SpaceWire Intelligent Camera

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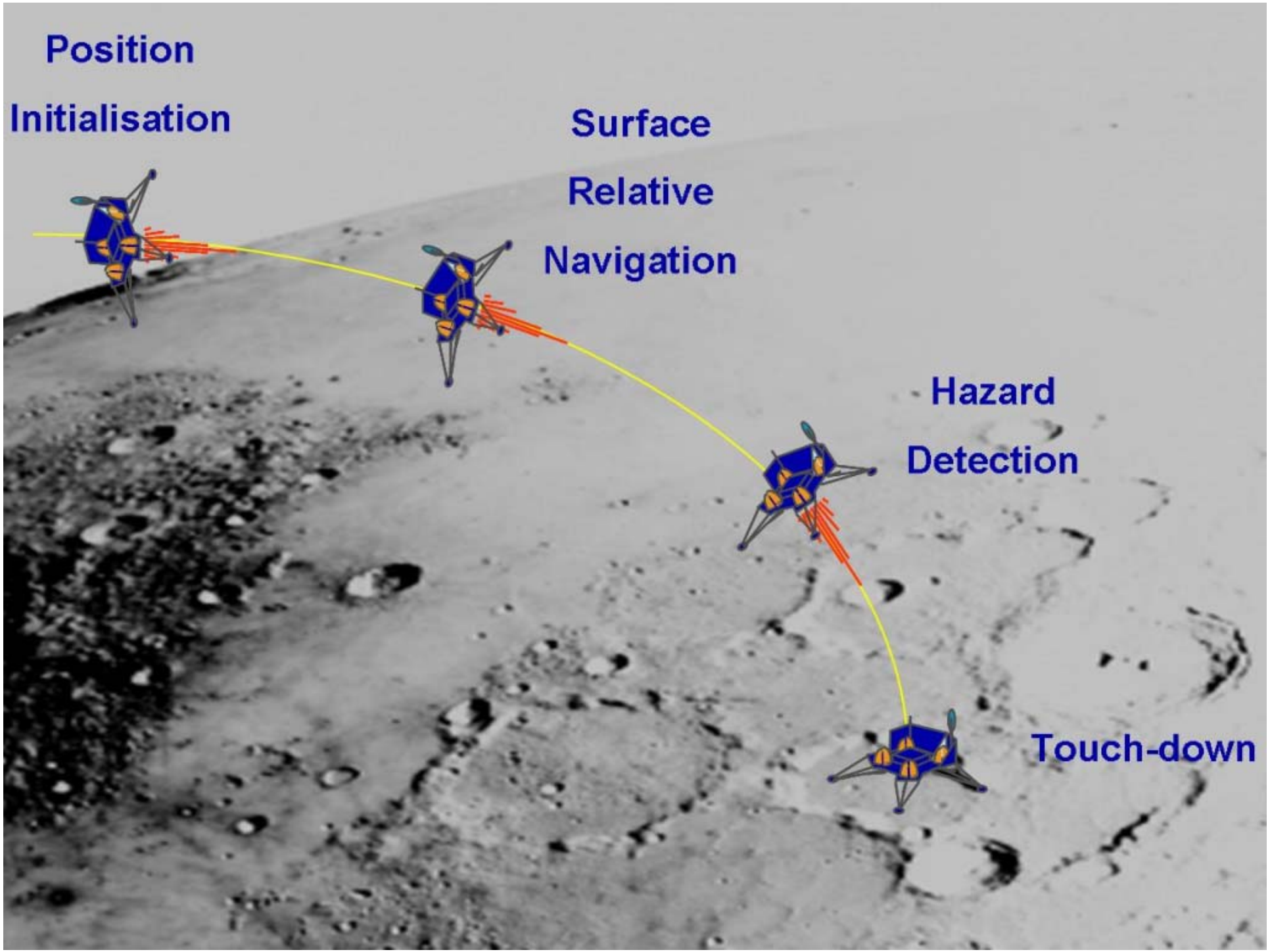
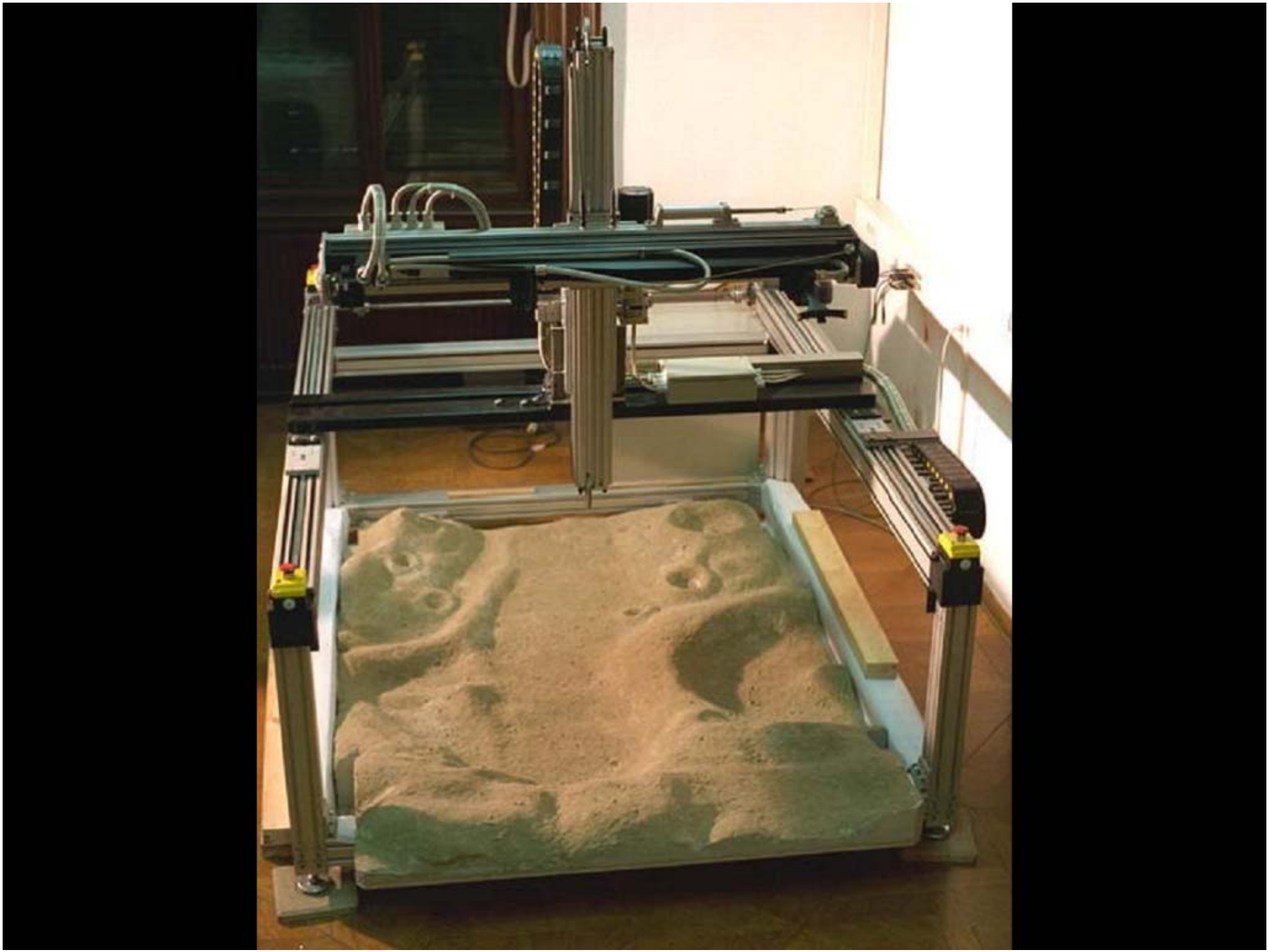
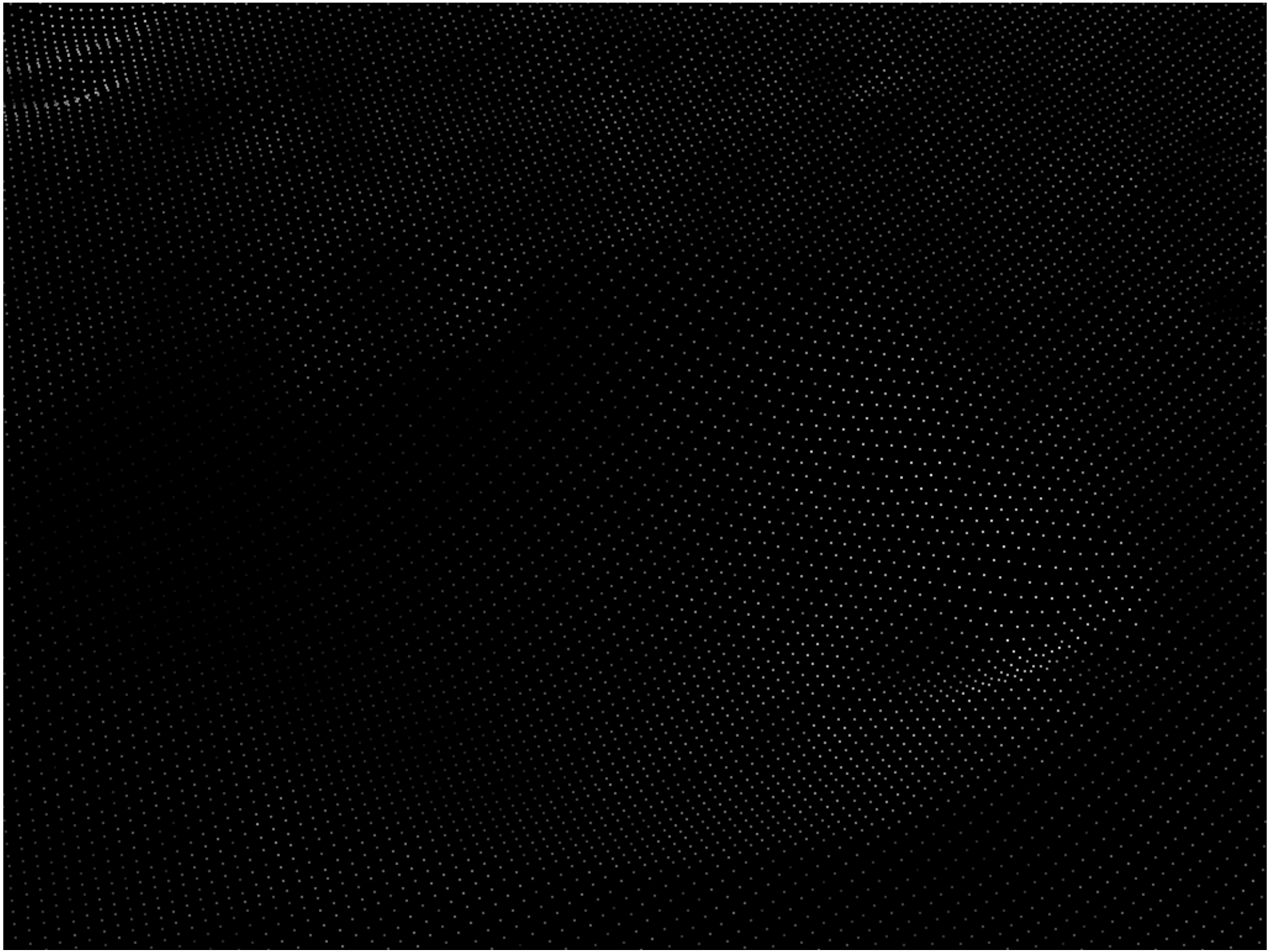
