40 IDEAS
HOW TO ENHANCE YOUR MACHINE VISION SYSTEM

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MACHINE VISION…

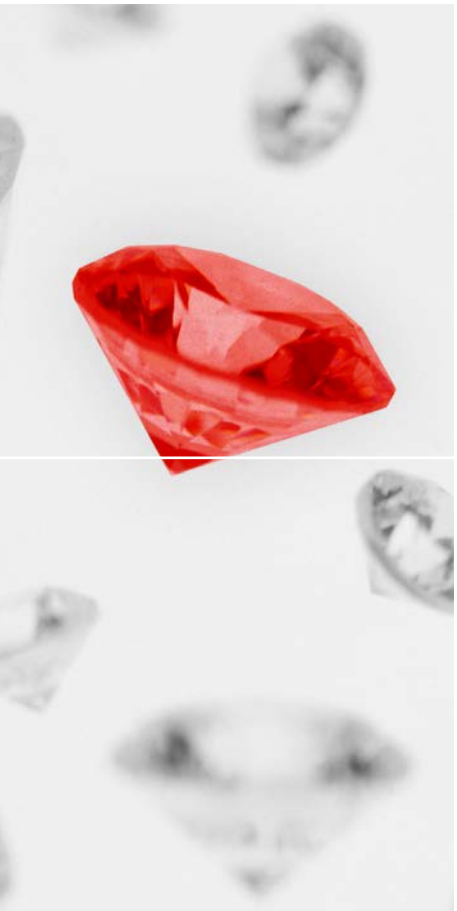
A generally accepted definition of machine vision is:

*"... the analysis of images to extract data for controlling a process or activity"**

The details in the image are what are important for machine vision applications. The higher quality of the starting image, the less software workarounds required, to allow you to focus on your core technology.

The question is then, are you getting the details you need from your image? Chances are an even better image would be beneficial.

We gathered some ideas (suggestions or considerations) to get you thinking about how to enhance your machine vision system to get a better image. These are some simple things you can do (some are even free) that might make dramatic improvements.



*source: Wikipedia

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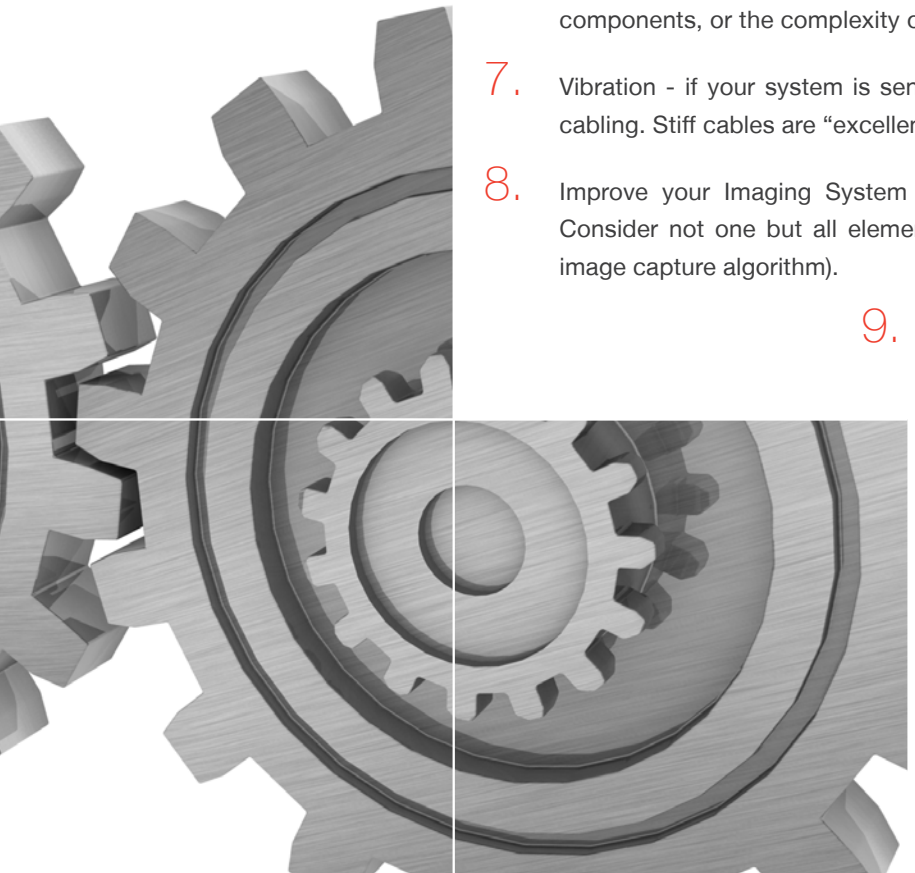
OVERALL SYSTEM

