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### Trending in the News: Lia's Top 4 Article Picks

**Pushing the Laser Limit**

Australian quantum researchers have shown it's possible to vastly improve the coherence of lasers, overcoming a bound that has been accepted as a fundamental limit for 60 years.  

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**Fraunhofer Researchers Use Quantum Photonics for Tap-Proof Communications**

Researchers at Fraunhofer IZM are developing a universal platform that enables solutions for tap-proof quantum communication and high-precision quantum sensors to be miniaturized, quickly and built to customer specifications.  

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**Laser-Based Hacking from Afar Goes Beyond Amazon Alexa**

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**Multipass Spectroscopy Method Enables Disease-Detecting Breath Test**

An optical sensing method developed by a research team at the University of Warsaw relies on highly sensitive spectroscopic measurements to detect the presence or absence of formaldehyde in a person's breath.  

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Automated toolpaths with integrated process parameters for optimal laser cladding technology

Authors:
Igor Ortiz, M. Angeles Montealegre, Piera Álvarez

Laser cladding is a new complex manufacturing process, due to many variables that are involved. For coating or hardening complex 3D geometries, a customized CAM-system is needed for calculating the laser process toolpaths necessary for filling the complete treated area.

Talens System has developed a new CAM-Software AZALA, that has been designed for automating the toolpaths and process parameters researched and validated in our laboratory machine tool. AZALA software automates the process workflow and creates a friendly user interface, for generating automated laser process toolpaths that the process know-how is integrated in them for a complete workflow automation.

Furthermore, with AZALA software, the user is able to work in both environments: laser cladding and hardening processes.

Additive manufacturing started in the eighties as a new technology for surface coating and repair added value parts. This technology includes three main processes: coatings, part repair, and build near net shape 3D geometries. Laser cladding is a coating technology that can include into the additive manufacturing process. In this process, a metallic powder or wire is melted on metallic substrate using high power laser as a heating source. The result is a metallurgical bonding between both.

Laser cladding is a new complex manufacturing process due to many variables that are involved. These variables include laser process power, process speed, powder feeding rate, gas flow, laser on and off connections etc. In addition, variables intrinsic to the geometry of the laser clad such as the width or height of the laser track and the dilution with the substrate or the overlapped between contiguous tracks must be taken into account. During the coating process, unless a special nozzle is available, it is required to keep the laser head with the nozzle perpendicular to the part of the surface in order to maintain the cone of the powder flow stable during the process. The programming complexity rises, controlling the robot axes with the correct nozzle head orientation. The nozzle head is assembled in the robot arm and must maintain a normal orientation with the surface. This orientation is supplied with a coordinate and vector position that is attached on each point.

Due to different industry sectors like turbine blades, mold and dye, oil and gas, energy, automotive, and aerospace, etc. there are different types of parts and geometries that can be susceptible for repair by laser cladding. For coating complex 3D geometries, a customized LMD-CAM system is needed for calculating the laser cladding toolpaths necessary for coating.

There are barriers with software that arise in complex programming tasks and in many manual interactions due to modifications from machining processes to laser cladding processes. There could be incomplete and fragmented software due to the toolpaths algorithms that are prepared for machining processes; one could need to request expert knowledge due to new process variables; or there could be lack of standards for process integration with the software environment.

Talens System has developed a new CAM-Software- AZALA, able to overcome these barriers and calculate these complex tool paths. Based on “in deeply” experimental research that has been integrated with mathematical algorithms for achieving automated toolpaths with validated laser process parameters inside.

This software has been designed for automating the toolpaths and process parameters and has been researched and validated in our laboratory machine tool. Process know-how and variables have been programmed in customized CAM environment for laser cladding processes like coating, repair, and building geometry from 3D CAD data. With this software, the operator is able to create automated slices and configure a toolpath including the process parameters inside on each slice.

1. CAD model with coating areas selected
2. Load master CAD Model in the software
3. Create zero workplane
4. Extract reference edges for the toolpaths
5. Selected boundary areas for LMD process
6. Execute creation of constant tool paths
7. Create NC code for machine tool (CNC) or robot
8. Send the NC program to machine tool (CNC) or robot

Figure 1: Software Work Flow
The software development started with process variables like overlap between contiguous laser tracks, layer height, laser power, process speed, powder feeder activation, and laser on and off connections. With the description of these variables a mathematical approach of a coating toolpath was developed. These toolpaths have been validated with equidistant distances between each track in the laser cladding process. The software is capable, in a simple way, to calculate the toolpaths for 2D and 3D CAD surfaces and geometries. Data points have been added to the laser cladding toolpath, these data points are linked to CAD geometries for optimizing the cladding process with the part geometry. On each toolpath the points have assigned the process variables for automating the laser cladding process and reduce manual intervention.

The software has been designed to solve the complex variables related to laser additive manufacturing and laser hardening processes. The workflow is divided in three main steps, the first step is when the user selects, by colour, the areas to be coated or hardened in any CAD system. After this selection the CAD model is loaded in the system. (Figure 1)

When the part model is in the software it must be configured for the laser coating/hardening process. The desired work plane is created for future post-processing the NC code for CNC or robot cells. The next step is to extract the geometry edges for creating the toolpaths with equidistant track toolpaths for a correct coating of the piece (Figure 2). After the edge extraction, the areas that were previously prepared by colour and need to be coated can be selected automatically. If necessary, the manual area selection is also configured.

