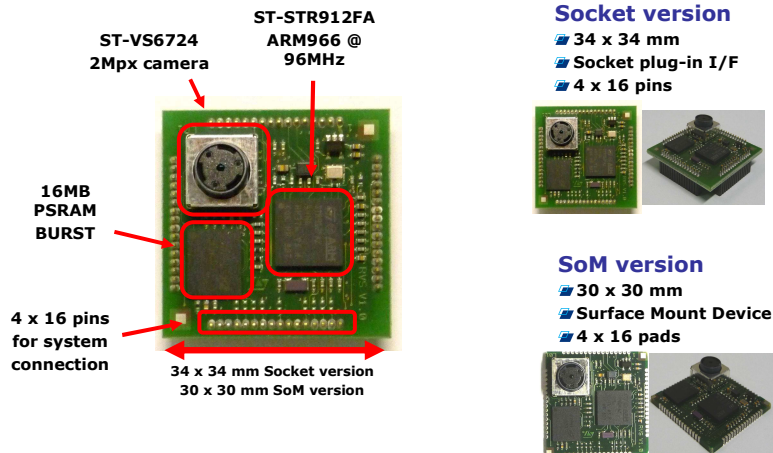


RVS v. 1.0



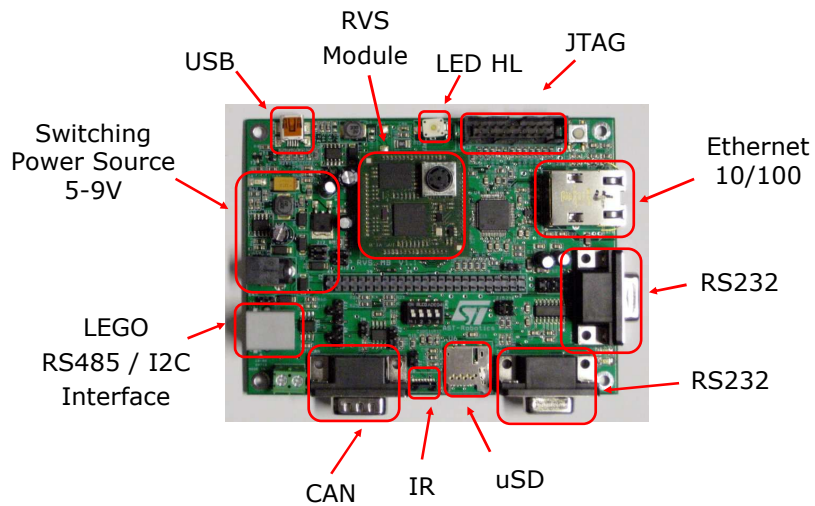
Public – Not Confidential

AST-Robotics

May 2009



RVS Development Board



Public – Not Confidential

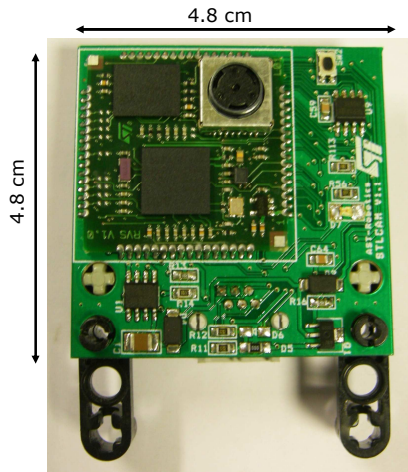
AST-Robotics

May 2009



STLCam (ST LEGO Camera)

An optimized RVS Main Board for LEGO Mindstorm NXT



- Host for Vision Module based on RVS 1.0
- Communication:
 - USB
 - LEGO - I2C / RS485
- Rear expansion connectors:
 - MII (Ethernet pins)
 - JTAG
 - GPIOs
- Features:
 - Dual power USB / LEGO
 - Reset

Public – Not Confidential

AST-Robotics

May 2009

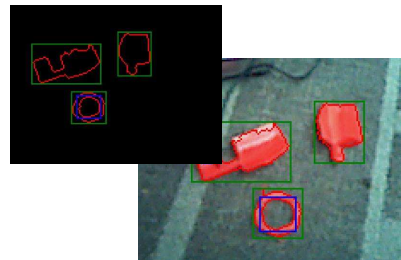


Embedded Processing

RVS Capabilities

- ETH-RT streaming: 800x600 @ 30fps
- RT processing up to 240x180 @ 30fps
- Blob analysis (Contour points, Area, Perimeter, Circularity, Outer box)
- Face detection
- Harris features extraction
- Multiple camera synchronization

Blob analysis



RVS performance table

Image resolution	160x120	240x180	240x180
Frame rate	30	30	15
Acquisition overhead	0.41%	0.62%	0.31%
Image size (pixel)	19200	43200	43200
Available instructions per image	3200000	3200000	6400000
Available instructions per pixel	166	74	148

