Image © HaSt GmbH

Accelerated damage settlement with AI

Artificial Intelligence counts car dents after hailstorms

Extreme weather events such as intense hailstorms have increased significantly in recent years, resulting in mass damage. The AI-based hail scanner from HaSt GmbH supports the work of hail damage appraiser so that car owners can get their claims settled more quickly.

Equipped with powerful Single Board Computers from Kontron, the scanner relieves experts of the tedious task of counting dents and provides reliable and reproducible AI results within half a minute.

kontron
The Power of IoT

HaSt GmbH
Essen

Project:
Hail scanner

Kontron Platform:
3.5-SBC-TGL

www.hast-hagel.de

HaSt GmbH has three managing partners and eight other employees. The company also relies on external service providers, for example for the construction of the metal arch, and on Fraunhofer IAIS as a partner for the development of algorithms in the field of image processing and AI. At the beginning of 2025, 60 hail scanners are in use. Internationalization is an important issue for the Essen-based company. The scanner is now also sold in Switzerland, Austria, the Benelux countries, France and the USA. Other countries will follow.

After severe hailstorms back in 2016, it became clear that climate change poses serious challenges for the hail damage appraiser industry. The idea of a digital scanner solution was the brainchild of HaSt founders and managing directors Michael Lenhartz and Jens Orzol, who both run their own surveyor's offices. Using image recognition and AI, they wanted to relieve the experts of the time-consuming task of counting the dents caused by hail.

HaSt GmbH was founded to clearly separate scanner development from the hail damage appraiser offices. A research project was started with the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS. At the time, Artificial Intelligence was about to become much more widely used in practice, following a series of breakthroughs in speech and image processing, as well as in computing power.

Kontron Single Board Computer

- Kontron Single Board Computer are developed for harsh environments and offer increased long-term availability of up to 10 years. Some variants are designed for continuous operation (24/7) under extreme operating conditions and high system loads.
  The integrated TPM 2.0 security chip ensures improved hardware security.
- The Single Board Computer 3.5" SBC-TGL is based on the processors of the 11th generation Intel® Core™ U series and Celeron® 6000 series and is additionally equipped with an Intel® Next-Generation Iris® Xe Graphics unit. The graphics card enables major improvements in processor, graphics and AI performance. It is therefore ideal for use in AI, deep learning and similar applications that require high speeds and processor performance.

Advances in AI innovation leveraged

However, given the state of AI technology at the time, the project was still challenging. In 2020, industrial engineer Tino Blankenheim joined the management team to coordinate the further development and re-evaluation of the research results. In the meantime, a lot had happened in AI innovation, and the product was soon available as a prototype. With Schaden-Schnellhilfe (SSH), Germany's largest umbrella organisation of independent motor vehicle experts, a very large network was available to test and establish the hail scanner in a pilot project - by experts for experts.

The association's biggest customer is the insurance industry, which commissions its 80 partner offices at over 200 locations throughout Germany to assess accident damage. The newly opened doors made it possible to validate the scan quality and output even better. The prototype has been continuously developed and optimized for practical use. "The aim is to reduce the workload during the inspection so that the experts can concentrate on their core business: To fully assess the damage and advise their customers on what to do next," says Tino Blankenheim.

Speed boost with Kontron computers

"We have now equipped the product, which has been on the market since 2021, with new computer technology that gives us completely different possibilities and speed," explains the HaSt managing director. In the first version of the product, the evaluation time after passing through the scanner sheet took about five minutes. To prevent the scanner from becoming a bottleneck in the digital process, the experts looked for more powerful computer technology. "The aim of the change was to reduce the old evaluation time from five minutes to less than one minute. By switching to Kontron technology, we were able to reduce this time to under 30 seconds with the

