Mouse Sensor Network

Cheap Smart Cameras for distributed vision

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Smart Cameras

» Systems based on wired (USB/UTP) manually calibrated cameras.

» Well-calibrated systems work, popular in industrial vision

» Intense (embedded) processing → Very expensive

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Visual Sensors

» High pricepoint and power consumption is a result of the high resolution of the input device which increases system performance.

» Sensors with lower resolution allow simpler electronics:
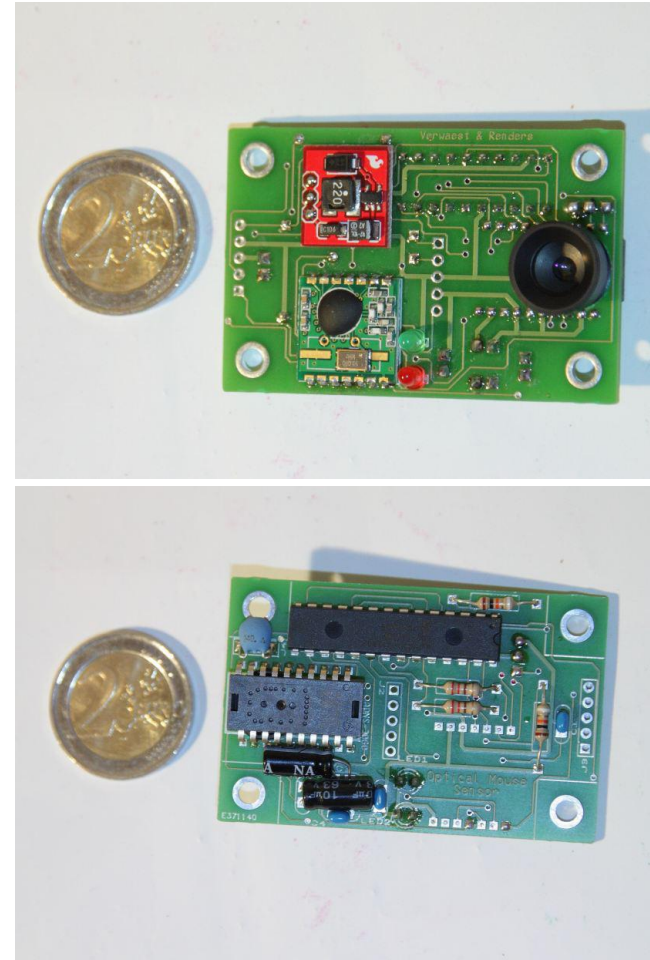
   » Mouse sensor camera

Mouse sensor

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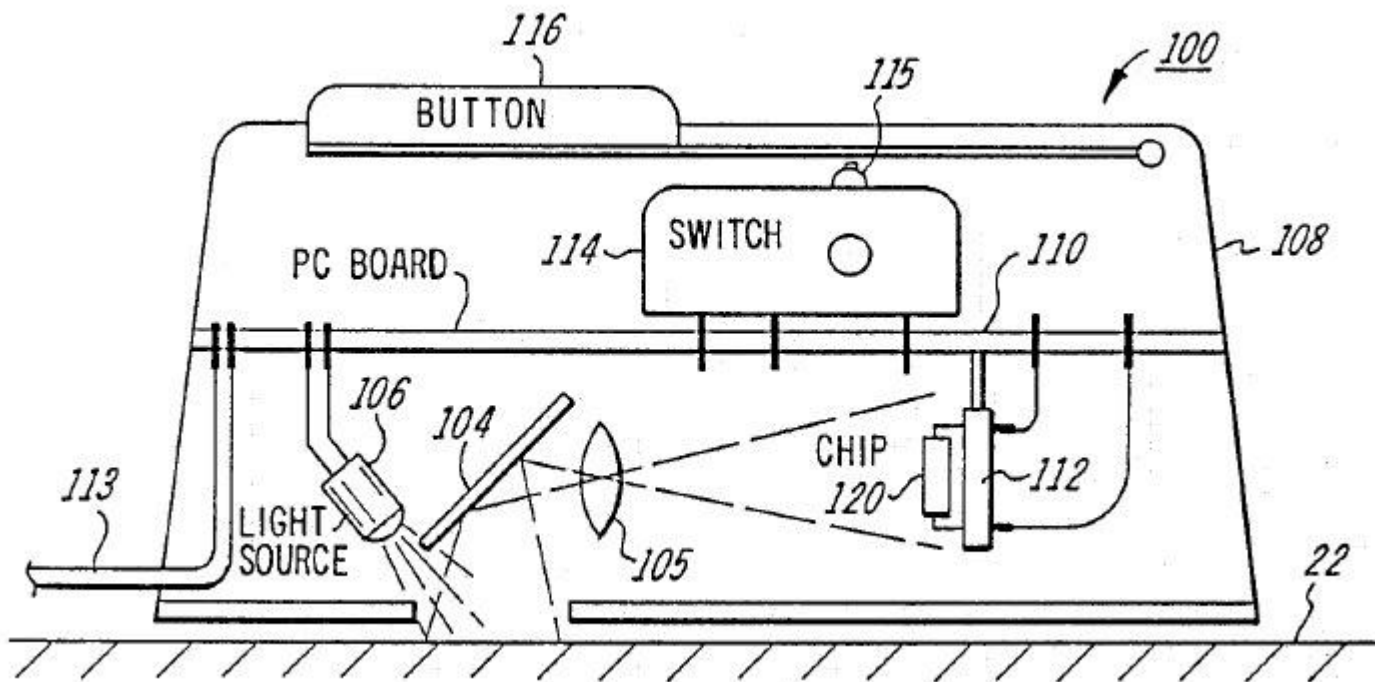
Mouse Sensor (ADNS-3060)