1. First determine the details (contrast, sharpness, etc.) in the image that are required and then back out the system requirements.
2. Give your system elements room to breath. Cooler cameras, frame grabbers, and PCs can run better and last longer.
3. Calibration – does each component of your system require calibration? Can you purchase a higher level sub-assembly from your supplier that is already calibrated when you receive it?
4. Is the system calibrated correctly and how do you test that the calibration was and is in conformance.
5. Are the parts or application tolerances too wide to repeatedly detect your part?
6. Throughput – what is the bottleneck in your system? Your ultimate throughput is only as good as the weakest link. Is your system limited by speed or distance of mechanical movement, the performance of the electro-optical components, or the complexity of your measurement method algorithm?
7. Vibration - if your system is sensitive to vibration, pay special attention to cabling. Stiff cables are “excellent” transmissions lines.
8. Improve your Imaging System decisions with a system level approach. Consider not one but all elements (optics, camera, interface, cables, and image capture algorithm).
9. Think of integral architectures to reduce costs while increasing performance, instead of only buying the lowest priced parts.
10. Determine the relevance of ‘the image’ for your success towards your customers and against your competition.



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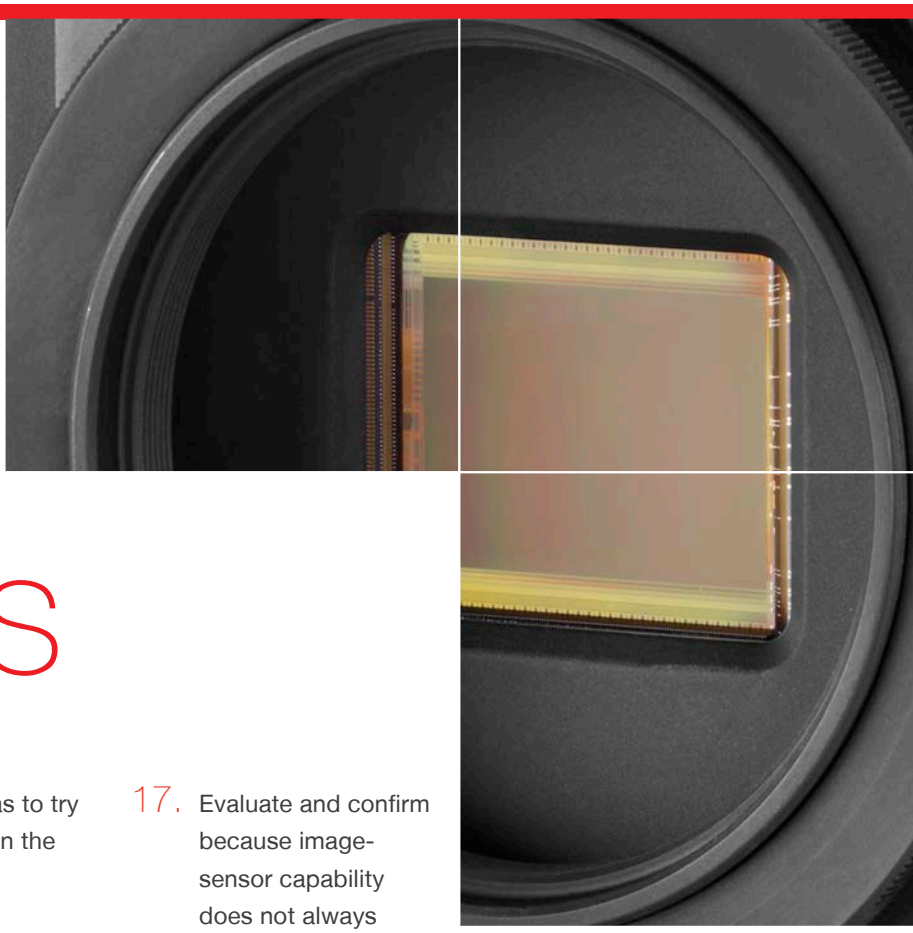

CAMERAS

11. You can increase the resolution of cameras to try to reduce the number of overall cameras in the system.

12. Replace line scan cameras with fewer latest high-speed CMOS area-scan cameras. You will be surprised what the latest CMOS technology can do compared to just a few years ago.

