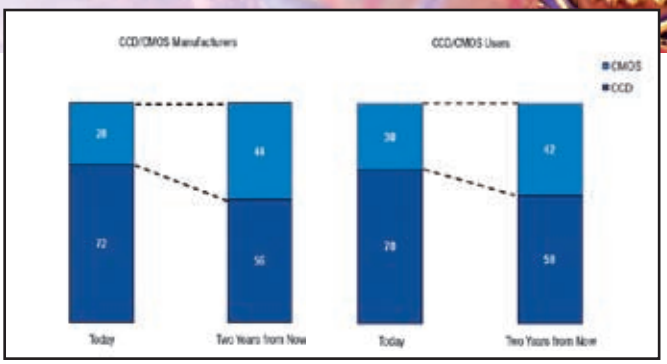
Secrets Unveiled

Technology Trend Survey for Industrial Vision Cameras

Machine Vision market surveys mostly address economic aspects and naturally try to cover all facets and technologies of the field. Single technical aspects can very rarely be looked deeper into for risk of otherwise blasting the survey out of proportion. However, for suppliers and users of vision components and products it is of equally high interest to learn which features are demanded today and which are the trends of the future. For the product class of cameras, which according to the annual EMVA study is at 30 % turnover share the biggest component sub-group for machine vision products, a survey was now conducted to cover these technical aspects. The survey was designed and executed by Framos Imaging Solution, Munich, in close cooperation with the INSPECT.

Two different questionnaires have been compiled for camera users and camera manufacturers respectively, each in German and English language. Due to the significant differences in impact on the vision market that the different participants brought to the table, the number of employed or produced cameras was taken as a weighting factor. The higher the number of cameras has been stated, the bigger the impact of the individual answer in light of the total result. In order to avoid statistical distortion of the study, the top 5 %, i.e. the biggest producers and users, were taken out of the evaluation. In addition, only questionnaires were accepted for the evaluation where the participant took at least five minutes time to completely answer all questions. Only then could the input be evaluated seriously.

In total 532 questionnaires have been completed and returned. However, for 266 of those the completion was done in less than five minutes so that in the end a total of 266 questionnaires were accepted for evaluation. From these 83 participants are producers and 183 participants are users of industrial camera technology. After deducting the top 5 % 75 producers and 170 users remained. That means that after taking care of all distorting factors there was still a good number of questionnaires to evaluate so that the study does have a reasonable good statistical relevance.



Distribution of CCD and CMOS cameras today and in two years time

The producers covered in the survey manufactured between one and 800,000 cameras in 2008. The users named numbers of cameras employed between one and 30,000 during the same period.

After deduction of the top 5 % numbers of up to100,000 produced and 2,000 employed cameras remained for 2008. On average the participating manufacturers produced 5,330 cameras mainly for the areas of security (45 %) and industry (32 %), whereas the participating users on average employed 97 cameras mainly for applications in industry (67 %) and security (13 %).

CCD or CMOS

Questioned about the percentage of CCD chips and CMOS chips, respectively, in the used or sold cameras today and in two years time, both producers and users expect a significant shift towards the CMOS technology. Currently 28 % of cameras sold, are CMOS cameras, 72 % are CCD-based cameras. In two years time the manufacturers expect an increase by 16 % to 44 % of CMOS cameras.

The users currently utilize 30 % CMOS cameras as opposed to 70 % CCD cameras. An increase by 12 % to a ratio of 42 % CMOS cameras is expected within the next two years. Consequently, the users expect that there will still be a share of 52 % of CCD cameras put into use in 2010.

Trend towards Color

The distribution between monochrome and color cameras has been at 38 % color cameras and 62 % monochrome cameras in 2007 on the manufacturer's side. For the users this was somewhat similar at 35 % for color cameras and 65 % for monochrome cameras. Supply and demand were very well in synch.

In 2008 the result is very similar for the camera users: 35% color cameras and 65% monochrome cameras. On the camera manufacturer side, however, a significant increase of 13% up to 51% of color cameras can be noticed and the matching decrease down to 49% of monochrome cameras.

