

process but as noise ratio is high, it is recommended to use at least over 4bit. As data analysis under railway environment is an important area for its potential accident, it is considered that a technique of enhancing reliability for sensing data compression would be required to be developed in the future.

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REFERENCES

- [1] Alan V. Oppenheim and Ronald W.Schafer, "Discrete Time Signal Processing", 3rd ed. Pearson, 2007, pp 182-265
- [2] R.M. Gray, "Quantization Noise Spectra" *IEEE Trans. Information Theory*, vol. 36, pp. 1220-1244, Nov. 1990
<http://dx.doi.org/10.1109/18.59924>
- [3] S.J.Wellington, J.K.Atkinson and R.P.Sion, "Sensor validation and fusion using the Nadaraya-Watson statistical estimator" in *2002 Proc. IEEE Int. Conf. Information Fusion*, pp. 321-326.
- [4] N.S.V. Rao, Nadaraya- Watson estimator for sensor fusion, *Optical Engineering*, Vol. 36 No. 3, 1997, pp.642-647.
<http://dx.doi.org/10.1117/1.601136>
- [5] S. P. Lloyd, "Least squares quantization in pcm," unpublished Bell Laboratories technical note. Presented in part at the Institute of Mathematical Statistics Meeting, Atlantic City, NJ, Sept. 1957. Published in the special issue on quantization, *IEEE Trans. Inform. Theory*, Mar. 1982.