

# Q&A CMUcam

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## Q&A - CMUcam1 and CMUcam2

**Q:** How accurate are the CMUcam functional specifications ?

**A:** We believe them to be accurate however due to the nature of vision system technology like this, your results may vary. **It is important to note CMUcam technology is fundamentally experimental in nature and you should never use a CMUcam in a mission critical application that can effect anyone's safety or that could cause property damage. Do not use a CMUcam in any type of medical technology whatsoever.**

**Q:** Will you stop selling the original CMUcam (now called CMUcam1) ?

**A:** No, We have no plans at this time to eliminate CMUcam1. It is less expensive to produce and a good starting point for many.

**Q:** If I buy CMUcam1 now can I upgrade it to CMUcam2 in the future ?

**A:** Yes, you can save money and reuse your serial cable, AC adapter and digital camera module.

**Q:** How different is the new CMUcam2 to use compared to CMUcam1 ?

**A:** CMUcam2 is a direct upgrade of CMUcam1. The hardware interfaces are exactly the same, with the same power connector and serial cable. The CMUcam2 is, however, slightly physically larger. The CMUcam2 command set is very similar and adds more commands and functionality, but the core color tracking concept is the same.

**Q:** How does the analog video output work on both CMUcam's ?

**A:** It is important to note that the video out capability on all CMUcam's is limited and you need to understand exactly how and when it works if you plan to use it. All of them are only black and white (monochrome) even though the CMUcam's are color. When using the standard OV6620 digital camera module the output format is the European PAL standard not the USA NTSC format. The OV7620 module (optional on CMUcam2 only) produces the USA NTSC format, however when using CMUcam2 with the OV7620 digital camera module it will not run in high resolution mode and the lens has a narrower field of view. It is also important to note in order to output in either of the above video standards, the digital camera module must be set to its full operating speed of 50hz PAL and 60hz NTSC. CMUcam1 can do no on-board processing while the camera module is set to full speed. CMUcam2 cannot run in all operating modes when set to full camera module speed. This just a summary, for important details download the user manuals for both CMUcam's from our web site.

**Q:** How are pan and tilt servo's supported on the CMUcam's ?

**A:** CMUcam1 only supports one servo directly. That servo can be positioned manually by sending commands to CMUcam1 or you can enable automatic panning from right to left with the servo when CMUcam1 is tracking. CMUcam1's servo control is limited to only working while it is streaming tracking data at full speed. If you are using CMUcam1 in "poll" mode and or with a slow controller like a Basic Stamp 2 the servo output responds slowly and is not very useable. CMUcam2 has sophisticated control of up to five servos. Two servos can be enabled for automatic pan and tilt function. CMUcam2 can fully control all five servos regardless of serial interface baud rate or whether "poll" mode is on or off.

**Q:** What is the difference between using the OV6620 and the OV7620 module with the CMUcam2 ?

**A:** In terms of capabilities, the OV7620 sensor is a higher resolution sensor (664x492 raw sensor locations) than the OV6620 sensor (356x292 raw sensor locations). But this fact has very little to do with the issues which arise when considering which of these sensors best matches your application of the CMUcam2. Following are a list of considerations: **Resolution** - While it is true that the OV7620 sensor is a higher resolution sensor than the OV6620, because of the fixed memory size of the frame buffer of the CMUcam2, the CMUcam2 only supports a single resolution of 160x239 for the OV7620 sensor. The CMUcam2 supports a low resolution mode of 88x143 and a high resolution mode of 176x255 for the OV6620 sensor. So using the OV6620 in high resolution mode one can actually achieve higher resolution operation than the single resolution mode available for the OV7620 sensor. **Frame Rate** - Another resolution related issue is maximum frame rate when continuously processing a stream of images. The lower the resolution, the fewer the pixels which need to be processed and the higher the achievable frame rate. Although an increase in frame rate can be achieved by changing the down sampling rate and the virtual window size, the actual number of pixels output by the sensor has a much larger effect. Because of this, the CMUcam2 can achieve a much higher frame rate when the OV6620 is operated in its low resolution mode than the single resolution mode available for the OV7620. **Analog Video Output** - Another difference between the two sensors is the format of the analog video output of the two sensors. The OV6620 sensor outputs in analog PAL format and the OV7620 sensor outputs in analog NTSC format. In both cases the output is in black and white. It is important to note that in most uses of the CMUcam2 the analog output will not be used. In a typical application the results of processing the image or the raw pixels are transmitted digitally via the serial port to the host computer or microcontroller so this is not an issue. However, if live black and white video is important, then you may want to take the format of the analog video output into account. **Summary** - Our recommendation is that the OV6620 module is the best choice for almost all applications, especially considering its lower cost and the faster processing time achievable with this module. In the rare applications where NTSC monochrome analog video output is required you may want to consider the OV7620.