» Simple on board processing (Motion Detection)

» Up to 6400 Fps

» Power Consumption

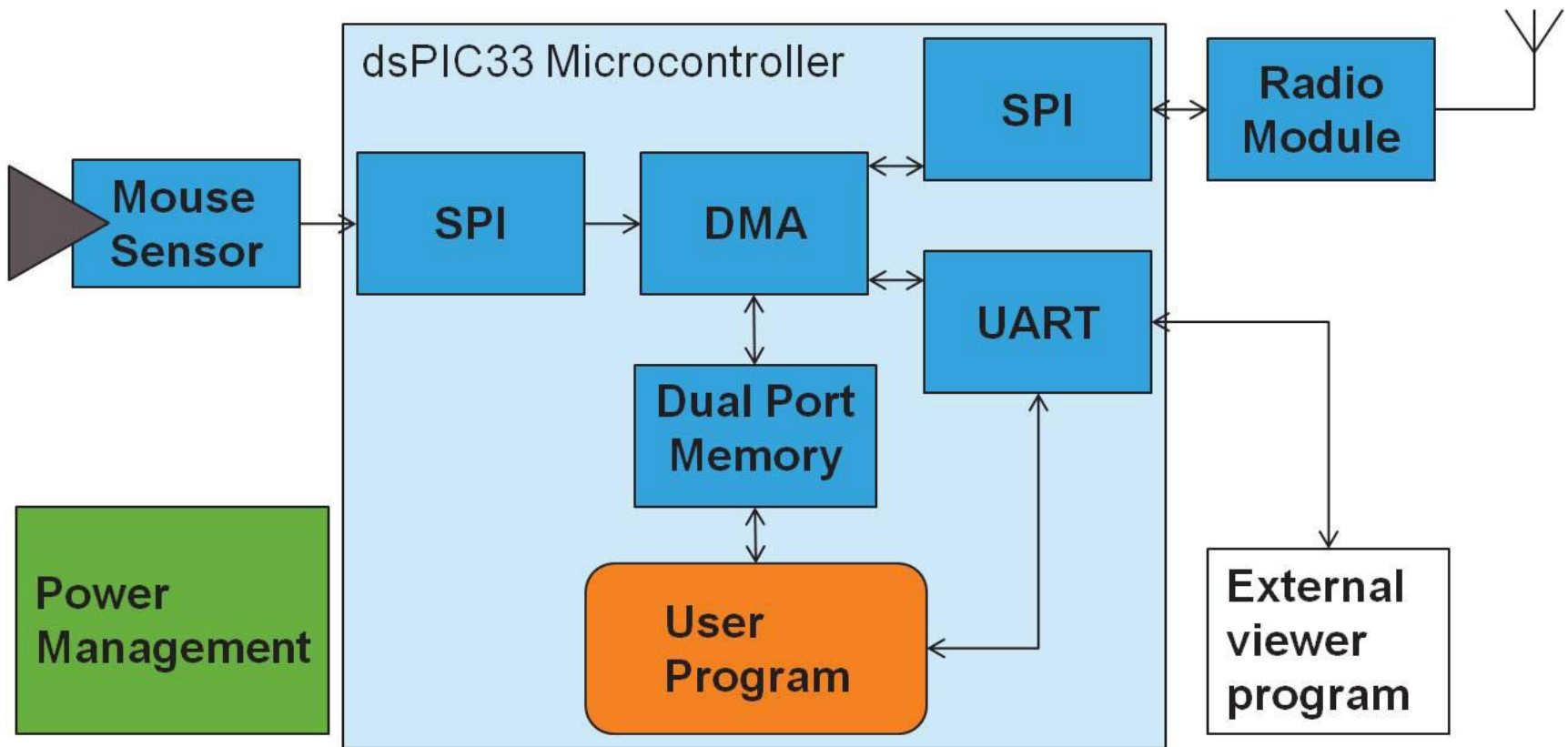 15 mW active mode, < 1mW alert mode

» Regular Image Processing (BGS, etc)
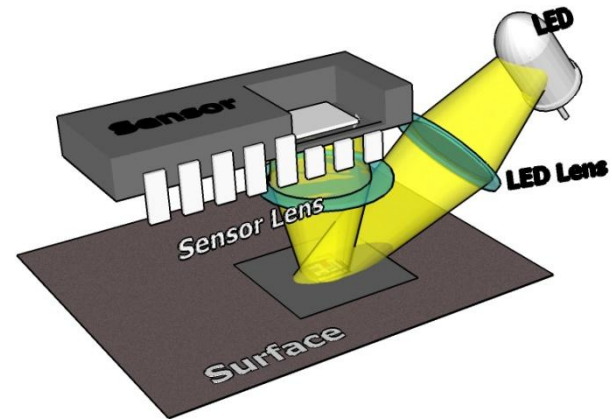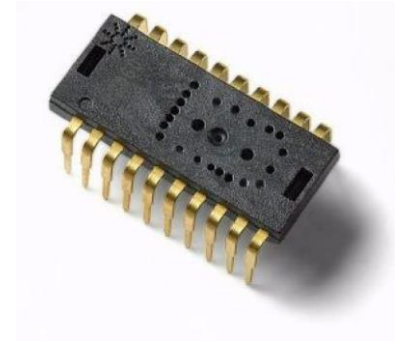
Mouse Camera

» Compact

» Low Power

» Wireless Connection

» Processing on Board
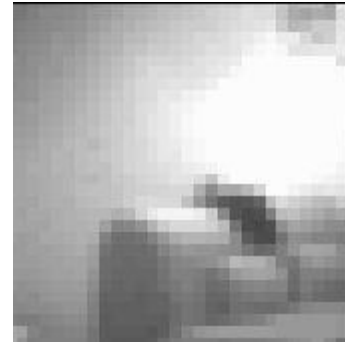
» Low Price

Mouse Camera Architecture