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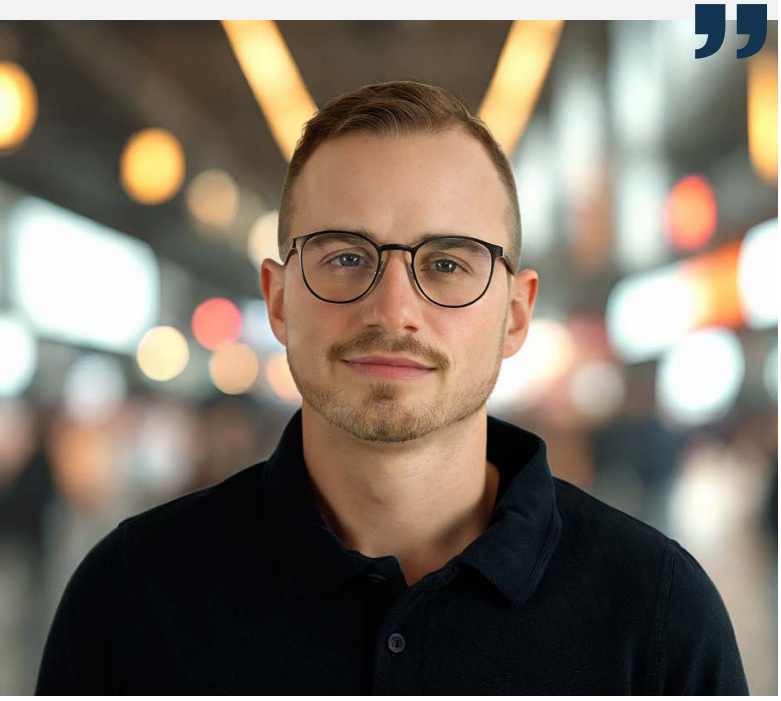
>
> Tino Blankenheim, Managing Director HaSt GmbH



new express scanner," says Blankenheim. This also sets the company apart from its competitors. In order to select suitable computers for the scanner, market research was carried out in consultation with the research partner. The hail specialists came across the Kontron 3.5" SBC-TGL Single Board Computer, which is already equipped with cooling elements and meets all the requirements.

In addition to performance, the basic specifications also included the smallest possible form factor so that the computers would fit into the slim line LED scanner arch - not a trivial requirement. Ruggedness and shock resistance were also required for the not always gentle transport of the scanners. A wide range of temperatures had to be covered, as the product can also be used in unheated and non-air-conditioned environments. The Essen-based company first ordered a computer to test all scenarios. Once the Single Board Computer had proven itself in terms of performance and robustness in accordance with the specifications, Kontron was selected as the hardware partner. "In addition to the significantly higher speed, additional functions are now possible because we are no longer limited in terms of computing power," reports Tino Blankenheim.

Better performance for product optimization

"It was also important for us that our hardware supplier is based in Germany and can deliver quickly, in sufficient quantities and at a price that is economical for us," says Blankenheim. Thanks to the Kontron Group's organization, there is great confidence in their ability to deliver. Barring any technological leaps or additional functionalities, the company intends to continue using this type of computer in the future. In addition to the flexibility for large and small quantities of computers, long-term availability was a decisive factor. "Communication has always been very good and smooth. We were able to plan well and reliably, even for large quantities, even though it is a niche product," says the managing director.

In terms of chip architecture and communication, an Intel chip with an 11th generation Intel® Core™ i5 processor was chosen. "We chose this generation because it generally offers good performance and more than meets our requirements," recalls Blankenheim. HaSt uses the higher performance primarily for functions that improve the process and result quality of the analysis in the background. This includes, for example, optimizations in terms of scan consistency and increased resilience to fluctuating external factors such as light, driving speed, vehicle shapes, vehicle colors, surface textures and materials.

Inspection situation in the scanner LED sheet © HaSt GmbH

Measuring process in the scanner sheet © HaSt GmbH

Numerous benefits for experts and policyholders

On site, the vehicle is driven through the LED sheet system under controlled lighting conditions, with camera technology capturing all surfaces for AI analysis. By speeding up the inspection and assessment process, policyholders benefit from faster claims settlements in the event of mass claims. Previously, the manual process involved experts inspecting the entire vehicle, including damage to attachments. The damage was then calculated. “Counting dents manually was time-consuming and eye strain-inducing. After a while, it becomes difficult to see the damage in bright light - especially when this task takes several weeks in the case of mass damage,” explains Blankenheim. This also gives the experts more time for consultation.

“Hail is very regional: The scanners therefore do not have a fixed location, but are driven to the expert offices where they are most needed in the event of damage - in Kassel and Augsburg in 2023, for example,” explains Blankenheim. Hail damage service providers also use HaSt technology for repairs and smart repairs. They specialize in pressing out dents in the surface of the vehicle. Thousands of people affected by a weather event often turn to the same companies. Here, too, the Hail Scanner takes a lot of the work out of the process.

Particularly important: “The digital approach not only makes the process of counting dents faster, it also makes it more traceable. The result is always the same, which also provides permanent proof,” says the hail expert. This significantly reduces the scope for ‘black sheep’, where the number of repaired dents exceeds the number of dents determined by the expert. Repairers, experts, insurers and policyholders are all on the same page, which saves a lot of discussion.

