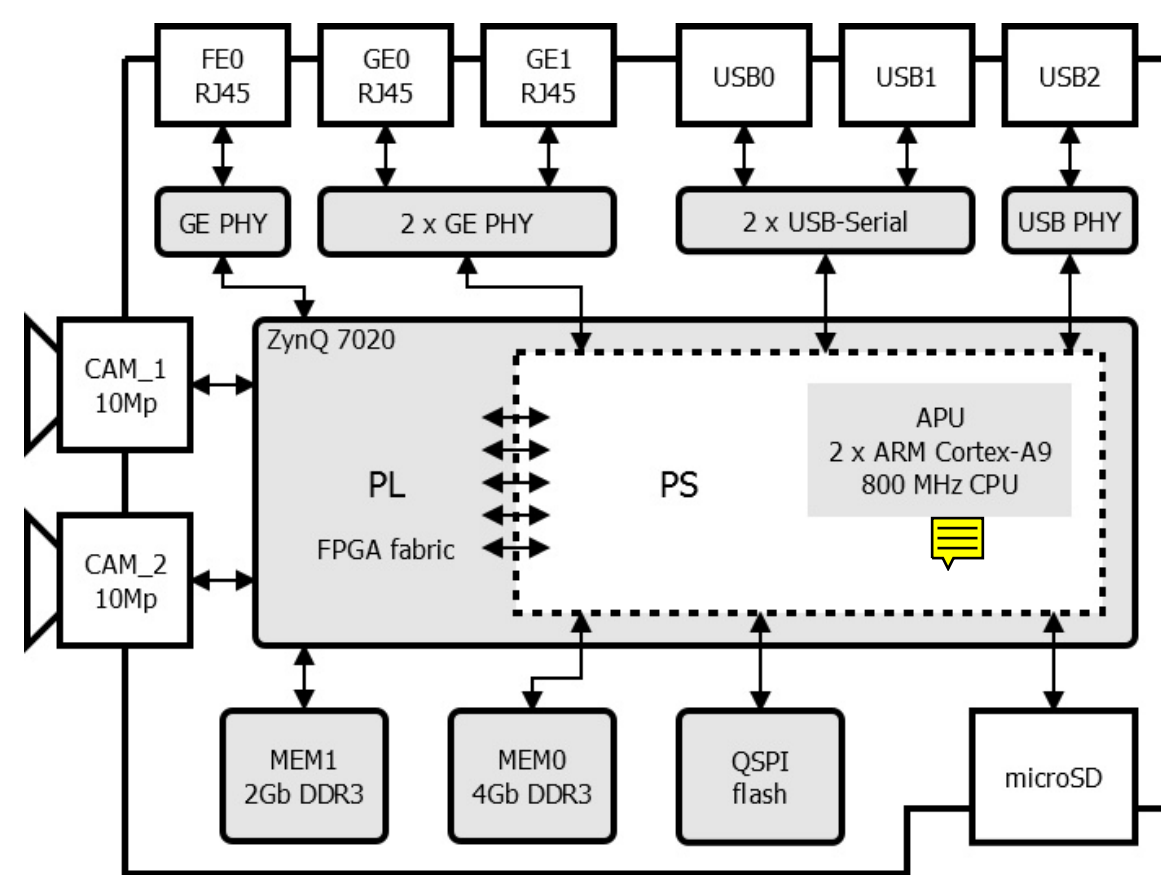


GIMME2 HARDWARE



SPECIFICATIONS

- IMAGE SENSOR: Aptina MT9J003
- RESOLUTION: 10Mp
- FRAME RATE: 15fps@10MP, 60fps@1080p
- PROCESSING UNIT: Xilinx Zynq 7020
- PROGRAMMABLE LOGIC (PL): Artix-7 85K Logic Cells
- PROCESSING SYSTEM (PS): Dual ARM Cortex-A9 (766MHz)
- MEMORY: 4Gb DDR3, 2Gb DDR3, QSPI, SD-card
- COMMUNICATION: 2xGBe, 1xFE, 3xUSB 2.0 (one host)
- PHYSICAL DIMENSIONS: 130x82mm
- POWER INPUT: 12-24V
- POWER CONSUMPTION: <18W@24V



