SoC for ultra HD mono and stereo-vision processing

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Oct 1, 2018 – PPNIV, IROS, Madrid
VisLab

Group started in **mid 90s** at the University of Parma, Italy
Spin-off launched in **2009**
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Acquired by Ambarella in **2015**
Ambarella

- Chip company working on ultra-HD video
VisLab + Ambarella

- Starting July 2015 VisLab is working with Ambarella
  - Ambarella, a chip company
  - VisLab, a computer vision startup
Goal

• Design an engine for automotive systems (from ADAS to Autonomous Driving):
  – High performance
  – Low cost
  – Low power consumption
  – Automotive grade

  to handle perception, data fusion, and ultimately also path planning
Ambarella CV SoC

- Current CV chip (CV-2):
  - 4k images (up to 8 image streams, incl multiscale) @30fps
  - IDSP on board, H.265 on board
  - Stereo processing @ 30fps (incl multiple stereo)
  - Monocular processing @ 30fps (CNNs, vector, serial)
  - Power consumption: under 5W
  - AEC-Q100
4k Image Resolution

4k, cropped (3840 x 1280)
Image Quality – Sun
4k Stereo Vision
Stereo Calibration

• In the past calibration has been one of the major showstopper for stereo vision, especially on vehicles

• A stereo camera is a measurement instrument

• Calibration needs to be maintained… for years
Stereo processing and autocalibration come from VisLab’s multi-year history.
4k Stereo Vision
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4k CNN Classification
EVA – Embedded Vehicle Autonomy
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• Short Range Module: 4x 1080p stereo cameras
EVA – Embedded Vehicle Autonomy

• Long Range Module: 6x 4k stereo cameras
EVA Stereo Vision Sensing
Conclusion

- Visual perception is key for intelligent vehicles
- We are porting advanced tools (like stereo and CNNs) into a low-cost, low-power, high performance chip
- The CV family: CV-1, CV-2, CV-22,…