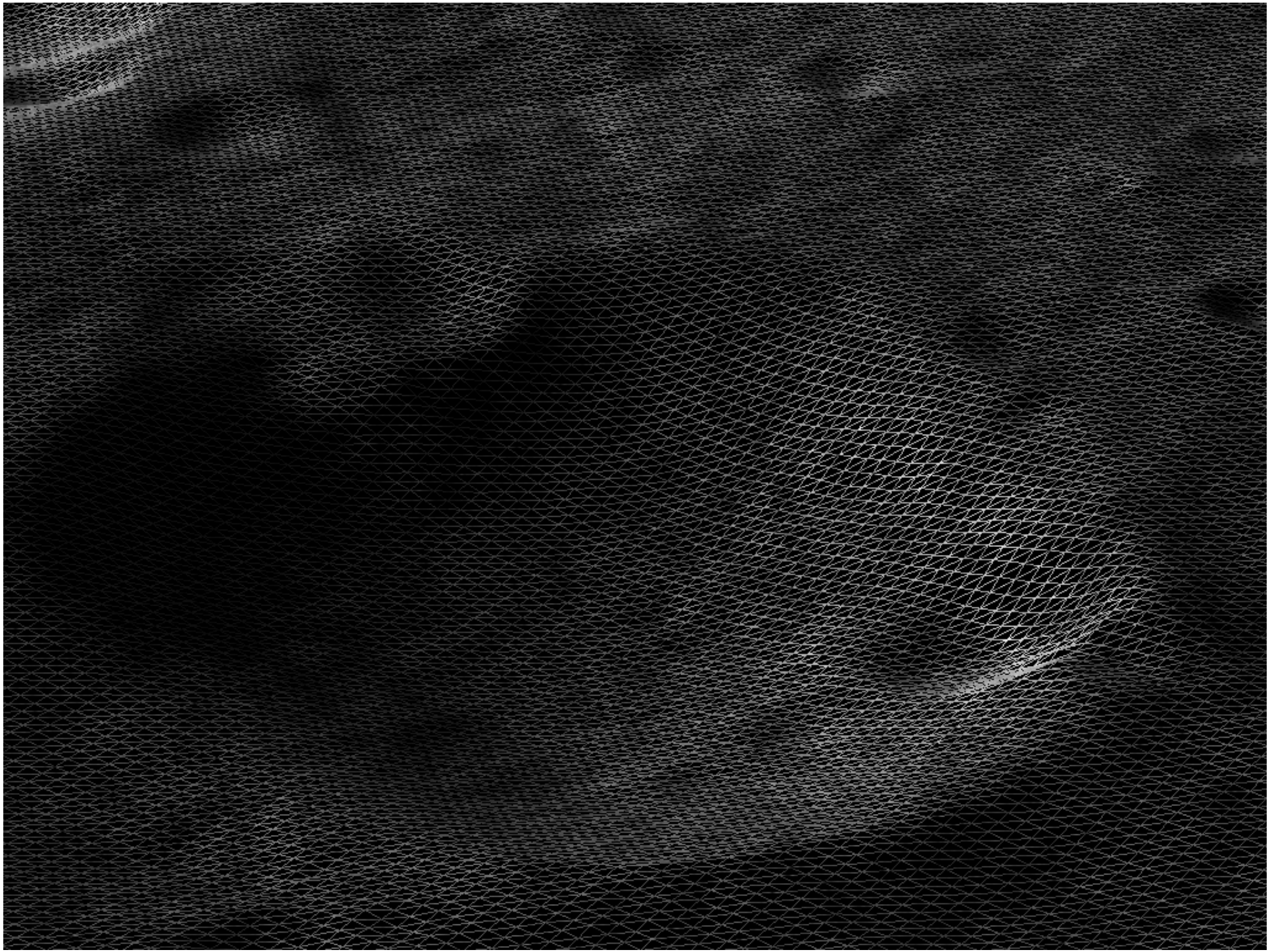
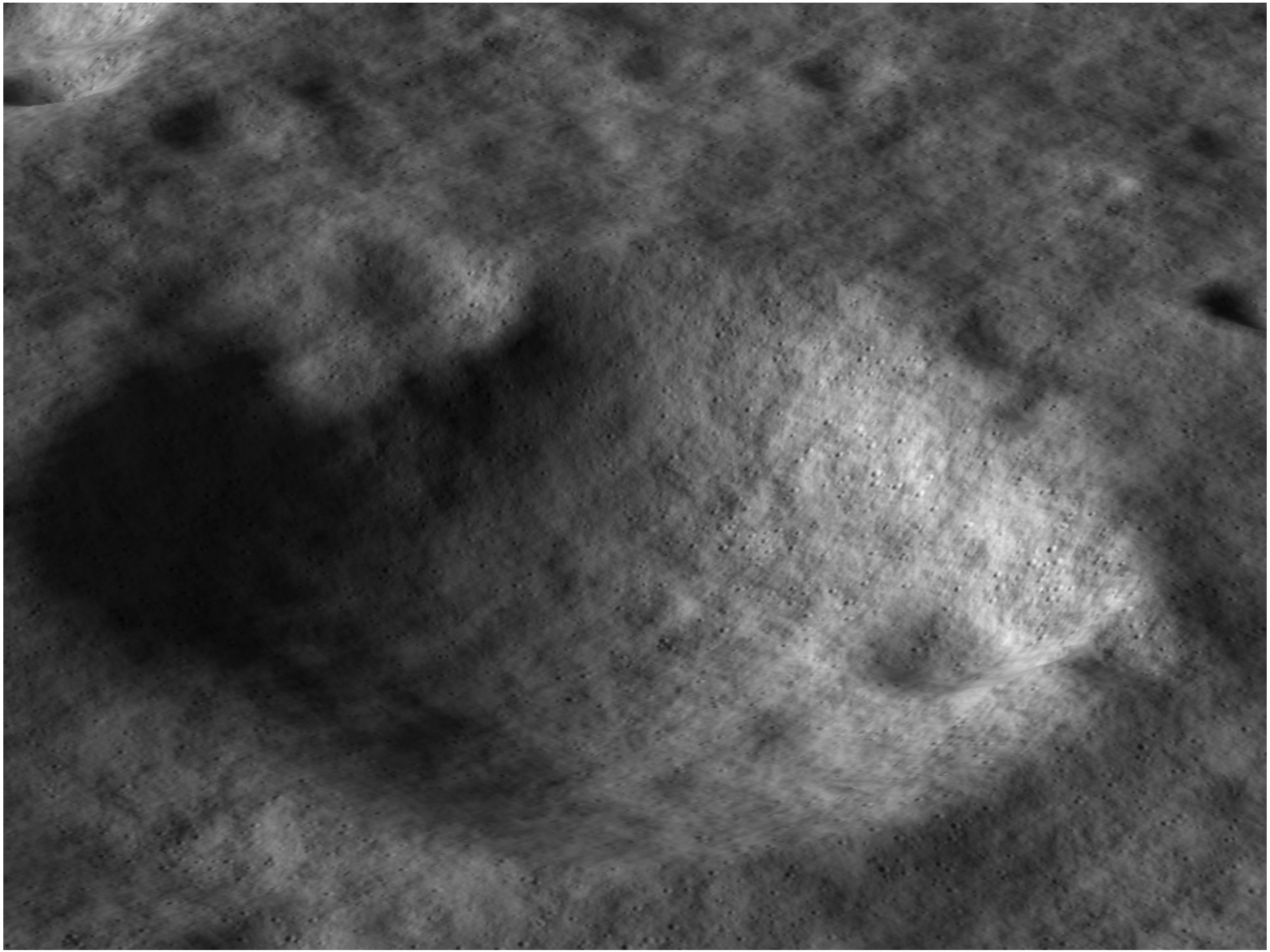

