Traffic monitoring using radar

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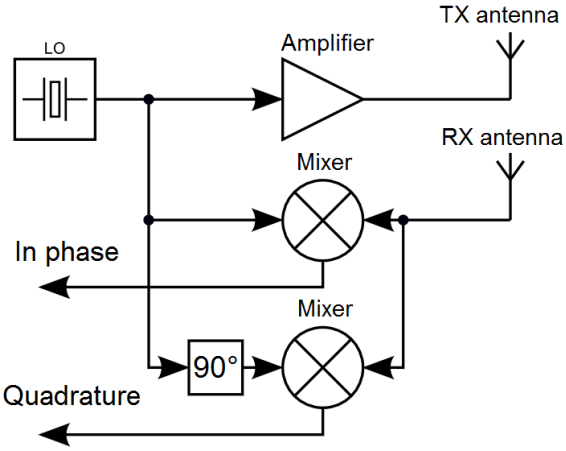

The receiver circuitry of the modern radar is inherited from the well-established radio technology which has been used for decades to transmit sound and data.

With the current evolution of radar, possibilities to use the technology in new ways emerge. In this study, the technology has been evaluated as a method of measuring traffic. The implementation is described in detail, and the result is that traffic monitoring is a suited use case for radar, with some limitations.

Radar has been the subject of a recent major technology leap. Historically, radar has been exclusive for high-end applications, but recently the technology has been shrunk down into small, high frequency radar circuits suitable for mass production. The new circuits enable the use of radar in new areas. Modern cars for instance, often utilize the technology to measure the traffic situation around the car.

The traditional methods of monitoring traffic consists of hoses stretched across the road or coils buried in the tarmac. The hoses are vulnerable to disturbances, like snow plows, and the coils are expensive to deploy since the tarmac needs to be removed first.
By using a radar module placed at the side of the road, both of these limitations are addressed. If this new method was to be used, traffic could be monitored at more places, leading to improved utilization of roads.

The traditional radar measures the time between a pulse and the echo to calculate the distance to a target. Modern radar instead compares the phase and frequency of the sent signals and the echo that returns. By doing so, the electronics can be made simpler.

The radar signals can be coded in different ways, called modulations. Two modulation methods were evaluated in the study, Frequency Modulated Continuous Wave (FMCW) and Frequency Shift Keying (FSK). The FSK method was found to be more suitable in this particular situation because it uses the movement of the object in its view to measure the distance to it. If the object doesn't move, it doesn't get spotted by the FSK radar. This makes the moving vehicles stand out clearly from the stationary background.

All in all, the study shows promising potential for the future use of radar in traffic monitoring applications. With more developed algorithms and modulations the technology will provide many benefits to the measurement of traffic.