

# **NOISE FILTERING FOR ACCURACY IMPROVEMENT OF CONVEYOR BELT TYPE DYNAMIC WEIGHING SYSTEMS**

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Degree of Master of Science in Industrial Automation

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the  
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## ABSTRACT

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Conveyor belt-type checkweigher machines are important part of modern production factories. They are used to determine the weight of the different types of products without stopping the products on the weighing conveyor. The main challenge of dynamic weighing system is providing high measurement accuracy, while the checkweigher machine is running at high conveyor belt speeds. In this paper different types of noises such as electronic noises, motor vibration noises and noises due to natural frequencies are analyzed in frequency domain and it is discussed how digital filtering such as Notch filter, FIR lowpass, IIR lowpass are effective to obtain the required accuracy level. Then to achieve further accuracy level, system is modelled using first principles as spring-mass system as well as black box model. Finally, the selected model is used to apply Kalman filter. Then Kalman is selected as the best filtering method and applied to the real system and simulation and experimental results & conclusions are discussed in detailed.

**Keywords:** Check weigher, Frequency Analysis, Model based filtering, Notch filter, FIR lowpass, IIR lowpass, Kalman Filter, Black box model

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## LIST OF ABBREVIATIONS

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FFT :	Fast Fourier Transform .....	19
FMCG :	Fast Moving Consumer Goods .....	1
HMI :	Human Machine Interface.....	2
LP FIR :	Low Pass Finite Impulse Response.....	3
LP IIR :	Low Pass Infinite Impulse Response .....	3
OEM :	Original Equipment Manufacturer .....	2
PLC :	Programmable Logic Controller.....	1
UPM :	Units per Minute .....	2