Position
Initialisation
Surface
Relative
Navigation
Hazard
Detection
Touch-down









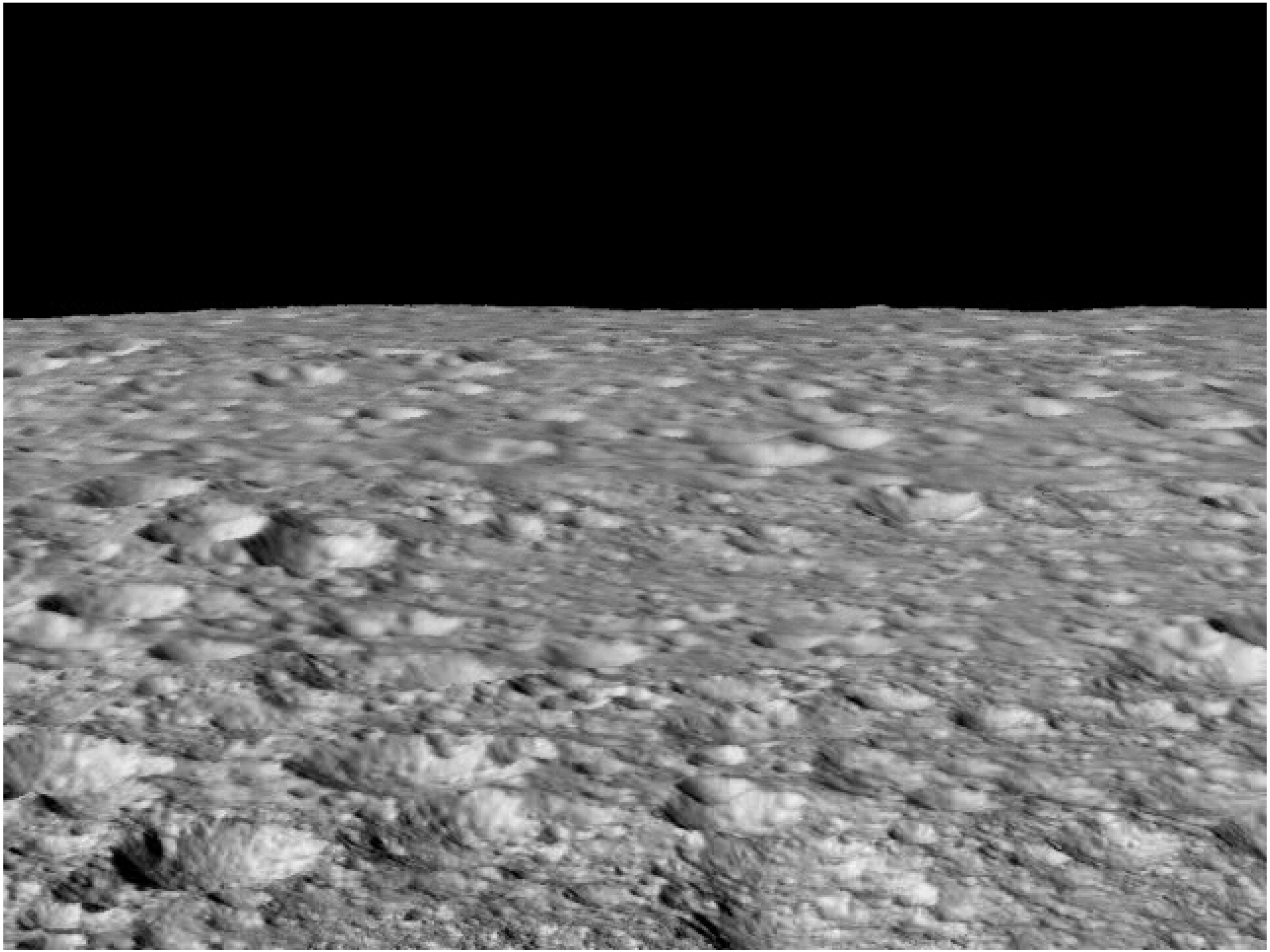


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Image Processing Chip

- Images from camera chip
  - Via ping-pong memory
- Detect features on surface
  - 100 features extracted each frame
  - Harris operator
  - Ensure points spread across image
- Track features from one frame to next
  - 100 features tracked each frame
  - Correlation based tracking
  - Search window predicted by GNC
- Manage list of tracked features
  - Tracked points
  - Failed to track points
- Send tracked points to GNC computer

Image Processing Chip

- Interface to GNC computer
  - Originally PCI
  - Dual redundant interface required
  - Large pin count
  - Short distance
- SpaceWire a solution
  - SpaceWire mini-router
  - Two SpaceWire links to GNC computer
  - One SpaceWire link to Camera for control
  - Parallel ports into image processing chip