Face detection



Public – Not Confidential

AST-Robotics

May 2009

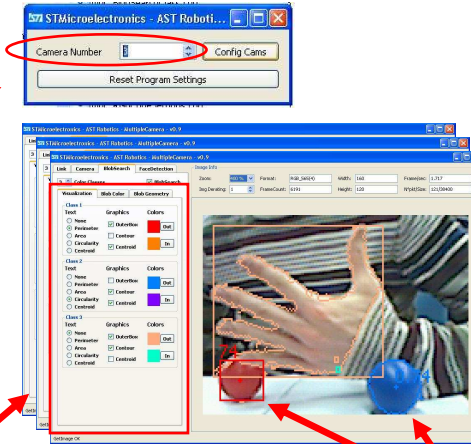


RVS PC Evaluation SW

PC imaging environment to test the functionalities of an RVS module connected via Ethernet

Features

- ▣ Multiple camera management with a single PC through Ethernet
- ▣ Pre-testing of microcontroller algorithms
 - ▣ Blob analysis
 - ▣ Face detection
- ▣ Save and Load image files
- ▣ Windows and Linux supported



Blob and graphical settings

Color blobs

Public – Not Confidential

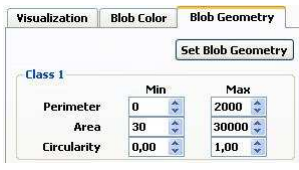
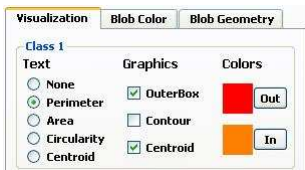
AST-Robotics

May 2009



Embedded blob analysis

- ▣ Visualization options
- ▣ Blob geometry
- ▣ Color rules



Embedded blob analysis algorithm ported both on the RVS module and on the PC evaluation software

Public – Not Confidential

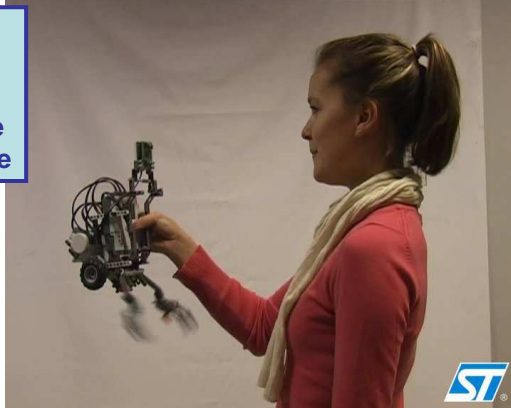
AST-Robotics

May 2009



Embedded face detection

Embedded face detection algorithm can run either on the RVS module or on the PC evaluation software



Public – Not Confidential

AST-Robotics

May 2009

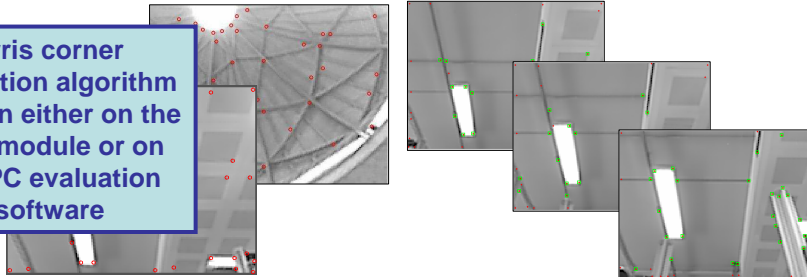


Embedded Harris

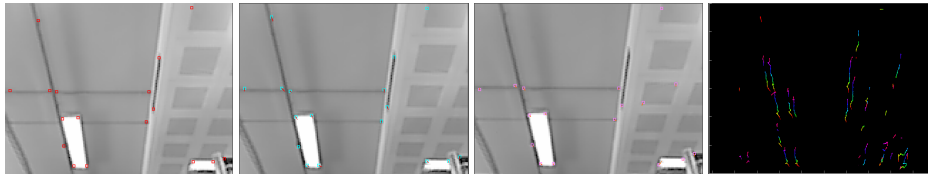
Harris Corner Extraction

Matching algorithm

Harris corner extraction algorithm can run either on the RVS module or on the PC evaluation software



Harris Movement Vectors



Public – Not Confidential

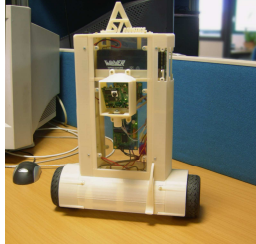
AST-Robotics

May 2009



Robots with Embedded Vision

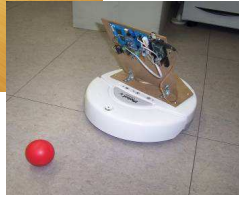
G2 ballFollower



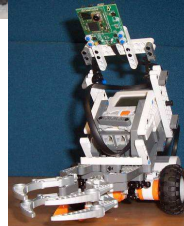
AGV-Joker



TableJoker



RoombaBot



LegoS Joker

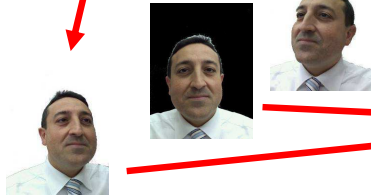
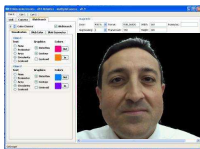
Public – Not Confidential

AST-Robotics

May 2009



Robot Avatar



This system can feed synchronized images to a PC for low cost 3D avatar reconstruction



Public – Not Confidential

AST-Robotics

May 2009

