

Distance measure by camera

Abstract

We present a new method for the measurement of the absolute distance of a remote target based on the laser diode self-mixing interferometer technique, which is assisted by an electronic feedback loop that is capable of improving the measurement accuracy. The feedback loop supplies a periodic change of the emitted wavelength that exactly corresponds to a single interferometric fringe. This allows the measurement of the target distance with higher accuracy, which, in principle, is limited only by the detection shot noise and not by the fringe quantization error that is typical for the conventional fringe-counting approaches. We developed a prototype that is capable of measuring the target distance with 0.3-mm accuracy in the 0.2- to 3-m range.

I. INTRODUCTION

LASER RANGING techniques are widely used to perform contactless measurement of the distance of a remote target for both industrial and scientific applications. These techniques are useful when contact with the target is not possible, the targets surrounded by a hostile environment, and/or no perturbation on the target is to be made. Commercially available instruments are based either on time of-flight methods (telemeters), which are best suited for long-range applications, or on triangulation techniques, which better apply to short-range measurements [1], [2]. Optical coherent techniques based on interferometric methods have also been proposed and demonstrated, and these are generally based on the so-called synthetic-wavelength approach that is achieved through modulation of the emission wavelength of a laser. The laser source with a continuously tunable emission wavelength is used to read out an interferometer

(typically in Michelson configuration), and the obtained interferometric signal carries information about the difference in length of the reference and the measuring arms of the interferometer. These methods can have a high accuracy, but at the expense of a complicated experimental setup, which often requires a double interferometer for calibration

Block Diagram :