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Mouse Sensor (ADNS-3060)

Main features of cmos sensor:

» Tiny Camera 30x30 Pixels

» Wide Spectral Responsivity

Figure 13. Relative responsivity

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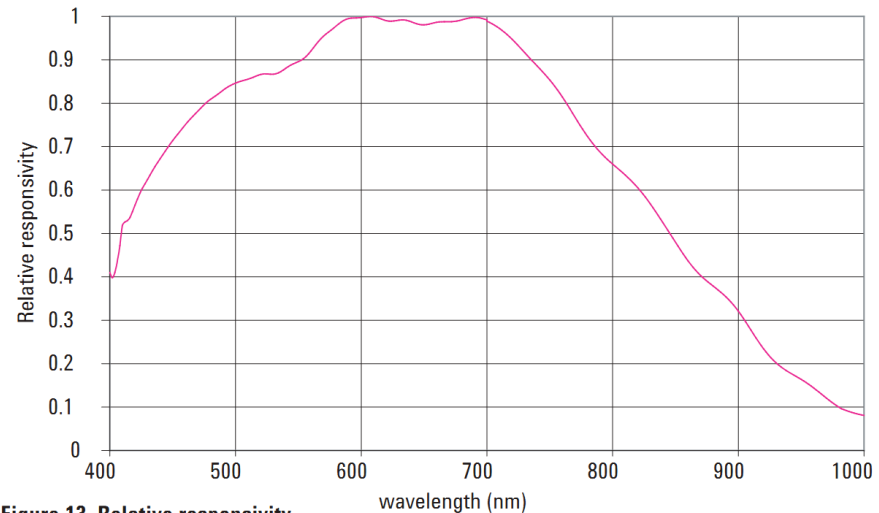
MicroController (dsPIC33F)

» 16 bits Modified Harvard Architecture

» Up to 40 MIPS

» Hardware Communication Capabilities (SPI, UART, I^{2}C)

» DMA (Image Reading and Transmission)

