

1. Introduction

The Institute for Telecommunication Sciences presented several contributions at the January 1994 meeting regarding the traditional analog measurements of bandwidth and signal-to-noise ratio (T1A1.5/94-102, T1A1.5/94-103). This contribution presents correlation results of these measurements to the T1A1.5 VTC/VT subjective viewing test data. Results are given using the subjective scores from two of the three labs.

2. Models

A least squares first-order predictor was fit to each analog measurement. Each predictor was designed to map its output values (\hat{s}) into the usual 1 to 5 range. The fitted models are as follows:

Bandwidth:

$$\hat{s} = 0.882 + 0.809 \cdot \text{Bandwidth}$$

$$\text{coefficient of correlation} = 0.619$$

$$\text{RMS Error} = 0.882$$

SNR:

$$\hat{s} = 36.427 - 0.743 \cdot \text{SNR}$$

$$\text{coefficient of correlation} = 0.279$$

$$\text{RMS Error} = 1.078$$

Weighted SNR:

$$\hat{s} = 11.250 - 0.153 \cdot (\text{Weighted SNR})$$

$$\text{coefficient of correlation} = 0.123$$

$$\text{RMS Error} = 1.114$$

3. Results

As expected, the traditional bandwidth measurement provides some indication of the perceived quality. This is due to the fact that the bandwidth varies in proportion to the coding resolution, e.g. CIF versus QCIF. The scatter plot of subjective score versus the first-order predictor using bandwidth can be seen in Figure 1. There is one measurement of the bandwidth for a given HRC. Therefore, the banding is a result of the bandwidth measurement being replicated for all 25 scenes of a given HRC.

For the T1A1.5 subjective test data, the signal-to-noise ratio (SNR) and the weighted SNR are not good correlates to the subjective score. Because neither SNR nor weighted SNR varies much over the 25 HRCs, these parameters do not provide a significant indication of quality differences between HRCs. The scatter plots for SNR and weighted SNR can be seen in Figure 2 and Figure 3 respectively.

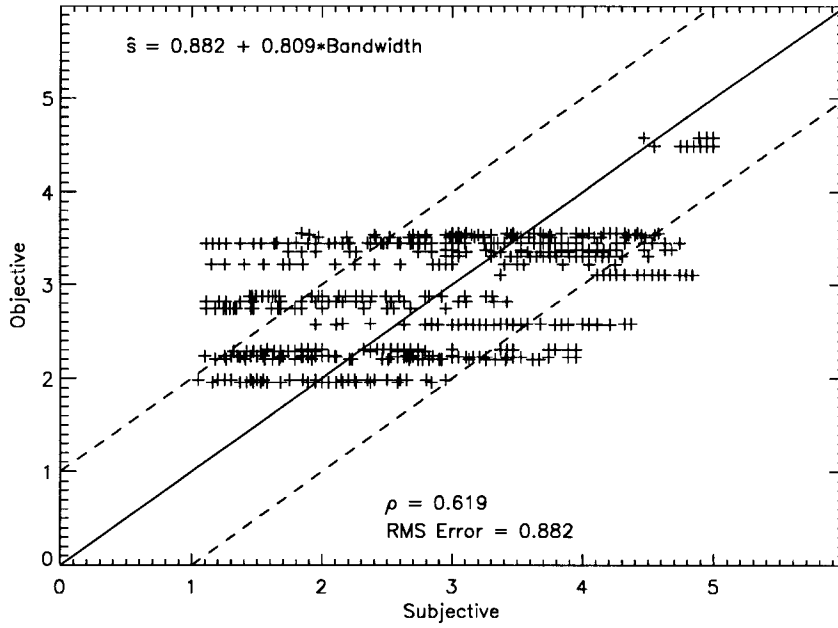


Figure 1: Bandwidth vs. subjective score.

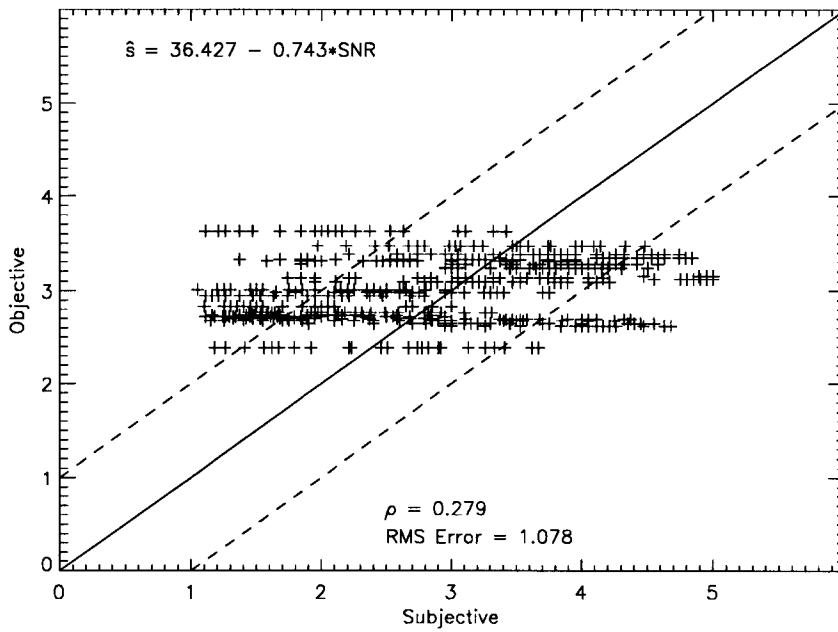


Figure 2: SNR vs. subjective score.

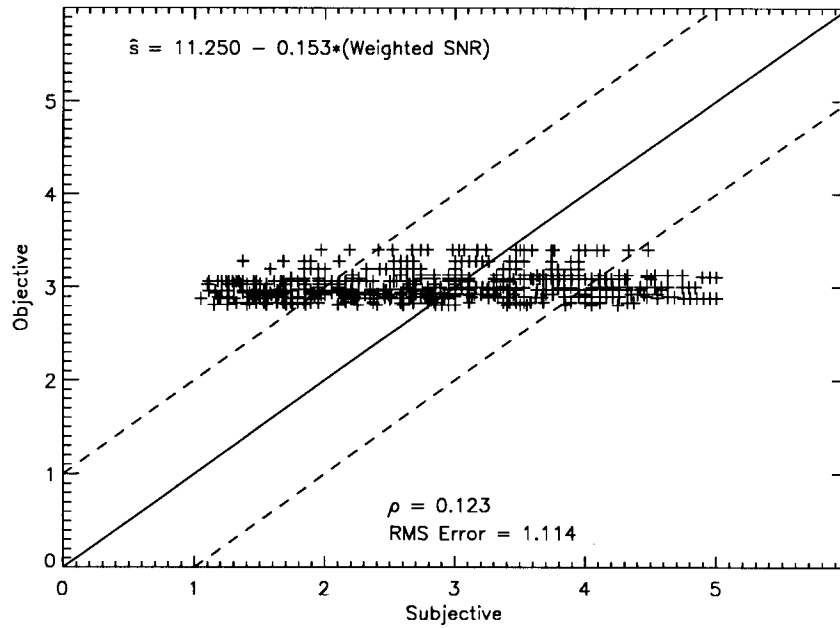


Figure 3: Weighted SNR vs. subjective score.

4. Summary

This contribution has presented correlation results for two well known and widely used analog objective measurements. The traditional bandwidth measurement was found to account for 38% of the variance in the subjective scores ($0.38 = 0.619^2$) while the SNR measurement was found to account for only 8% of this variance ($0.08 = 0.279^2$).