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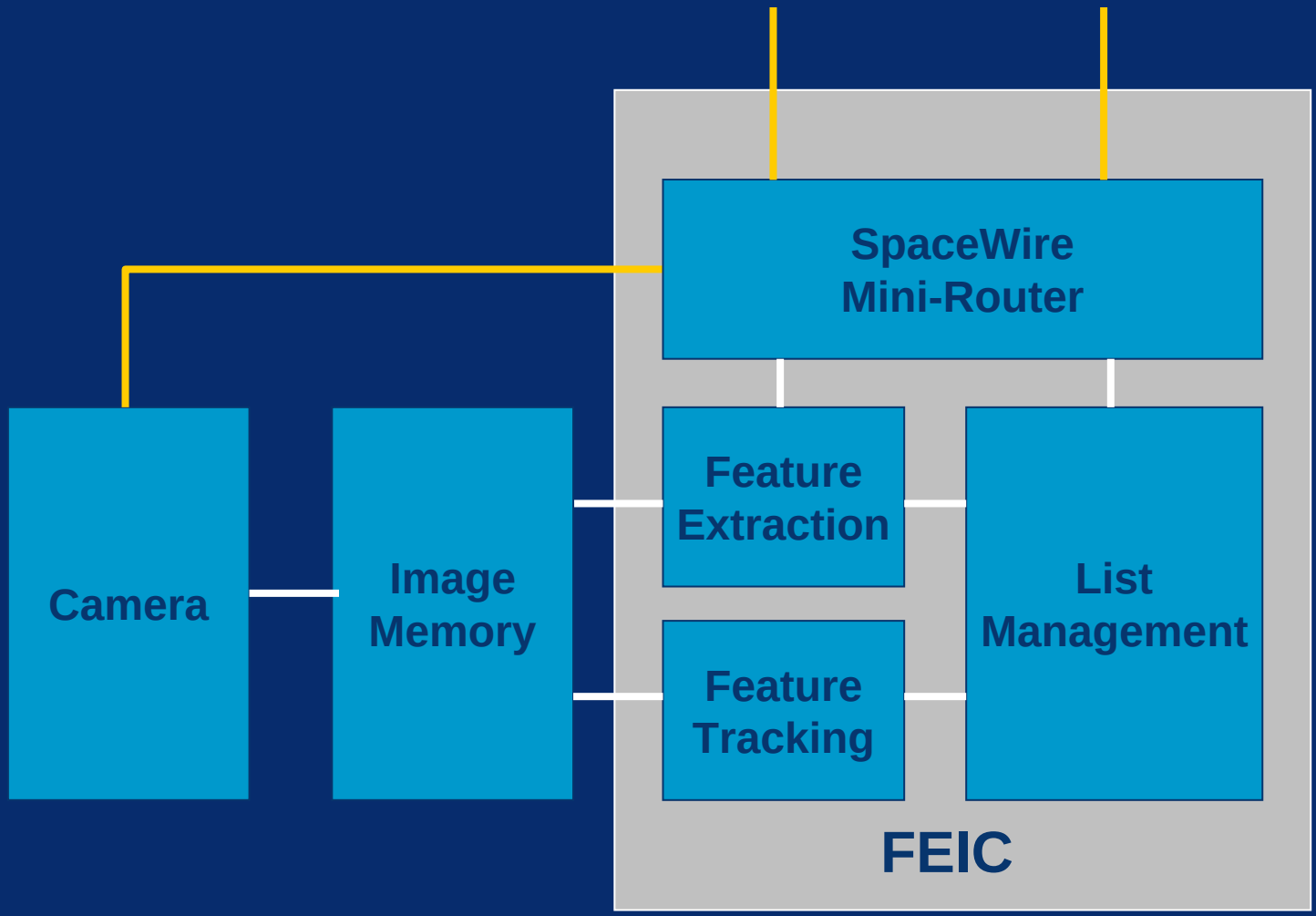