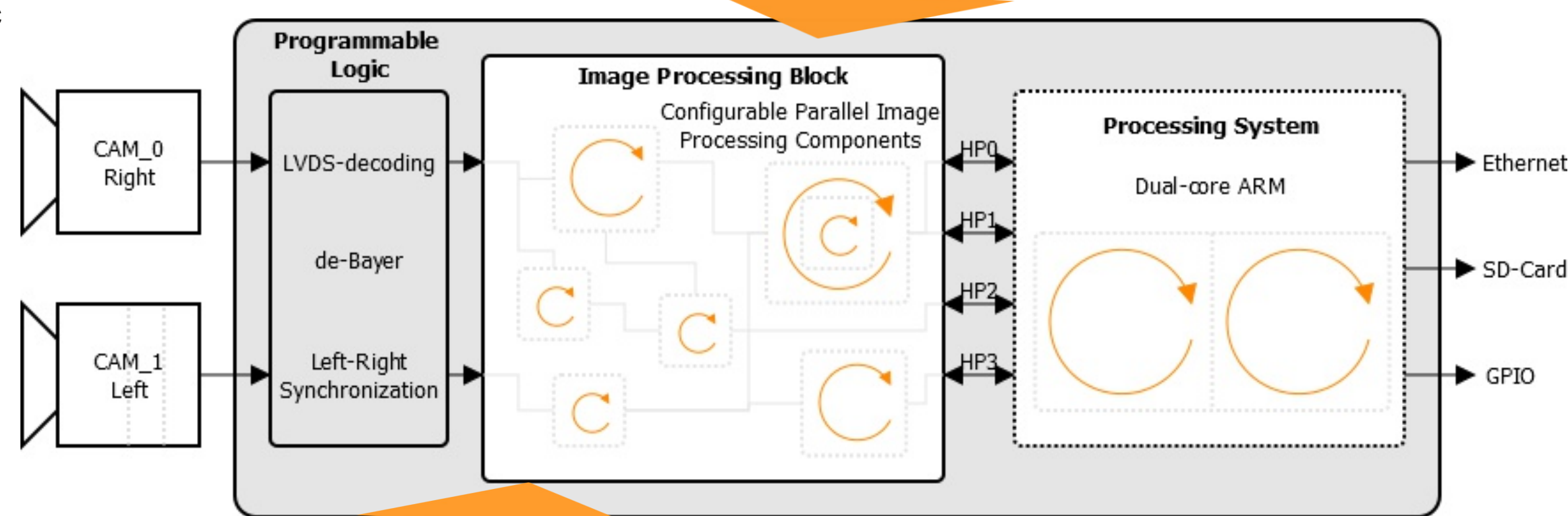
PROCESSING

DISTRIBUTED PROCESSING

- FPGA: Low and medium level image processing
- CPU: Application level, control loop, etc

IMAGE PROCESSING COMPONENTS

- RGB2HSI
- RGB2HSV
- RGB to R, G, B or I - 12/8-bit
- Thresholding
- Colour Discretization (see Naiad)
- Sliding Windows (see right)
- Stereo Matching
- Corner/Edge Detection



