



LT-PAM: A Ranging Method Using Dual Frequency Optical Signals

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Abstract- This paper describes a new ranging technique using optical signals. The proposed technique is called LT-PAM (Long-Term Phase Accordance Method), and it has been extended from our own ranging technique called Phase Accordance Method (PAM). LT-PAM transmits multiple sync patterns composed of two sinusoidal waves with different frequencies. Unlike chirp modulation techniques, LT-PAM transmits the two waves simultaneously and thus enables the shortening of measurement time. We have conducted experiments using two types of light sources, collimated and diffused light. The experimental results indicated that the proposed method showed a moderate level of accuracy by adjusting the measurement time. For example, LT-PAM using a light emitting diode transmitting multiple sync patterns lasting 4 ms achieved 19.5 mm standard deviation in a measurement ranging 1500 mm. We also describe the theoretical analyses related to the proposed technique and discuss possible improvements by comparing theoretical and experimental results.

Index terms: Optical distance measurement, signal processing, Long-Term Phase Accordance Method (LT-PAM), time-of-flight (TOF)