How SBC and AI work together in the overall system

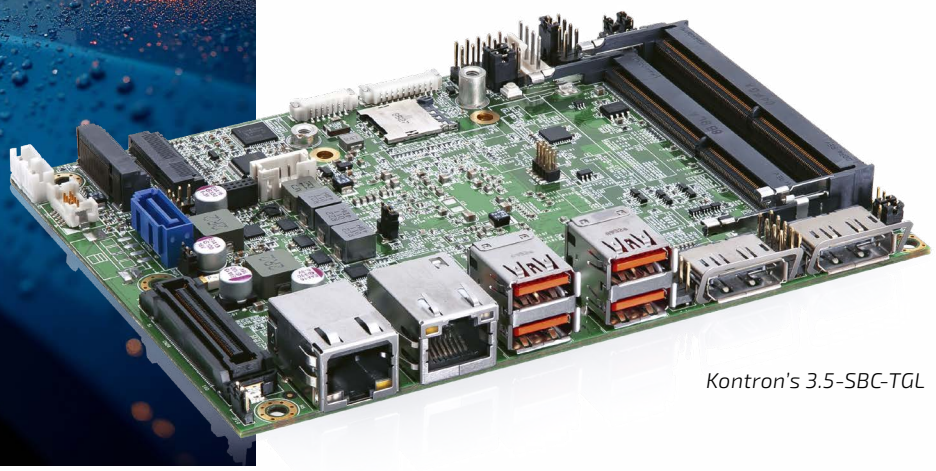
The scanner contains an optical camera-based system that detects surface irregularities based on the refraction of light. Intelligent algorithms process the camera images from three-dimensional space into usable two-dimensional images. A number of measurements are taken, such as speed, lateral distances, height and the shape of the vehicle, to create a blueprint of the vehicle with its shape and irregularities. The AI was previously trained to recognise the hail-specific dents and distinguish them from other similar-looking dents - such as those caused by water droplets. The experts classified a large number of images so that the AI could learn to distinguish between the dents. Today, it can detect almost all types of damage.

Five SBCs are installed in each scanner sheet, one for each of the five cameras connected to the camera system. They perform each calculation independently. "This is of course a great advantage, because we can run everything in parallel, which saves a huge amount of time," says the managing director. A further, sixth computer acts as an interface computer, coordinating communication within the system to control the individual SBCs and issue instructions. It ensures that everything is started, stopped, recorded, analyzed and evaluated at the right time. It also bundles the information and handles communication with the operating laptop or other connected computers to forward the scanner output.

The benefits of a local solution

"The AI is of course constantly being trained and improved, also based on different conditions. Hail always varies from region to region. This results in different dent shapes and intensities," says the hail expert. Dents also look different on plastic parts. This ability to detect dents also means that fraud can be prevented: Blankenheim knows that hail events are often the subject of insurance fraud. But the scanner also detects dents made by car owners themselves. "So if there are hundreds of dents on the roof and the scanner only detects twenty, then it gets exciting," says Tino Blankenheim with a smile.

The company deliberately opted for the SBCs rather than a cloud solution because the scanner should be able to work offline in places with poor Wi-Fi, such as an underground car park, and calculate the result locally. Appropriate interfaces are used to import and export data. "This is an advantage for us in terms of data protection, as each customer keeps their data exclusively for themselves. It has also made it much easier for us to further develop the system from an IT security point of view," concludes Tino Blankenheim. In addition, the approximately 40 Gigabyte of data processed per vehicle do not have to be transmitted. The compression required for this would lead to a loss of quality, which the hail specialists are not prepared to accept. The company will continue to focus on optimization in the future. They are currently working on a scanner for caravans - and, of course, on further internationalization, as the hail problem is becoming increasingly important worldwide.



Kontron's 3.5-SBC-TGL

About Kontron

Kontron AG (**www.kontron.com**, ISIN AT0000A0E9W5, WKN A0X9EJ, KTN) is a leading IoT technology company. For more than 20 years, Kontron has been helping companies from a wide range of industries achieve their business goals with intelligent solutions. From automated industrial processes, smarter and safer transport to advanced communication, connectivity, medical and energy solutions, the company provides its customers with value-adding technologies. With the acquisition of Katek SE at the beginning of 2024, Kontron significantly strengthens its portfolio with the new GreenTec division in the areas of solar energy and eMobility and employs around 7,000 people in more than 20 countries worldwide. Kontron is listed on the SDAX® and TecDAX® of Deutsche Börse.

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