

DEVELOPMENT OF WEB LATERAL ALIGNMENT IN ROLL TO ROLL PROCESSING

By

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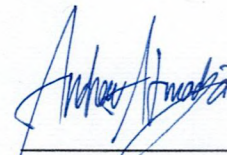
Revision after the Thesis Defense on July 7, 2025

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

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ABSTRACT

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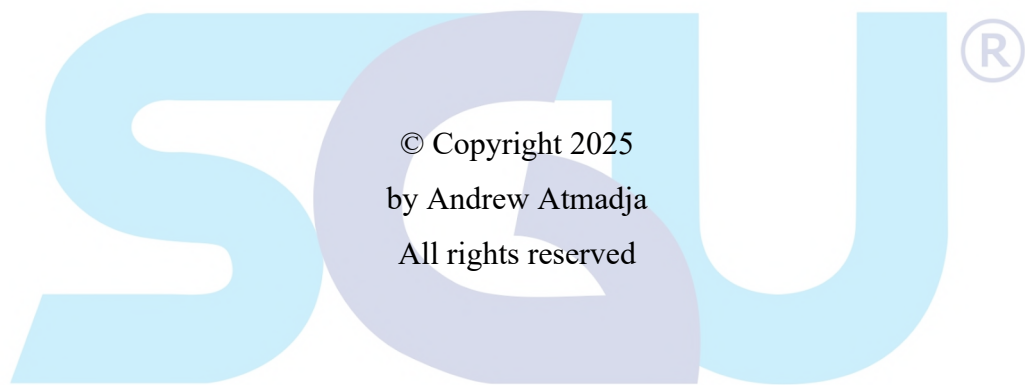
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XYZ Company's horizontal flow wrapper packaging machines face serious web alignment problems that impact both product quality and operational efficiency. This thesis presents the design and testing of an easy-to-build prototype web guide to address these issues. The system uses infrared sensors to monitor the web's lateral position and a PID controller to keep it centered automatically. Tests showed the prototype could track web position accurately up to 0.01 cm, despite minor sensor nonlinearity. Proper PID tuning for the DC and stepper motors significantly improved the system's response and reduced errors. Careful adjustment of sensor parameters also helped minimize unwanted movements and oscillations. However, adding a deadband reduced accuracy, and high web speeds led to loss of traction and more alignment errors. In summary, the developed prototype offers a sensitive, and reliable web guiding solution, suitable for improving web alignment in packaging processes.

Keywords: Web Alignment, Web Lateral Control, Displacement Guide, PID Control, Edge Position Sensor.



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DEDICATION

I dedicate this work to God, for it would now be possible without His help.

I also dedicate this work to the support and sacrifices of my family, whose love and encouragement have been my strength.

I further dedicate this work to the pursuit of science and the wonder it inspires. As a mechatronics engineer, it is both an honor and a privilege to explore the depths of engineering knowledge.



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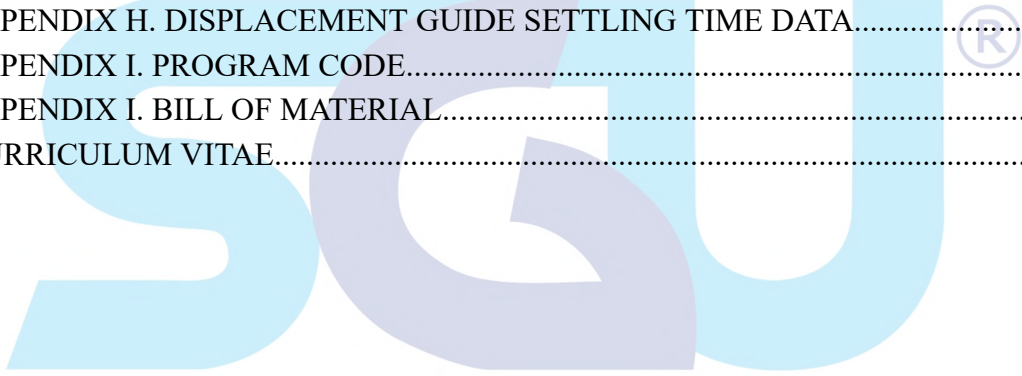
Finally, to my beloved family. Thank you for your endless understanding, support, and help in every way imaginable. This achievement would not have been possible without you all.

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