SLIDING WINDOWS

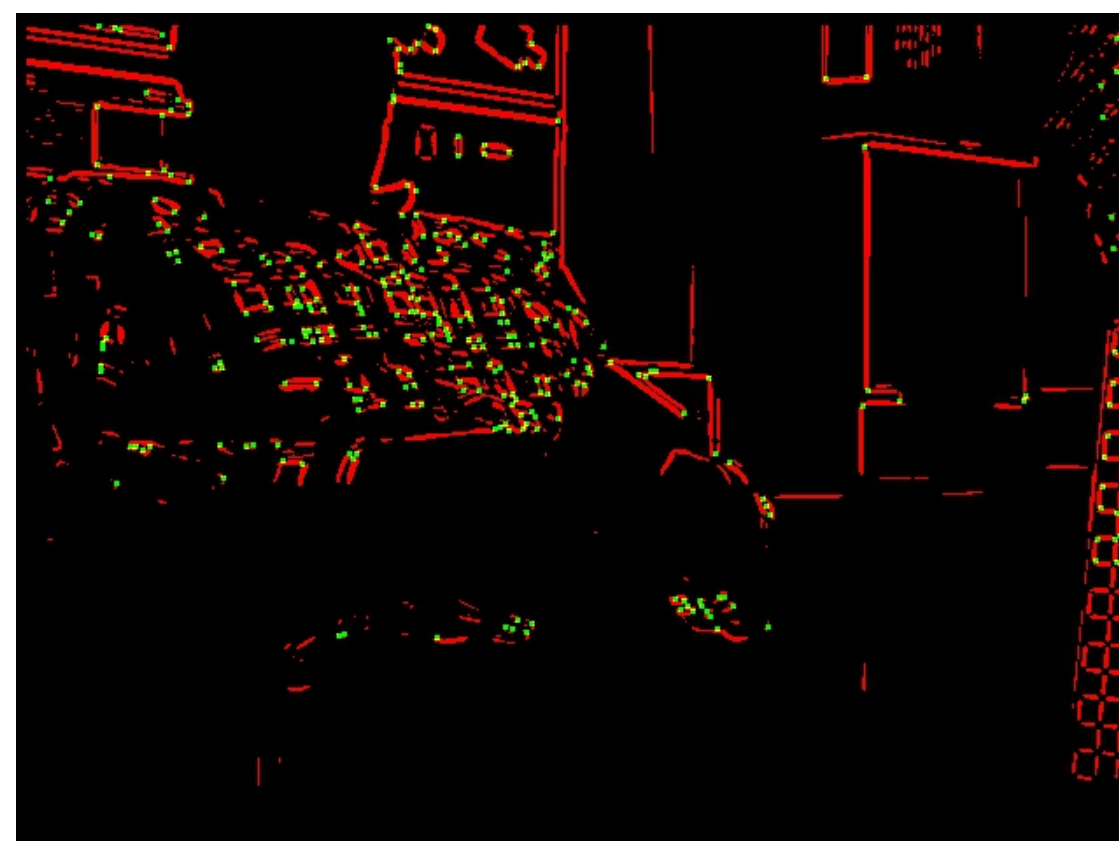
- Generic window size (3x3, 5x5, MxN)
- Window operations: Sum, Sub, Mult, SAD
- Linear filters: Sobel, Derivatives, Gaussian, Mean
- Non-linear filters: Max, Min, Median, Mode, Nonmaxima/minima suppression
- Morphological operations: Erode, Dilate (binary)
- Census transform