When the user has both types of data designated, extracted edges and selected surfaces, the next step is to calculate the toolpaths. The process parameters are already preconfigured in the software, so there is no need of configuring again. After the toolpath's calculation, the user just has to export the toolpath to NC code format. Finally, the NC program can be loaded in machine tools or robot cells.

With this software, we are capable of using different types of toolpaths. For example, with the first type of toolpath, geometry edges can be extracted and equidistant toolpaths that are suitable for some cases can be created. The second type of toolpath creates an adaptive toolpath with the surface geometries. This toolpath is adaptable along the surface type changes.

The software has a user-friendly interface for managing the laser cladding toolpaths that can be calculated, with preconfigured buttons in the software. Both types of toolpaths have a mathematical algorithm for generating equidistant tracks for a suitable coating of the surface and to guarantee good adherence between the melted powders with the substrate. The laser on and off connections, process speed, and power variables are inside the toolpaths. On the other hand, the process variables are validated and configured inside the toolpath. With this capability the toolpaths are fully automatic, and a friendlier workflow is created to avoid human errors. With this option, the laser process is fully automatic so a process engineer or a senior operator can manage it.

As a conclusion:
• New AZALA software automates the process workflow and creates a friendly user interface, for generating automated laser process toolpaths, which integrates the process know-how for a complete workflow automation.
• The user is able to work more efficiently in both environments: laser cladding and hardening processes.

About Talens Systems, Inzu Group, www.talensys.com
Talens Systems is a technology based innovative enterprise committed to the development and commercialization of turnkey solutions for laser applications and presenting its disruptive technology in development for laser heat treatment, laser cladding and laser cutting processes.

About the Author
Igor Ortiz is a R&D project manager and researcher in Ikergune at Inzu Group. He has a Master of Science (MSc) in industrial engineering from Ecole d’ingénieurs du CESI. He has more than 10 years of experience in product development, FEA tools, and production plants, and has been involved in different projects in the automotive and aerospace industries. Currently, he leads automated software development tools for laser material process (additive manufacturing, hardening).
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Style: The tone should be editorial and informative; it should not sound like a sales pitch. It should be comprehensible by a broad audience of readers with low to expert experience with the topic, so it is important to include examples and simple explanations alongside any technical language.

Length: 600 - 1500 words

Text: Please use standard fonts such as Arial, Calibri, or Times New Roman. Fonts, font sizes, and line spacing will be reformatted by LIA for the final piece. Grammar and mechanics will be edited to the LIA style guide by LIA, but please be mindful of spelling and grammar as you are writing so that your message is clear.

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  - Images with captions placed in the body of the article
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BLS Introduces the Extension Year

After an individual has passed the certification examination, he/she will be required to maintain that certification through approved professional development activities over the 3-year certification period. As the industry changes and technology grows, so too must the knowledge of the CLSO and CMLSO. The BLS only recognizes BLS Certification Maintenance (CM) points and may award these points for eligible laser-related activities. This year, the Board of Laser Safety has introduced the option of the Extension Year. If you are a CLSO or CMLSO and you were unable to finish earning the 10 Certification Maintenance points that are required in the 3-year maintenance cycle, there is now a new option for you. The extension year option gives you an additional year after your December 31 deadline to earn those CM points that you were missing. There are, of course, some limitations to this.

First, an extension year must be applied for. The request and payment of the extension year fee must be submitted no later than December 31st of the original 3-year cycle, i.e., the original certification expiration date. The renewal fee must also be paid by that deadline.

If a CLSO or CMLSO chooses to use the extension year, they can only renew by Certification Maintenance points. They also cannot earn more points in the same categories if they have reached the maximum, just because it is a new year. Only new points in categories not fulfilled will be accepted.

Lastly, the extension year can only be requested once every other certification cycle and there is no “grace period” allotted to the fourth year, since the extension year serves as its own type of grace period. They also may not extend two cycles in a row. If the situation is not resolved by December 31st of the extension year, the CLSO/CMLSO will go to Inactive Status.

The Board of Laser Safety even gives you an example of what an extension year might look like: “Mr. Laser is a CLSO and his certification cycle ends December 31 of this year. He realizes he does not have the required 10 CM points and due to a number of factors cannot earn the points by the end of his cycle. He chooses to apply for an Extension Year and submits his application prior to December 31. Since he did not use an extension year during his previous cycle, he is eligible for one in his current cycle, so he is approved. When he receives notification from BLS that he is approved for an Extension Year, he may begin earning CM points to reach the 10 CM points required for renewal. Mr. Laser already earned the maximum number of points for his job (3 CM) and for attending conferences (4 CM), so he must earn 3 CM points in the remaining categories. He

write for BLS!
Looking for a way to earn BLS CM points for free? BLS has restarted its newsletter and is inviting CLSOs and CMLSOs to share laser safety knowledge with the laser community. Published article submissions are worth 0.5 BLS Certification Maintenance (CM) points in Category 3. For more information on guidelines and regulations, email us at bls@lasersafety.org. Check out one of our submissions on the next page!