It remains to be seen if this result shows an early anticipation of upcoming market demands or if the need for color information in machine vision might be overestimated by the suppliers.

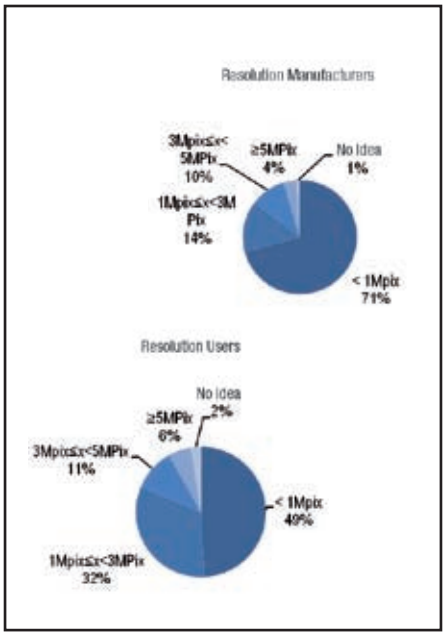
Mega-Mega-Pixel

The higher the camera resolution the higher the data density, the more accurate the data analysis, the "better" the result. High resolution has its price, though, in several aspects. Not only the camera price itself goes up, but also the requirements for the optical lens, for the computing power of the processor and the data transfer rate of the interfaces. So what will the future bring? More and more Mega pixels, as can be seen in the consumer markets?

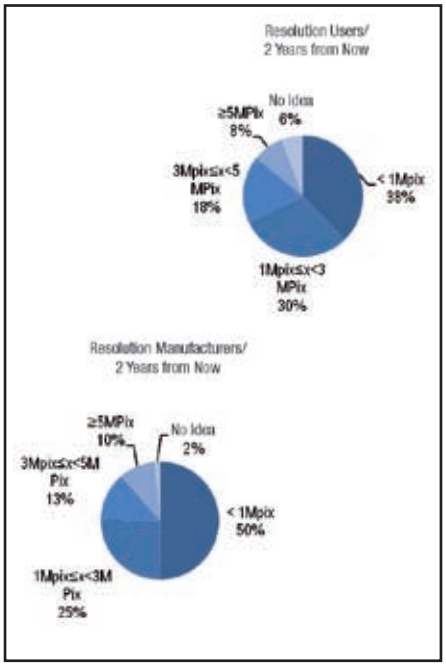
The camera manufacturers declared within the survey that 71% of their products today belong to the class below 1 Megapixel, 14% are between 1 and 3 Mpix, 10% in the 3–5 Mpix range and 4% are in the high resolution class of more than 5 Mpix.

For the users the distribution differs somewhat with 49% below 1 Megapixel, 32% between 1 and 3 Mpix, 11% in the 3–5 Mpix class and 6% above 5 Mpix. Despite the differences, supply and demand are still reasonably well aligned.

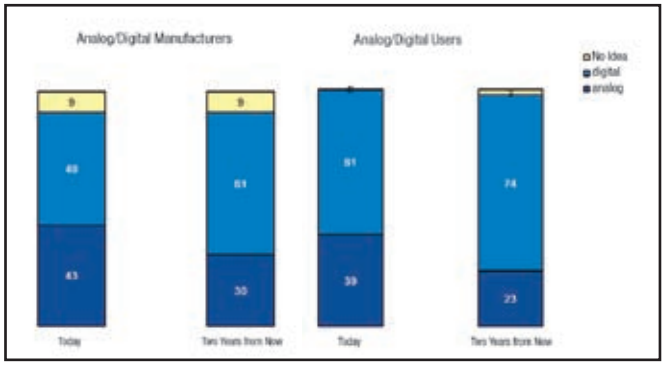
In two years time the camera manufacturers expect the current situation to change toward: <1 Megapixel at 50%, 1–3 Mpix at 25%, 3–5 Mpix at 13% and >5 Mpix at 10%. 2% of the producers did not answer this question.



