

ARIMA Modeling of Noise in Electromyography Signals

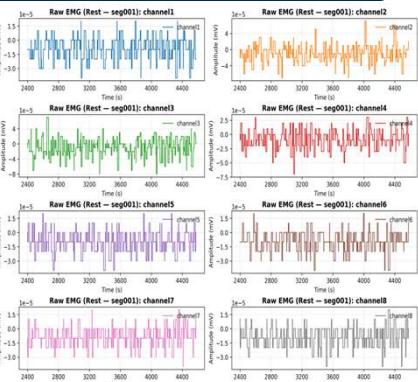
Introduction

ARIMA(Autoregressive Integrated moving average) has often been used to study how EMG signals change over time. This project takes a new look at the *noise* within those signals instead—separating real noise from muscle activity and then modeling it with simple ARIMA equations. The result is cleaner EMG data and a practical, model-based way to reduce noise without the side effects of heavy filtering.

Raw Data → Noise Acquisition → ARIMA

Segmentation & Noise Acquisition

Raw EMG recordings were divided by gesture and channel, trimmed to equal length, and labeled consistently. After removing 50/60 Hz hum, rest segments were isolated to create noise-only traces for ARIMA-based modeling and analysis.



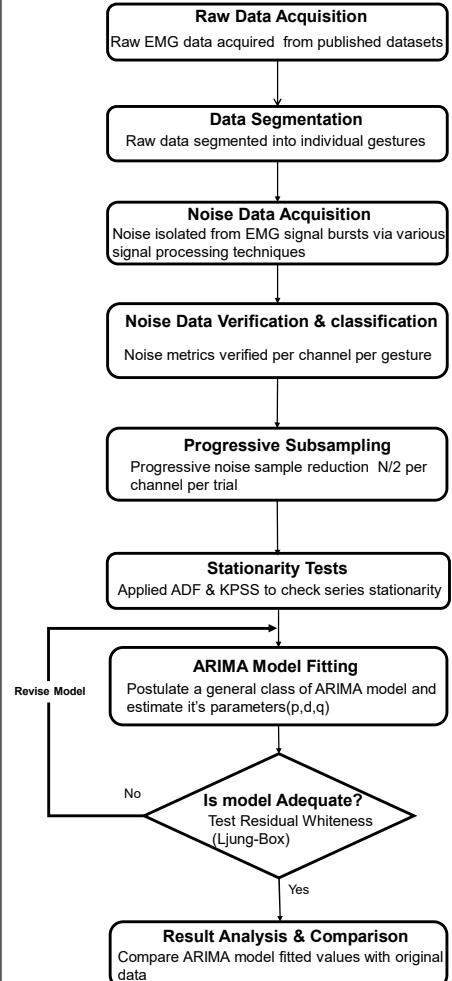
Electromyography Signal Noise Composition

channel	tag	Confidence Score	cardiac_like	common_mode
CH1	Cardiac-like leakage	0.277	0.2553571	0.097478383
CH2	Cardiac-like leakage	0.431	0.2862303	0.097478383
CH3	Residual-EMG	0.044	0.1734184	0.097478383
CH4	Cardiac-like leakage	0.241	0.2482445	0.097478383
CH5	Cardiac-like leakage	0.177	0.2354596	0.097478383
CH6	Uncertain	0.2	0.1726493	0.097478383
CH7	Cardiac-like leakage	0.15	0.2300042	0.097478383
CH8	Uncertain	0.2	0.184076	0.097478383

Objectives

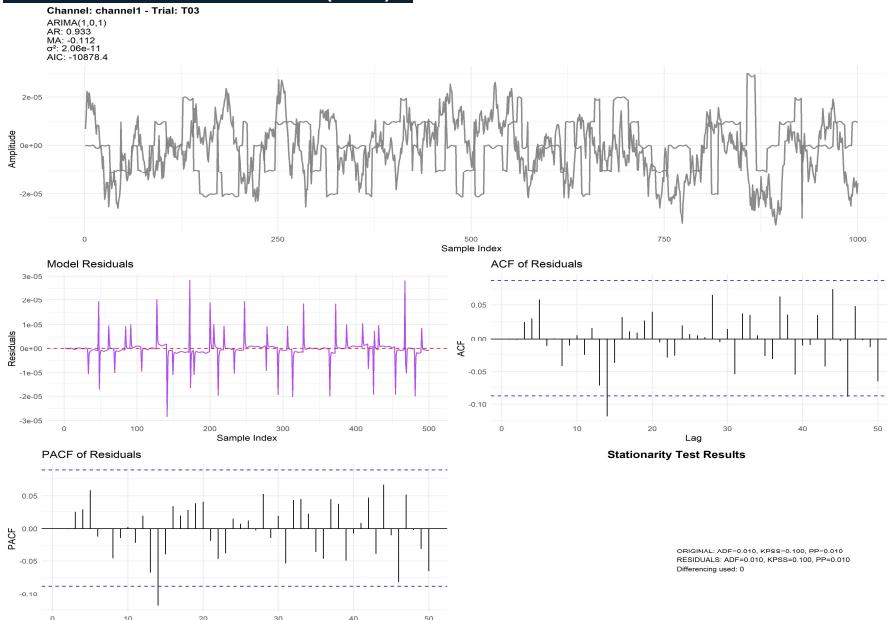
- Build a reproducible method to extract EMG noise suitable for modelling and verification.
- Test whether low-order ARIMA models describe that noise by examining residual whiteness (ACF/PACF, Ljung–Box) and lightweight overlays/denoising to confirm practical utility.

Methodology

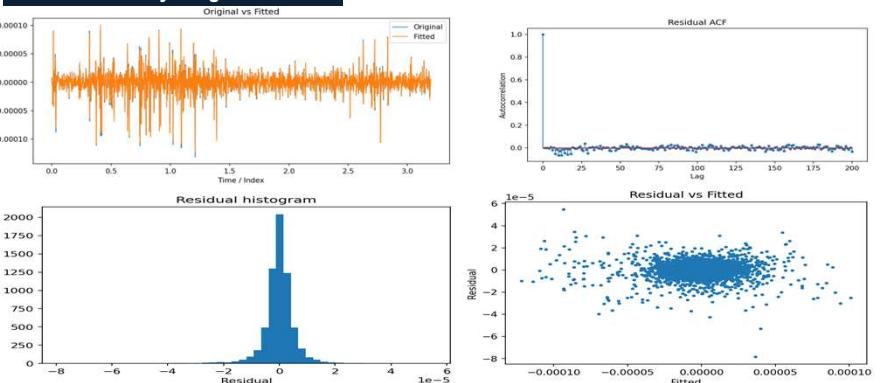


Results

Dataset III - EMG Pattern DB (MYO)



Dataset IV - Delsys Trigno IM



Conclusions

The study demonstrates that low-order ARIMA models can reliably characterize and reproduce electromyography noise, providing a practical and interpretable approach for improving signal clarity and analysis consistency across datasets.