Machine Vision: A Rockstar on the Factory Floor and Now the Baseball Field
6 Uses for Machine Vision in Manufacturing

Baseball is a sport wrapped in tradition, one of which is an umpire making the calls that weigh heavily on the outcome of the game. Now, that decades old tradition is being rocketed into the future with machine vision.

Recently, the independent Atlantic League made history by becoming the first American professional baseball league to use machine vision to call balls and strikes at its All-Star Game.

“What we know is technology can help umpires be more accurate and we’re committed to that. We think the Atlantic League is being a pioneer for all of the sport.” ~ Atlantic League President Rick White
(Associated Press article: ‘Robot Umpires’ debut in independent Atlantic League)

What is machine vision? Machine vision is the use of a camera or multiple cameras to inspect and analyze objects automatically, usually in an industrial or production environment, now becoming more and more common in sports. The data acquired is used in manufacturing to control a process, in baseball it’s used to make the calls of a home plate umpire. Both very different, but with a similar goal – delivering the best and most accurate outcome possible.

Last year, Boston University Master Lecturer Mark T. Williams and a team of graduate students at the Questrom School of Business experienced in data mining, analytics, and statistics determined that over 34,000 bad calls were made by umpires during the 2018 Major League Baseball season. Not due to lack of experience or judgement, but simply the fact that human brains aren’t wired to catch every micro-second of action. Umpires, like all humans, are
highly complicated beings—they get tired, distracted, sneeze, blink. Machine vision ‘umpiring’ does one job with hyper focused accuracy and rocket fast speed.

Almost all professional sports leagues use technology in some capacity to help referee and manage the games, including instant replay. Like employees in the manufacturing industry, umpires are now incorporating technology skills into their job duties.

In a recent Associated Press article Morgan Sword, Senior Vice President of MLB’s Economics and Operations said, "One of our focuses is not to replace the umpire. In fact, we’re trying to empower the umpire with technology. The home plate umpire has a lot more to do than call balls and strikes and he’s going to be asked to do all of that.”

We all know humans will always be one of the most complicated “machines” out there – in fact, human vision is unmatched at qualitative interpretation of a complex, unstructured scene. Then there’s machine vision which is a rock star at quantitative measurement of a structured scene due to its speed, accuracy, and repeatability.

When it comes to a manufacturing production line, a machine vision system can inspect hundreds, or even thousands, of parts per minute. The camera may be programmed to check the position of something, its color, size or shape, or whether the object is there or not. A system built around the right camera resolution and optics can easily inspect object details too small for the human eye to decipher, or, talking baseball, too fast for the eye to see.

Keeping the baseball theme in play, say you’re a manufacturer of one of the favorite snacks sold at every MLB ballpark across the nation. Currently you have human inspectors watching thousands of bags move down a production line. The workers need to ensure every bag is sealed correctly, every label is on straight and contains the correct information, and every bag is filled to the appropriate level.

With machine vision, this entire process can be automated to be faster, more efficient, and more productive. After the product has been inspected, a signal is generated to determine the next step. The camera captures the digital image and analyzes it against a pre-defined set of criteria. If the criteria are met, the object can proceed. If not, the object will be re-routed off the production line for further inspection.

Six Uses for Machine Vision in Manufacturing:

1. Robot/Machine Guidance

   A vision guidance system ensures increased robotic accuracy. While vision doesn’t make robots self-aware, it gives them the ability to locate parts to be picked up, determine where to apply a weld, inspect assembled parts, and determine where to place a part.

2. Data Collection

   Process control vision systems capture and communicate measured values to various data logging systems, capture historical data from your process and use data trends for process monitoring and proactive maintenance.
3. Counting

Once a machine vision system can locate an object of interest, it can count the number of similar objects present in an image. It can also tell whether the object is not present in an image, so a presence/absence test also falls under the category of counting.

4. Measurement

Machine vision can calculate the distances between objects, a task known as gauging. It makes exceptionally precise measurements to verify that the distance between two components of a product meet expectations.

5. Location

Machine vision can be used to locate the position and orientation of a part and to verify proper assembly within specific tolerances. Location can identify a part for inspection with other machine vision tools, and it can also be trained to search for a unique pattern to identify a specific part.

6. Decoding

Machine vision is used to sort products on a production line by decoding the symbol on the product. It’s an essential function of the machine vision system that it can decode these symbols so the parts can be tracked throughout the production process, and documented as to which finished product they become part of.

About Delta Technology:

Delta Technology has been the integrator and the manufacturers’ strategic partner of choice for robotics, automation, and custom manufacturing solutions since 1997. We are proud to employ Industry 4.0 methodologies to creatively and expertly design, engineer, and build custom industrial automation solutions to solve the most complex manufacturing challenges.

We partner with our customers to clearly identify their challenges and understand their goals. Based on our findings and our extensive experience in manufacturing, we design and engineer the best custom solutions for them.

We specialize in:

- Design, engineering, fabrication, and assembly of custom industrial automation and robotics solutions
- Cutting-edge and modern lean automation and lean robotics
- Machine-control software development
- Integration of automation equipment
- Vision-guided robotics, inspection systems, and adaptive controls