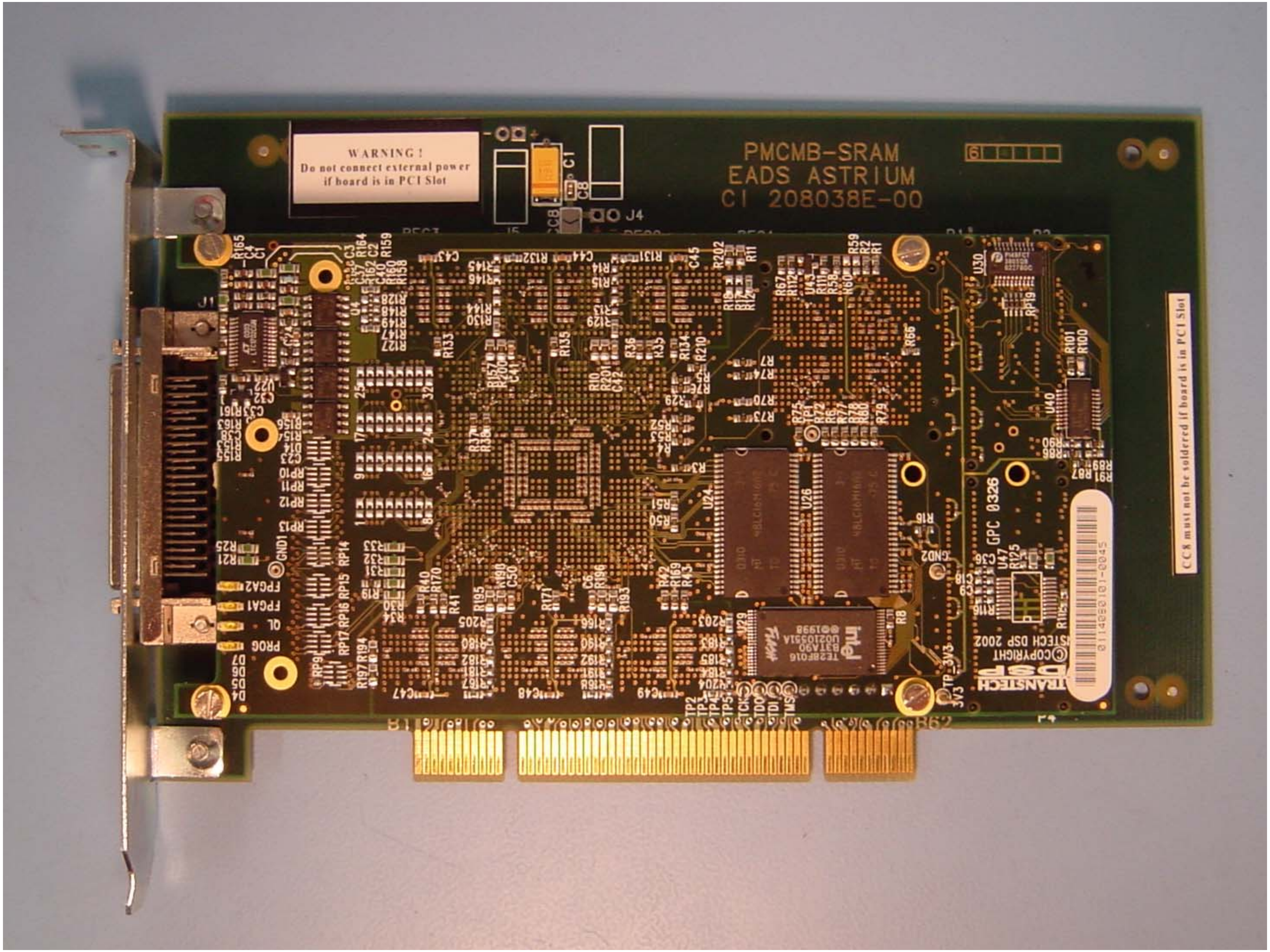
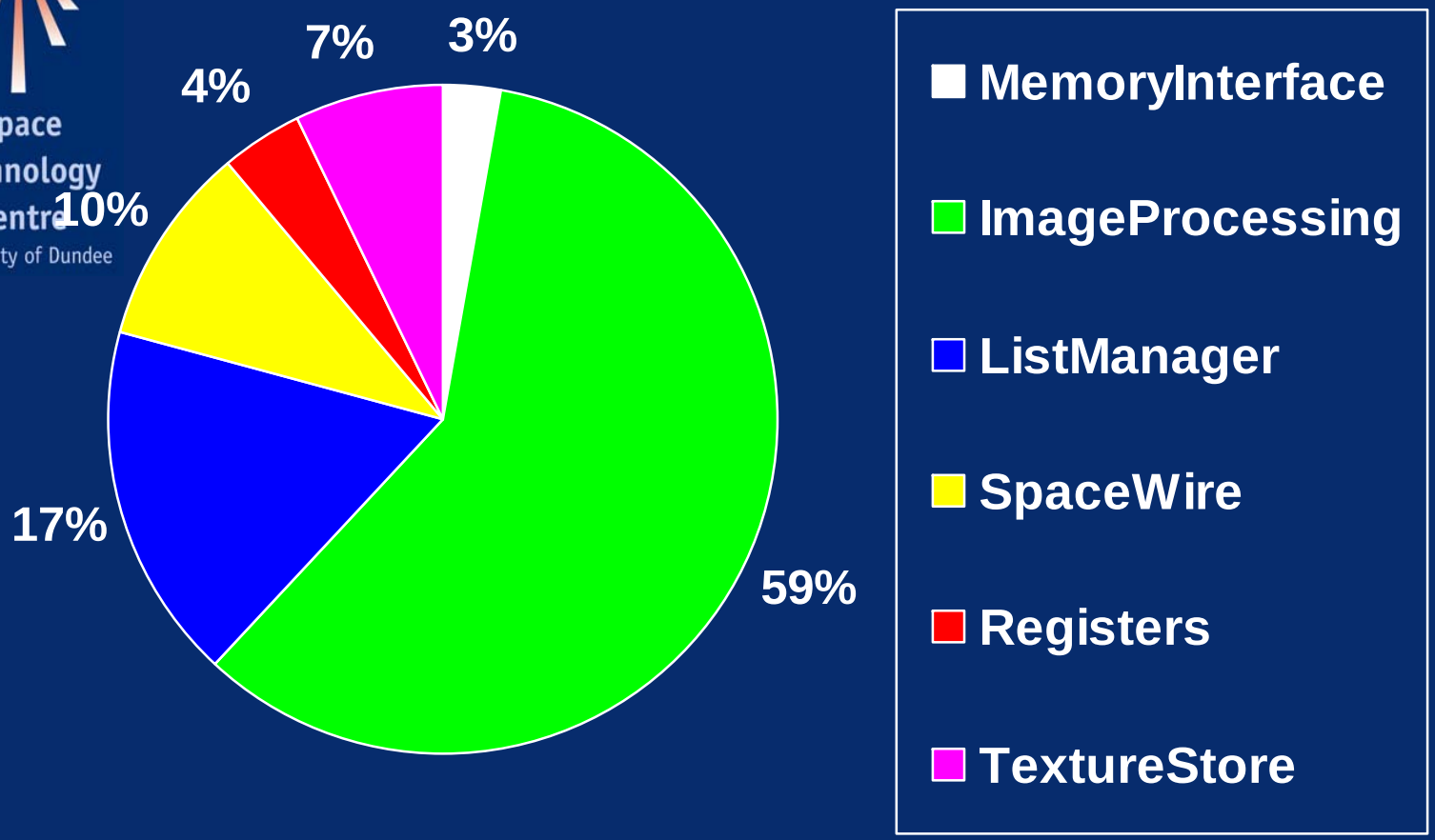
Image Processing Chip




