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Domains of application of microcontrollers and single board linux computers in data acquisition

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More than a decade ago, high function microcontrollers like the Microchip PIC allowed a large step to be made in data acquisition, as compared to fabrication of systems from discrete parts. They had a high level of integrated peripherals relevant to the task, good development environments, and relatively easy programming, including high level languages on the most advanced members of the family. Their level of interaction for the user was limited, and networking generally fell short of the standards needed to ensure reliability. More recently, single board linux computers like the Raspberry Pi and Beagleboard/bone provide a high level of user interaction, good networking, and a standard environment. They are made flexible by a large selection of inexpensive peripheral devices available, generally interconnected by the I2C protocol. Nevertheless, there are limitations on what such a system can do, since it does not usually have a real time operating system, and thus cannot respond to interrupts. Usually the ability to detect events at high speed is also limited. We will relate a hybrid approach using a PIC with a lower-end integrated system known as a Rabbit, which formed the basis of a high performance magnetic instrument known as netPICOmag. We propose extension of this concept to PIC and Raspberry Pi for real-time or time critical applications.

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