13. There are many reasons why it could be a better choice to add image-processing in the camera. For example, it could allow you to use a high image-acquisition speed and low vision interface speed. Common interfaces limit bit depths when it comes to speed.

14. Use multiple cameras to increase throughput, timing is key . . .

15. Use cameras for real-time processing to off load your PC and frame grabber requirements and simplify system design.

16. Use color to create contrast.

17. Evaluate and confirm because image-sensor capability does not always result in same camera capability. Not all sensor specifications are available in cameras and some cameras introduce more noise than they correct for.

18. Many camera manufacturers provide you the image-sensor performance. Some take image-sensor performance as a start and provide quality on top of that. What do you need?

19. Consult with an experienced camera manufacturer to develop a specialized camera for your system for competitive advantage. A custom camera does not have to be outrageously expensive; chance is that it already exists for 90% of your requirements and minor modifications could make a big difference.

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LENSES, FILTERS, AND LIGHTING

20. Do your optics have sufficient MTF to resolve the detail in the scene you are imaging? If you are not too familiar with MTF, study it and make sure you understand how it influences your imaging system.

21. Color imaging – is your application susceptible to chromatic aberration? Can you correct for the disturbance in software?

22. Do you have the correct Field of View (FOV) and Region of Interest (ROI) including the pixel accuracy needed?

23. Fighting reflections in your image? Slightly tilt the enclosure window, filter, or other optical elements placed in front of the camera.

24. Do you have a washed-out color image? Consider adding an IR cut filter.

25. Are you eliminating background or overhead lighting noise and other harsh environment disturbances with lens filters?

26. Use bright light to detect missing material.

CABLING AND INTERFACE

27. The most important advice is to use official standard interfaces. This will ensure that future changes do not require a complete redesign of the system.

28. Some Camera Link problems can be overcome by simple changes such as: Removing cable ties, leaving space between cables, reducing sharp cable bends, or reversing one Camera Link cable in a set to try to improve behaviour.

29. Reduce cable cost and count: Send power and triggering through the interface cable. Look into “3 tap CL”.

30. Timing – what is the desired sequence of events? Does your system require a deterministic interface?

31. When only considering the number of megapixels and frame-speed for throughput, the choices in interfaces becomes limited.

32. Talk to the experts to ensure that your system is not limited by the interface. You can use new performance interfaces like CoaXPress to keep bit depth even at high speeds for example.

33. There are many interface converter boxes on the market. These will give you more design freedom. For example: you can replace two Camera Link cables, which are limited in length, with a convertor and one longer Coax cable.

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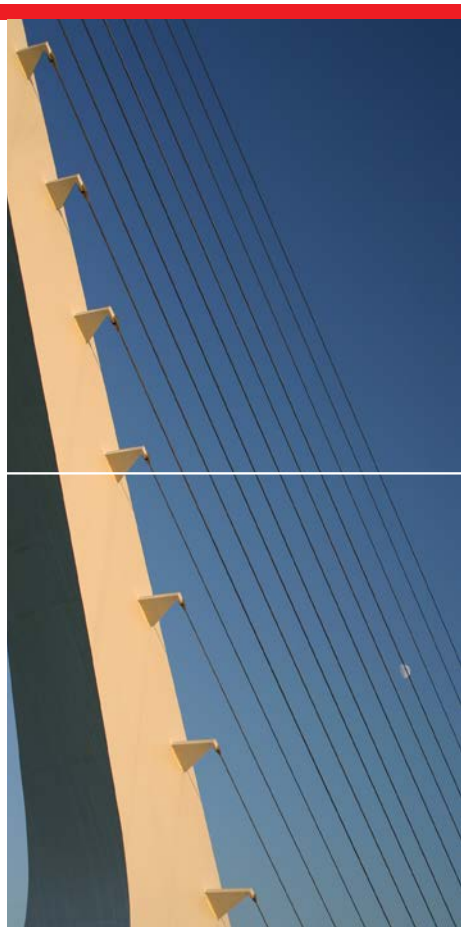


SUPPORT

34. Talk to companies that will think with you and not only sell you standard products.

35. Consider what the supplier can do for you and do not only focus on technology. Many long term relations are built on other important parameters such as strong support, supply chain management, response time, reliability of products, and reproducibility of products.