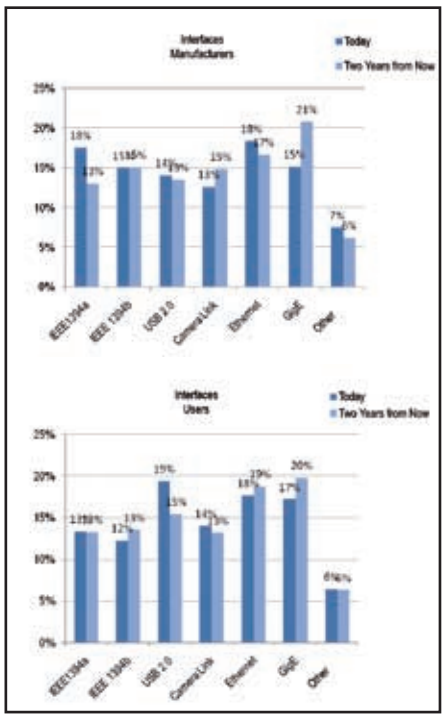
Manufactured/deployed camera distribution by resolution



Two-year projection for the distribution of camera resolution



Shares of analog and digital cameras at manufacturers/users



Priority distribution of current camera interfaces

The camera users indicated the following distribution of camera resolution for 2010: below 1 Mpix at 38 %, 1–3 Mpix at 30 %, 3–5 Mpix at 18 % and > 5 Mpix at 8 %. 2 % of the participants did not answer this question.

In summary the manufacturers expect a stronger trend towards resolution below 1 Mpix than is planned by the users from today's point of view. Part of the reason for this discrepancy is most likely the fact that the percentage of users from industry are significantly higher in this study than the percentage of users from the security area, which is not the case with the participating manufacturers.

The Eulogy for Analog?

Analog technology is dead, is only a relic from history; only legacy machines where modernization is not profitable enough feature analog cameras. This is one point of view.

(Almost) as often, one can hear the following: we are facing years and years with analog cameras still having a good percentage of the market. The price/performance ratio is unbeatable.

What now did the surveyed companies had to say to this question?

Today 43 % of produced cameras are analog cameras, 48 % are digital. 9 % of the manufacturers made no declaration. The producers expect a decrease of analog cameras by 13 % within the next two years. This leads to a forecast of a 61 % portion of digital cameras in 2010.

The surveyed users already employ at 61 % considerably more digital than analog cameras. They expect an increase by 13 % to 74 % in total for 2010.

… and the Interface

The topic most often and most heatedly discussed at trade shows and technical conferences is the camera interface. We asked producers and users of camera technology for their ranking among the current interfaces.

Looking at the answers, only the prognosis for the future provides a homogenous picture. The priorities for the current assessment by the manufacturers are as follows: Ethernet, Firewire a, GigE, Firewire b, USB2.0, CameraLink. The outlook for 2010 changes that ranking to: GigE, Ethernet, Firewire b, CameraLink, USB, Firewire a.

From the users point of view a different prioritization could be seen for today: USB 2.0, Ethernet, GigE, CameraLink, Firewire a, Firewire b. In two years time this picture changes, however, also to: GigE, Ethernet, USB 2.0, Firewire b, Firewire a und CameraLink.

Both groups see a clear trend towards the GigE camera interface.

Last but Not Least …

… there is always the question of how to choose from the abundant supply of different cameras. Which are the aspects the suppliers put special emphasis upon in order to convince with their product range and which criteria are relevant for the customer decision? And are both aspects in line?

In answer of the question „Please list your top five criteria in the camera selection" manufacturers and users named the following features:

Manufacturer	User
Framerate	Price
Resolution	Resolution
Signal-to-Noise Ratio	Framerate
Light Sensitivity	Interface
Size/Mounting Form	Size/Mounting Form

Within our short summary we could only cover a small portion of the market study results. The complete evaluation and thus also data regarding frame rates, read-out technologies, optical mounts and sensor formats, but also regarding the future development of smart cameras and the expected pricing for cameras, have been provided exclusively to the participants of this study as a thank you for the time they took and the valuable data they provided.

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