The Microcontroller reads up to 80fps using SPI-DMA (limit of the protocol).
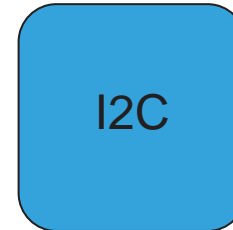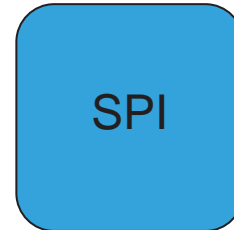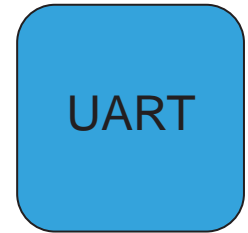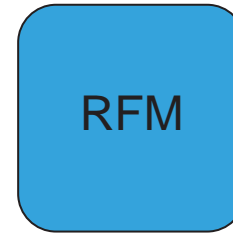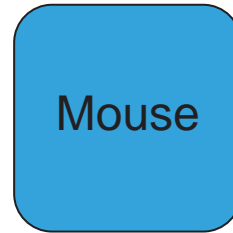
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Wireless Module (RFM12B)

» Standalone Tranceiver

» Frequency: 315-915 Mhz

» Up to 115200 bit/s in digital mode

» Low Power

» 433MHz is currently used

    (legal in Europe and US)

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Software?

» ANSI C
» Open Source (GPL)
» Modular
» Integrated
» Power Efficient
» Extensible
» "Abstract"

Mouse	RFM	UART

SPI	I2C

Efficient use of DMA and Interrupts to reduce the computational resources used by hardware interfacing

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# How can I program it?

» MPLAB IDE (microchip)

» C30 compiler (non-free) - student edition available for free

» Hardware Programmation

» PIC programmer (PICkit, …)

Applications

The lower resolution, although with processing framerates of up to 80fps, still allows many common applications for visual sensors such:

