

WHAT DO WE RESEARCH? LiDAR SYSTEMS

SYSTEMS BASED ON TIME-OF-FLIGHT

It consists of sending an optical pulse to a target and subsequently detecting the backscattered pulse. The distance is determined from the delay time.

Based on Doppler effect:
The optical signal sent is backscattered by the aerosols that move at the speed of the wind, thus modifying its frequency. The beat of the two signals is analyzed in frequency giving information about the direction and speed of the wind.

SYSTEMS FOR WIND SPEED MEASUREMENT

Fuente: AIST

GAS SPECTROSCOPY: DIFFERENTIAL ABSORPTION LiDAR

To measure the concentration of a gas, two signals are sent at close wavelengths, one inside and one outside the gas absorption line. From the difference in intensity of the two received signals, the gas concentration is determined.

APPLICATIONS

<p>FARMING</p> <p>Source: UDL</p>	<p>METEOROLOGY</p> <p>Source: NOAA</p>	<p>FACIAL RECOGNITION</p> <p>Source: Apple</p>	<p>AEROSPACE</p> <p>Source: NASA</p>	<p>AUTOMOTIVE</p> <p>Source: Google</p>
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RESEARCH LINES

<p>RM-CW LiDAR</p> <p>In Random-Modulation Continuous-Wave (RM-CW) systems, a pseudo-random sequence of bits is sent, and the cross-correlation of the emitted signal with the received signal is calculated, from which the distance is determined.</p>	<p>RM-CW DIFFERENTIAL ABSORPTION LiDAR</p> <p>Lasers at different wavelengths modulated with a pseudo-random sequence temporarily delayed between them are used. From the difference in intensity of their correlation, the gas concentration and the distance to the target are determined.</p>	<p>DUAL FREQUENCY COMB SPECTROSCOPY</p> <p>Two optical frequency combs with slightly different repetition frequencies are used and made to interact with the gas. Its subsequent interference in a photodetector maps the absorption that has taken place at optical frequencies to radio frequencies.</p>
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<p>RM-CW LiDAR developed at UPM</p>	<p>retardo = distancia Tiempo de correlación</p>	<p>Source: UPM, FP7 BRITESPACE</p>	<p>Transmitancia atmosférica absorción debida a otros gases Línea de absorción del gas λ_{off} λ_{on} Longitud de onda</p>	<p>Transmission profile Optical frequency RF frequency f_r $f_r + \Delta f_r$</p>	<p>Transmission (l.u.) Residuals Frequency (GHz) $t_{int} = 500$ ms Experimental Fitted</p>
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