Chapter 4

COMPARISON OF SPIKE NOISE REMOVING PERFORMANCES OF DIFFERENT FILTERS FOR LOW LEVEL SENSOR DATA

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INTRODUCTION

Nowadays, sensors or signal converters are used in many areas to measure different physical quantities. Sensors and transducers used to detect physical quantities often produce voltage in the order of millivolts. Therefore, they are easily affected by the electric and magnetic fields coming from the environment or the operation of the switching elements in the electric circuit. Especially in biomedical measurements, electronic noise, electrode noise, and motion artifacts are common random noise types[1].

Because of the importance of the subject in the literature, there are hundreds of studies about spike removing and de-noising. Sultana and Kamatham[1] reduced the noise in the ECG signal using the Savitzky-Golay filter (SGF) and discrete wave transform. SGF performance for speckle reduction in ultrasound images was investigated by Randhawa and Sunkaria. They evaluated the filter for various order and frame lengths and heuristically selected optimum order and frame length by evaluating filter output for a variety of filter order and frame length [2]. Menon and Seelamantula robustified the SGF after a heavy-tailed distribution for applications involving noise [3]. In an embedded electrocardiographic monitoring platform, Fernandes et al. presented the use of SGF for power line interference cancelation[4]. Yang et al. proposed a novel method, minimum arclength EMD (MA-EMD), for robustly decomposing data from time series with impulse-like noises [5]. Rogers and Harris developed a low-power spike detection circuit that decreases neural recording bandwidth by generating only a short pulse at each neural spike time. [6]. Naso et al. proposed an algorithm based on a fuzzy logic to detect and remove impulsive spike noise from track geometry measurements in

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