WARNING !
Do not connect external power
if board is in PCI Slot
PMCMB-SRAM
EADS ASTRIUM
CI 208038E-00
CC8 must not be soldered if board is in PCI Slot

Xilinx V6000 Usage



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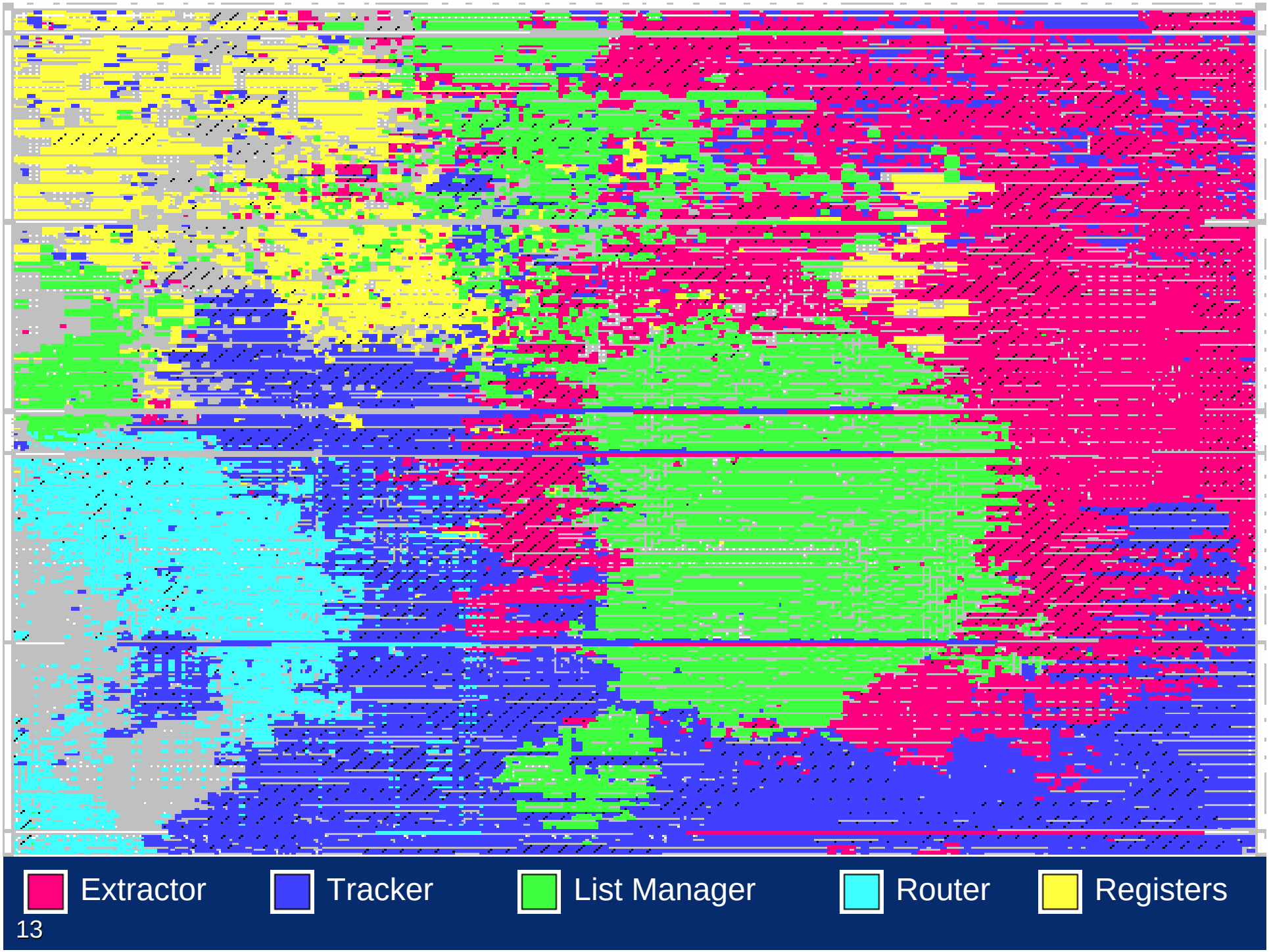
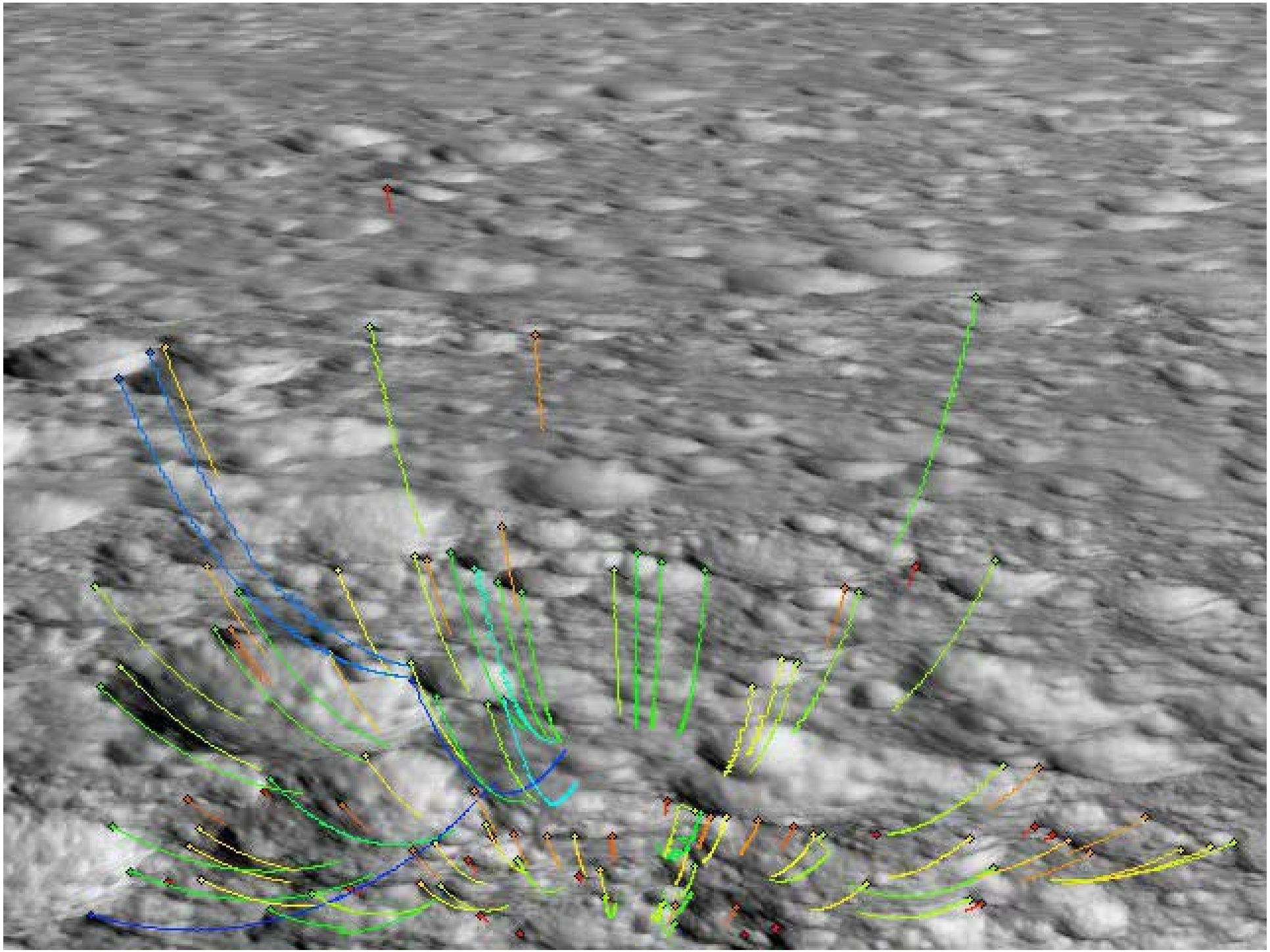
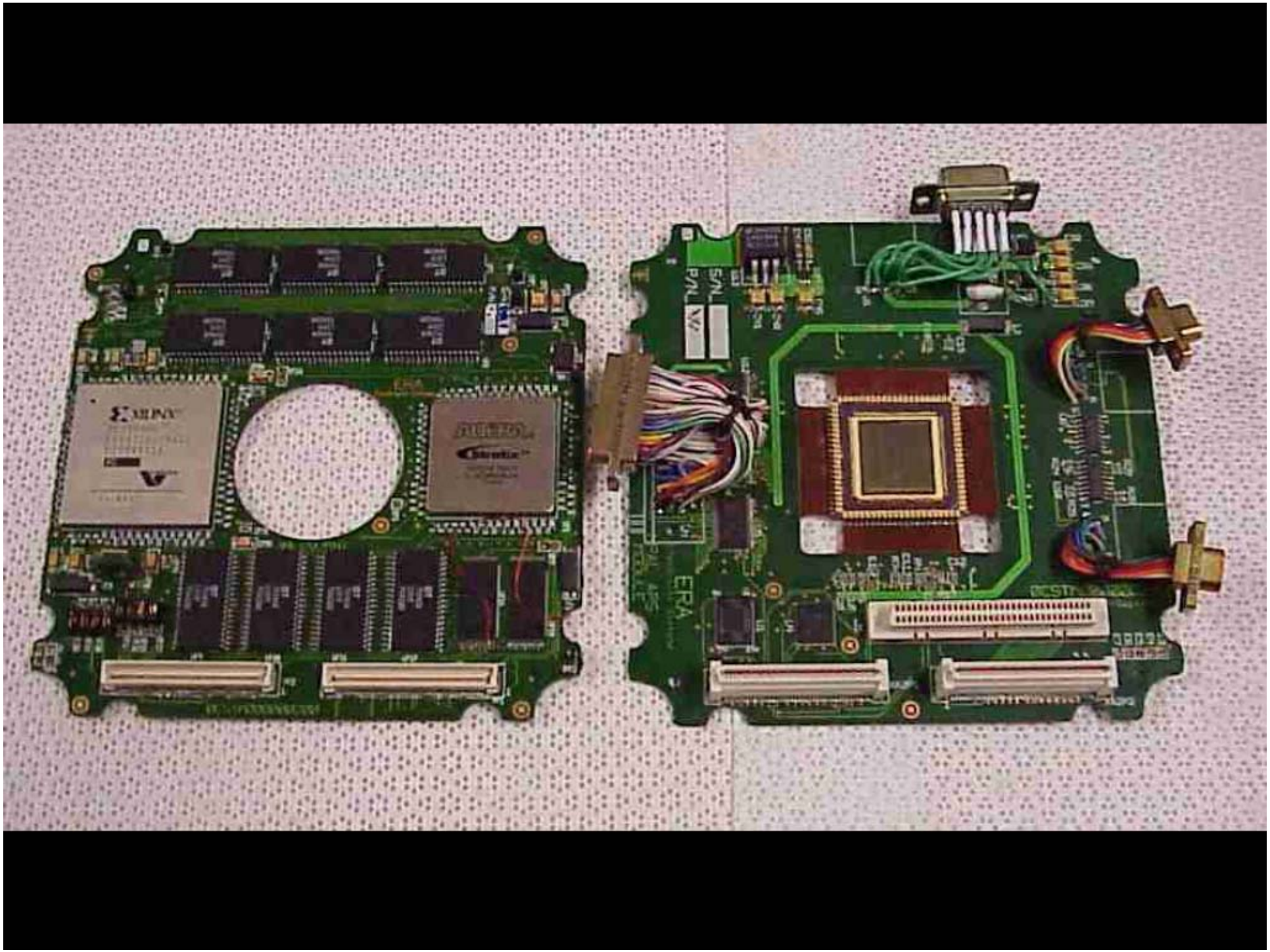

Extractor
Tracker
List Manager
Router
Registers






1
0.3
2
0.7
3.5
2
8 5.6 4 2.8 2 1.4

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SpaceWire Intelligent Camera

- Use of SpaceWire
  - Reduced pin count
  - Reduced power consumption
  - Enabled remote GNC
  - Loosely coupled, highly cohesive
  - Readily available SpaceWire test and development equipment
  - Proven SpaceWire Router IP
- Overall camera project
  - Very successful
  - Testing using helicopter planned
  - High state of technology readiness
  - Hope to see it fly to Mars
  - An enabling technology for future targeted landings