an innovative web steering mechanism that can work with minimal web tension.

GOAL
The goal of this assignment is to develop a model of the steering behavior of the web using the newly developed actuation principle, identify how its parameter change with different web materials and web dimensions and use it to devise an optimal control strategy. This is particularly challenging due to the significant delay in the system and large variation in material characteristic (young modulus 1-10 GPa), material thickness (10-1000 µm) and web width (200-1200 mm) resulting in a lateral stiffness variation of the web of more than a factor 1000!

ACTIVITIES
• Develop a physical model of the behavior of the web.
  This model can be identified by measuring on the available test set-up.
• Validate the model for different web material types and investigate how the parameters of the web influence its behavior.
• Develop an optimal control strategy for web steering.
• Implement and verify this control strategy.
• Design a controller that compensates for the nonlinear behavior and the position dependent force characteristics.
• Verify auto calibration data with external measurement tools.

Interested?
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