- Face Detection
- Motion Vector Estimation
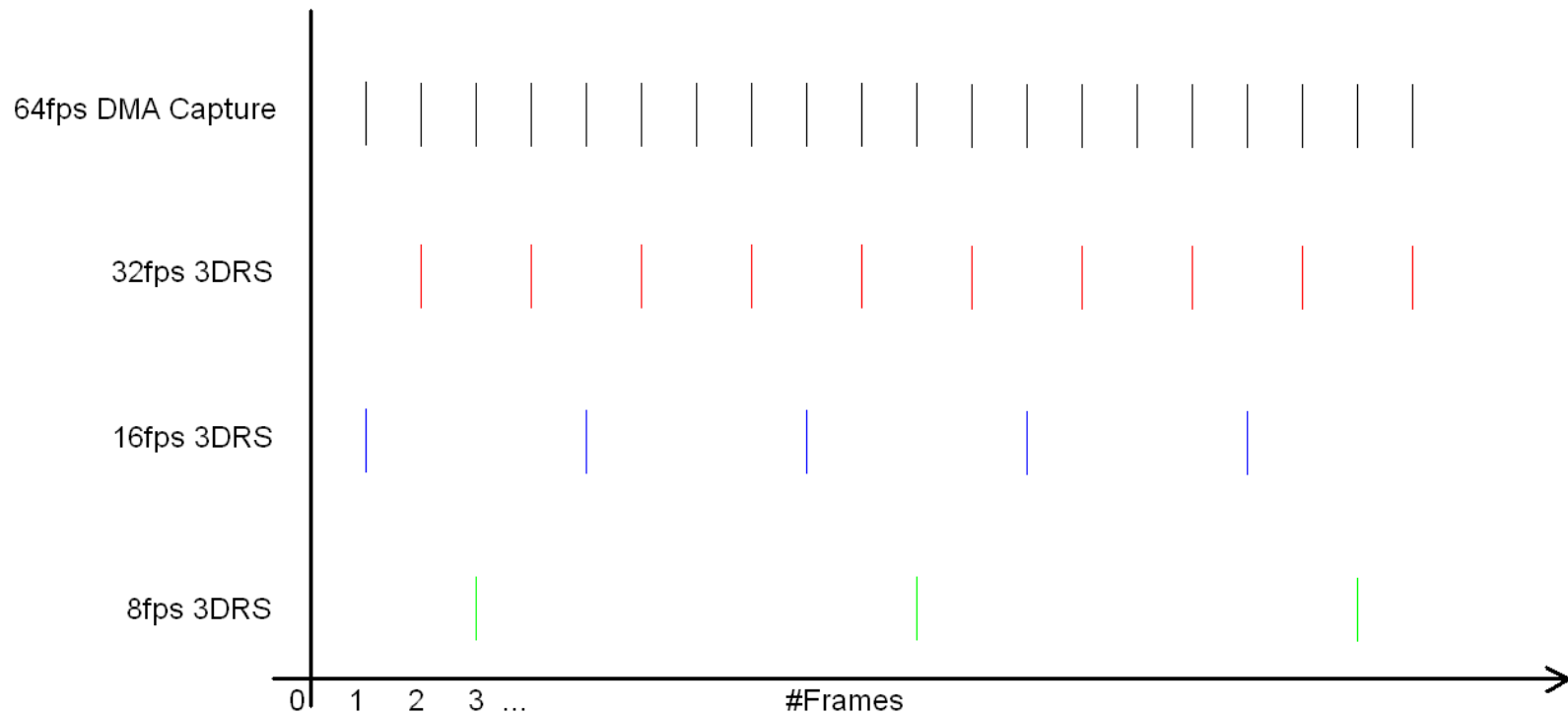- Edge Detection
- BackGround Subtraction
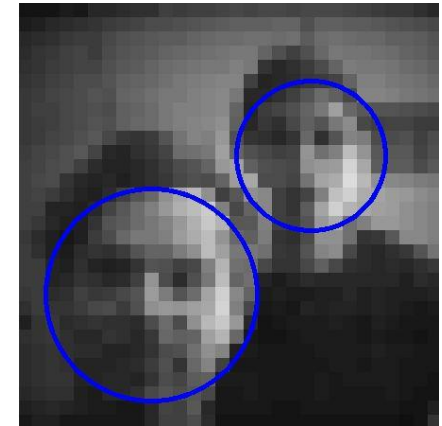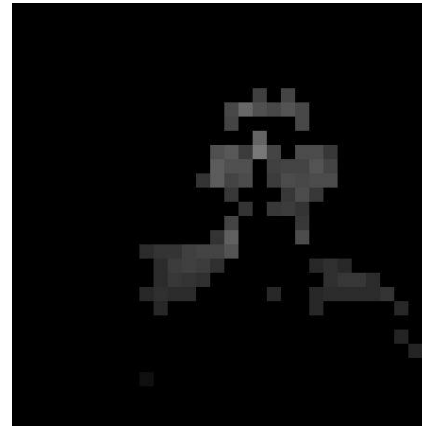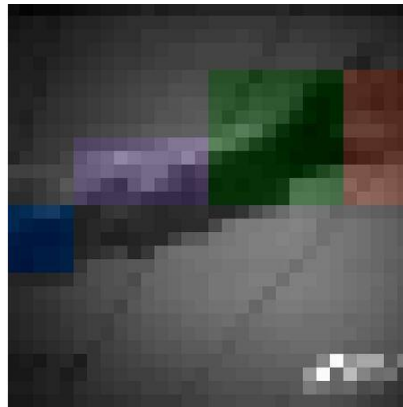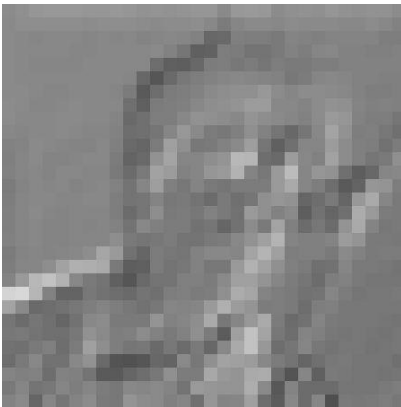
Applications

Motion Estimation with 3d recursive search

Applications

Wide speed ranges motion estimation

Using 3drs at 3 different framerates 32fps, 16fps and 8fps in order to cover almost of the objects speeds

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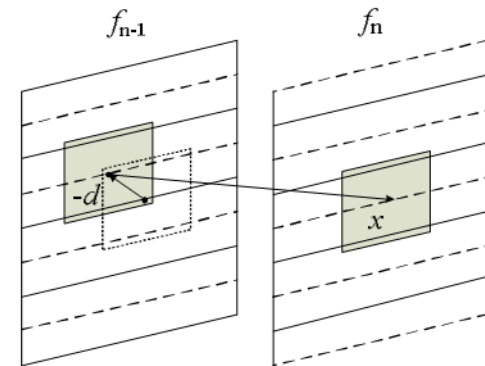
Applications

? 3DRS performances on a dsPIC with 30x30 pixels images **?**

Mcu usage during frame capture (DMA set and read)

3.8ms*Frame

3DRS execution

7ms

= Up to 92fps processing!!
Max bound 80fps due to SPI protocol

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Applications

Car Counter Video

Uses?

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