DEMO

SYNCHRONIZED STEREO IMAGES

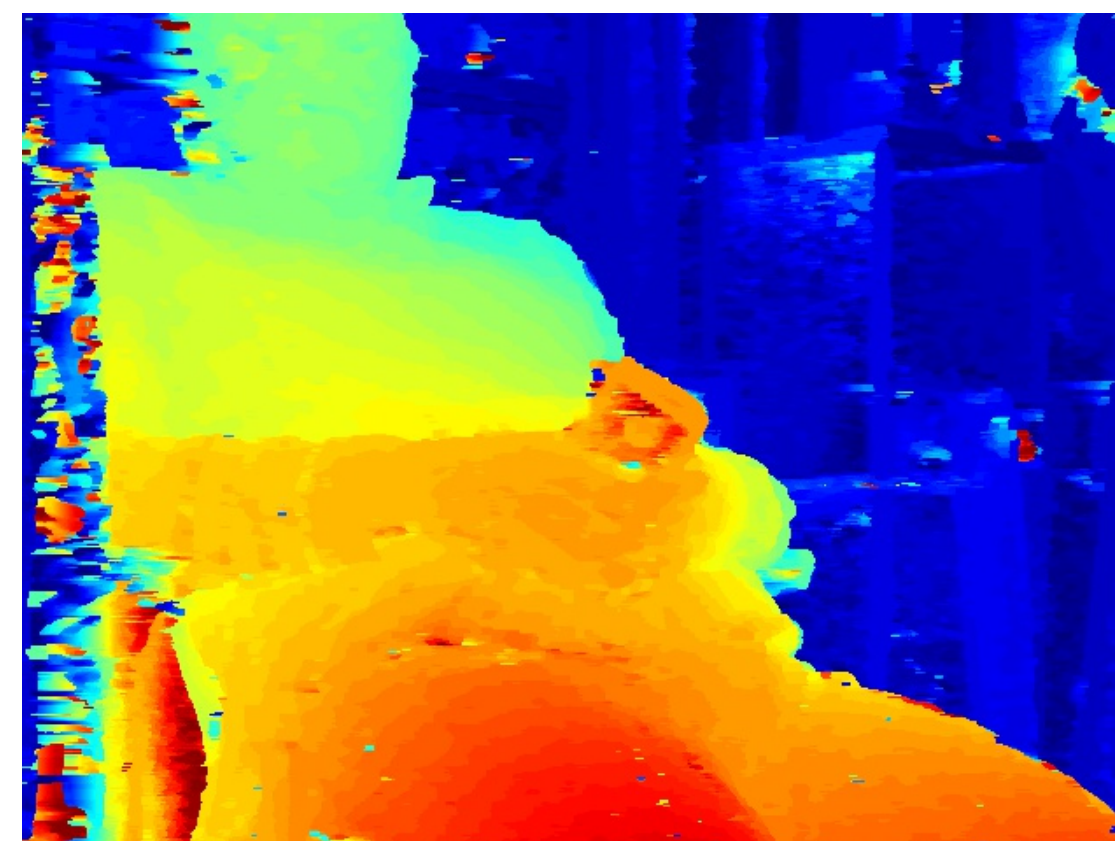


CORNER AND/OR EDGE DETECTION



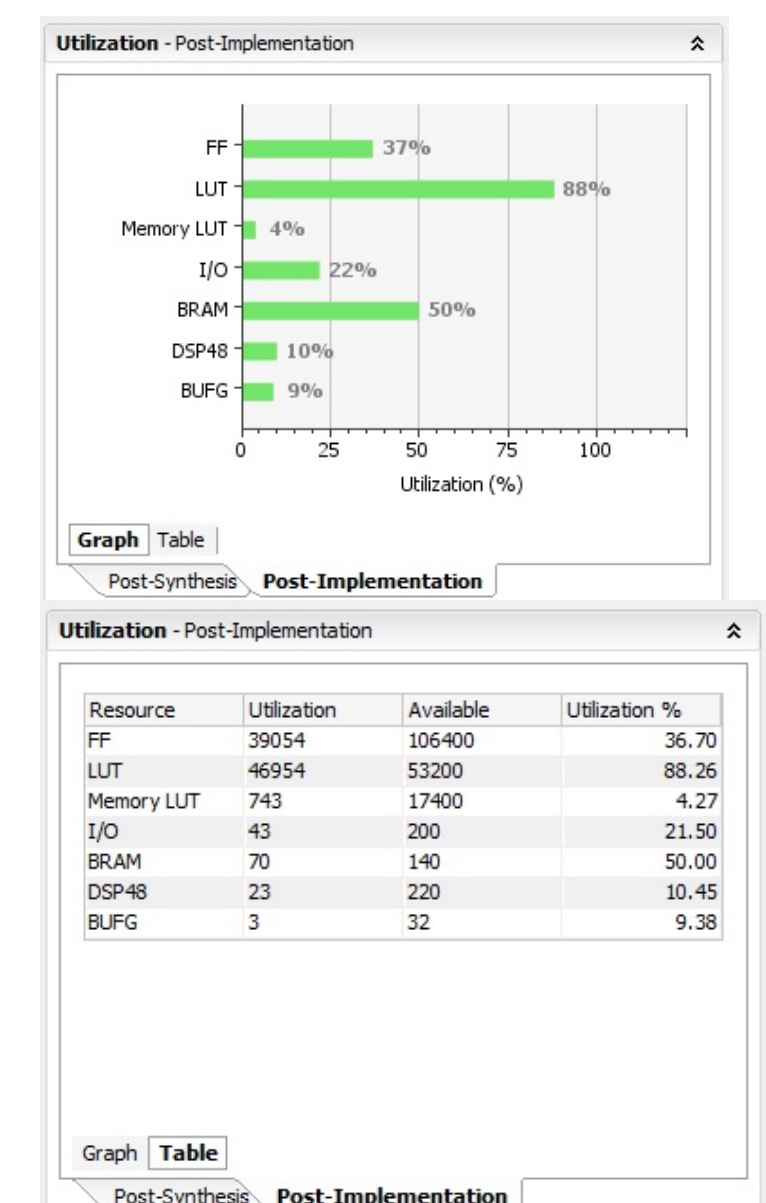
- Harris Features
- Red = Edge, Green = Corner
- Thresholds are set from the PS
- Window size 5x5
- $k = 1/16$

STEREO MATCHING



- Block Matching
- 128 levels of disparity
- 5x5 block size
- SAD (Sum of Absolute Differences)
- Horizontal median filter for noise suppression