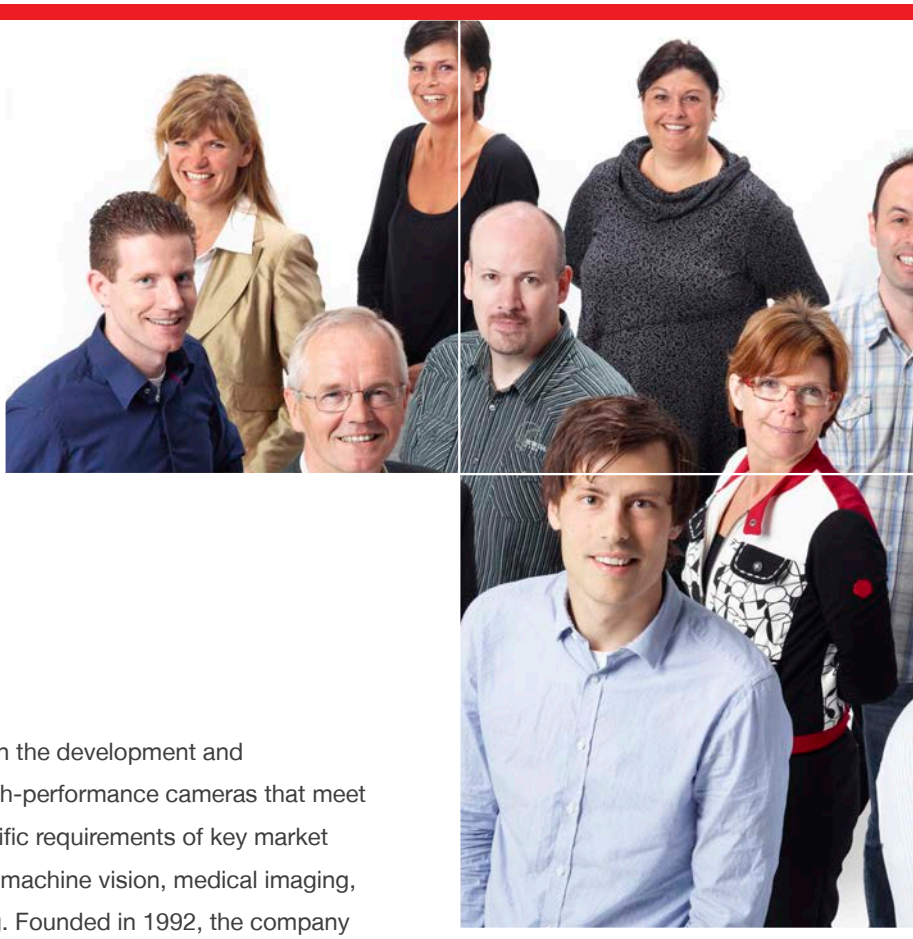
36. Determine what image related parameters are key for your application and compare solution options based on that list, rather than just comparing brochure parameters which every supplier will tend to optimize anyway.

37. Ask suppliers for advice, they often have experience from which you can benefit; they are the experts in their field.

38. Consider asking camera and frame grabber suppliers for their opinion. Some even have overviews for you. Also check out the information available by industry serving associations like EMVA, JIIA, AIA, or groups like a CoaXPress consortium.

39. There are blogs available on the internet that will help you to understand vision topics.

40. Do your partners share the responsibilities of your goals in the long run? Do you want to be a market leader or a low-end product seller?



ADIMEC

Adimec specializes in the development and manufacturing of high-performance cameras that meet the application-specific requirements of key market segments, including machine vision, medical imaging, and outdoor imaging. Founded in 1992, the company partners with major OEMs around the world to facilitate the creation of industry-leading cameras.

The unique Adimec True Accurate Imaging® technology provides new levels of precision and accuracy to vision systems. Its diverse line of camera products meet a wide range of performance, size, cost, interface and application requirements. Adimec has offices around the world focused on creating customer value and satisfaction through local, personalized support.

Need more inspiration? Contact us www.adimec.com

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