wipro.com

Future of smart manufacturing

Machine learning software with intelligent video analytics to automate industrial processes

Open Source

Imagine a world where you have machines do your bidding. Not just in an algorithmic and repetitive manner, but taking into account various situations and conditions that influence the product. Imagine manufacturing where the intelligence resides within the production setup and does not need interventions. Such a world is the promise of smart manufacturing.

Today, the manufacturing industry is looking at optimizing product development, production and post-production transactions to address a dynamic and global market. To achieve this, all facets of the manufacturing industry should look at harnessing the power of big data and analytics.

Smart manufacturing is a concept used for automation of industrial processes. It involves reducing inefficiencies in the entire pipeline of manufacturing: from idea generation to raw material sourcing to product sales. The use of intelligent software and big data to identify and resolve the sources of inefficiencies is one of the identifiers of smart manufacturing. It also recommends the use of flexible processes to address dynamic market requirements. This involves the use of predictive and preventive methods, rather than reactive approaches.

Large amount of data from various sensors is captured from manufacturing processes. Intelligence from such data can be derived through standard analysis methods to obtain automated actionable insights. Even then, there are a few areas such as quality control where human or human-like discretion and intelligence are required.

To overcome this hurdle in the journey of industrial automation, machine learning through neural networks is the way forward. Neural networks are software components modeled on the neurons in the human brain. Implementing such a network of artificial neurons connected to each other (i.e., a Neural Network) in software requires enormous computing resources. With the emergence of low-cost super power computing in the last decade and specifically general purpose graphical processing units (GPU), with hundreds of cores in a single chip, neural network processing has become possible in a reasonable amount of time. Large streams of data is analyzed in near real-time to gain actionable insights.

This is particularly useful in analyzing video, where large amounts of data is captured in a relatively smaller time. This also adds visuals as a parameter that can be leveraged for smart manufacturing along with other sensors such as speed, temperature and pressure. However, analyzing this requires machine learning techniques that are adaptive to a range of parameters.

A video analytics solution based on Deep Learning techniques built using open source products like Apache Spark and OpenCV, provides this in the form of low cost and high flexibility. The same machine learning program can be trained for various business scenarios.

A software application that combines the technology features mentioned earlier into a solution will help automate quality control processes to acceptable reliability. Let us look at two specific cases below.

Glass inspection

Inspection of finished glass products such as bottles or tumblers involve visual inspection by an assembly line worker for around 50 categories of defects in the finished product. Since this is a manual, slow and error-prone process, only a few items in a lot of finished products can be inspected. Even then, some defects can be missed and a defective product can reach the customer. There are high-end laser and mirror based appliances available in the market now that can automate these inspections. However, they are not popular due to high cost and lack of support for product variations.

The same machine learning program can be trained to recognize all kinds of defects within milliseconds and so it can inspect all finished products. This results in a much better coverage of the products inspected, far surpassing the human capability for manual inspection.

Equipment monitoring

Another application is the monitoring of equipment used in the manufacturing process; like motors, conveyors, robotic arms, guided vehicles. Here we will discuss the usage of thermal (IR) videos due to their capability to predict and thus prevent equipment damage.

Thermal cameras capture video in the infrared range of the electromagnetic spectrum. The human eye cannot detect infrared waves. Infrared (IR) waves are a measure of the amount of heat generated by the source equipment. Products created by assembly lines where there is equipment damage can also have higher percentage of defects. Machine learning models can be trained to detect overheating of different degrees in different hardware and generate alerts for preventive maintenance. This has high impact on capital asset protection and preventing production downtime.

Future of smart manufacturing

With more of the world moving towards better and cost efficient quality control, industrial process automation will grow by leaps and bounds. And machine learning will play a major role in automating complex tasks. Enterprises that embrace these newer technologies will set the standards for others to follow. In markets where **"innovate or perish"** is the slogan, Smart Manufacturing systems implemented with Machine Learning software combined with intelligent Video Analytics, will be the torch bearers.

About the author

Prajod S Vettiyattil
Enterprise Architect,
Open Source CoE, Service Transformation

Prajod S Vettiyattil is an Enterprise Architect in the Open Source Solutions team of Wipro. He is responsible for research and solution development in the area of Big Data and Analytics. Prajod has architected transformational and greenfield projects for large enterprises. His current work involves analyzing image and video content using deep learning, to solve hard problems.

Wipro Limited
Doddakannelli, Sarjapur Road,
Bangalore-560 035,
India

Tel: +91 (80) 2844 0011
Fax: +91 (80) 2844 0256
wipro.com

Wipro is a leading information technology, consulting business process services company that delivers solutions to enable its clients to do business better. Wipro delivers winning business outcomes through its deep industry experience and a 360 degree view of "Business through Technology".

By combining digital strategy, customer centric design, advanced analytics and product engineering approach, Wipro helps its clients create successful and adaptive business. A company recognized globally for its comprehensive portfolio of services, strong commitment to sustainablility and good corporate citizenship. Wipro has a dedicated workforce of over 170,000 serving clients across 6 continents. For more information, please write to us at **info@wipro.com**

IND/BRD/MAY 2017-APR 2018