UTILIZATION



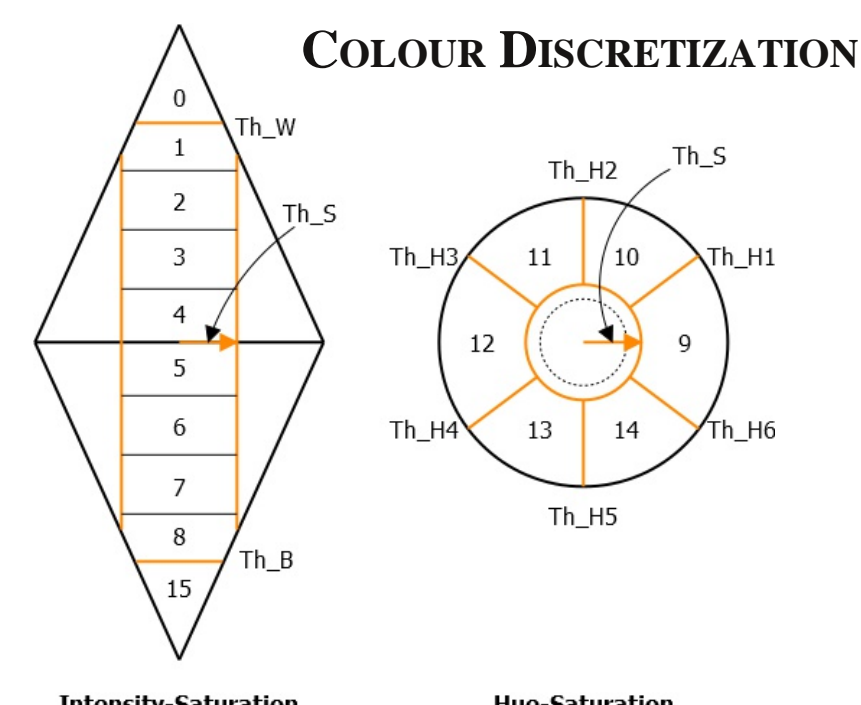
NAIAD - AUTONOMOUS UNDERWATER VEHICLE (AUV)



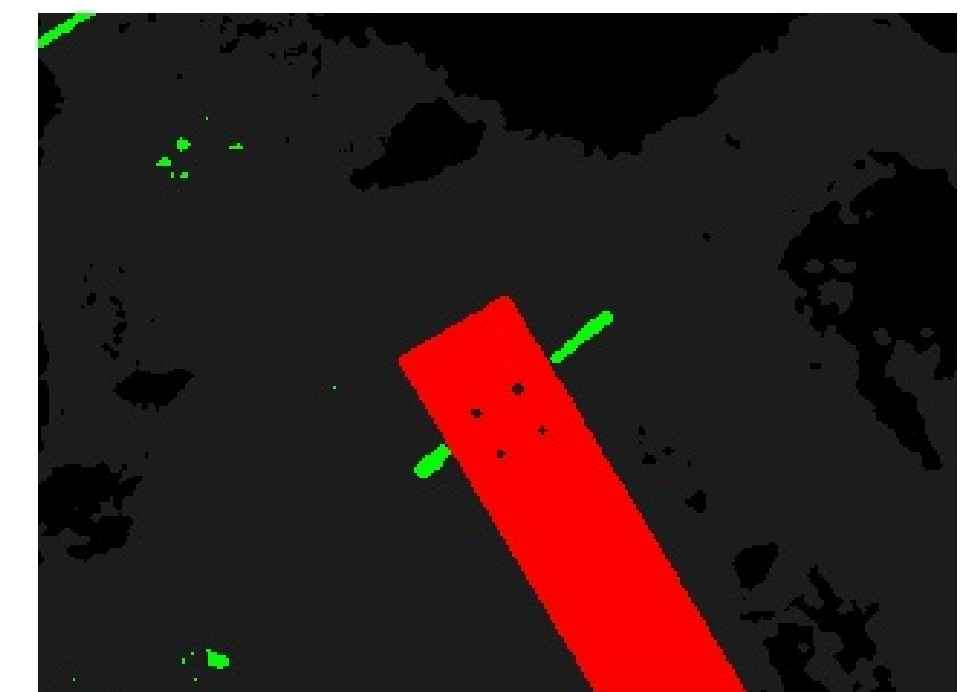
- 800mm, 30kg
- 6 DOF - 6 thrusters
- FOG, IMU, depth sensor, side-scan sonar
- 2 x GIMME2, 2 x BeagleBone Black



- 1 GIMME2 facing downwards
– for monitoring the seabed (above)
- 1 GIMME2 facing forwards



- PL configuration for RoboSub 2015
– RGB2HSI
– Colour Discretization



- Image to be processed by the PS
- Object detection/identification
- BeagleBone: Mission control and movement