LIGHT DETECTION AND RANGING (LIDAR)

Where did lidar come from, and where's it heading?

It may surprise you to learn that when laser first shot to prominence in the 1960s there was no real use for it. Of course, nowadays, lasers have a place in almost every single piece of technology around – but back then they were more a product of a time of curiosity and imagination than usefulness and application. In fact, scientists from back then would probably be amazed if they saw how we use their invention today.

This is particularly interesting, because although the uses and applications of lasers have developed considerably, the physics have remained almost unchanged since the days of Albert Einstein. And that's because it's impossible to change the rules of physics – although it's great fun to try!

One of the first steps towards laser's myriad applications was its use in the Lunar Laser Ranging experiment, where lasers were employed to measure the distance to the moon. Although scientists and physicists had been able to measure great distances previously using radar, laser made for far greater precision, because it has a much shorter wavelength. This makes it possible to confine a beam to the minimal convergence as defined by physics. To give you an idea of just how much more accurate laser is than radar, consider that if you were to use a radar to measure the same distance, the length of the wavelength means it would be as likely for you to hit the Atlas Mountains than the landing stop of the Apollo 11.

With the success of this experiment, people realised that light was more than something that flashes through the air; it could be a detector too. If it could tell us things about the moon's surface without having to actually travel there, what else could it do?

For a start, it could play a role in measuring the atmosphere. This is primarily where laser was focused during the 1970s, when entities like weather services used laser systems that would be considered enormous by today's standards to gauge features such as clouds and particles. Laser rangefinders also came to be used in surveying work, and for scanning.

These uses point to the versatility of the lidar concept – lidars can have single points, scanned beams and

LightWare Lidar

In mid-2020 LightWare Lidar launched the world's smallest and lightest microlidar, the SF000, which weighs just 8.8 g and is about the size of a Lego piece. It can deliver more than 380 readings per second, allowing for precise measurements of speed and distance.

even collect point clouds, measuring distances without compromising resolution or accuracy. And once people realised that there is literally no limit on the technology's range, they also realised its tremendous scope. Today, lidars are incorporated in everything from the Internet of Things to autonomous cars, to measuring a drone's height above the ground... and the uses keep growing.

As we move to make lidar smaller, more affordable and more readily available, we're set to see the next step in this amazing technology's evolution, an evolution that will be led by one question: what problem would you like to solve next?

This article was originally published as a blog post by Philip Constantine, Executive Vice-President of LightWare Lidar, based in Gauteng. It is a summary of his online discussion with Chief Engineer James Portman, forming the first episode of 'Light Conversations', available on YouTube and the LightWare Lidar blog: https://lightwarelidar.com/blogs/news.

Both the videos and the blog summaries are excellent resources for those wanting a better understanding of lasers and lidar.

Ep01 The evolution of lidar
Ep02 "What, exactly, is a laser?"
Ep03 Power play: choosing the right laser for the job
Ep04 Lasers and rainbows
Ep05 The science of lidar and light amplification
Ep06 Electron and photon conversion