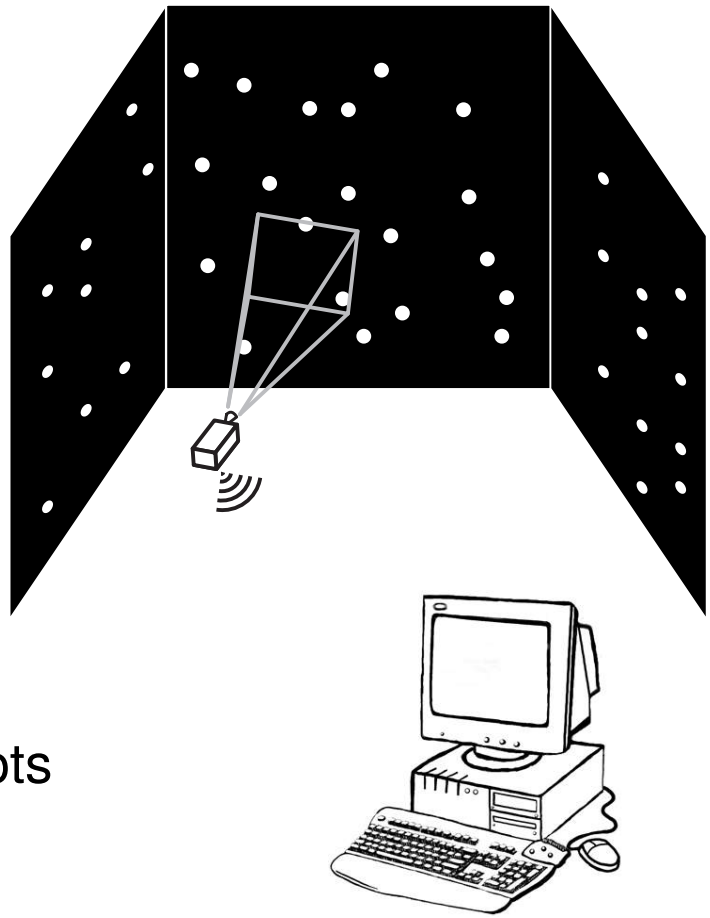
Intensity and Distance Thresholding in Hardware to Enable Flexible Blob Detection for a Vision System with Limited Bandwidth

Peter Samarin, Timur Saitov, Rainer Herpers, and Kenneth B. Kent

Bonn-Rhein-Sieg University of Applied Sciences, Germany
University of New Brunswick, Canada

Immersion Square at BRSU

- Pattern of infrared light spots
- Device: camera, FPGA, Wi-Fi
- Low bandwidth system ($\approx$ 50 Mbit/s)

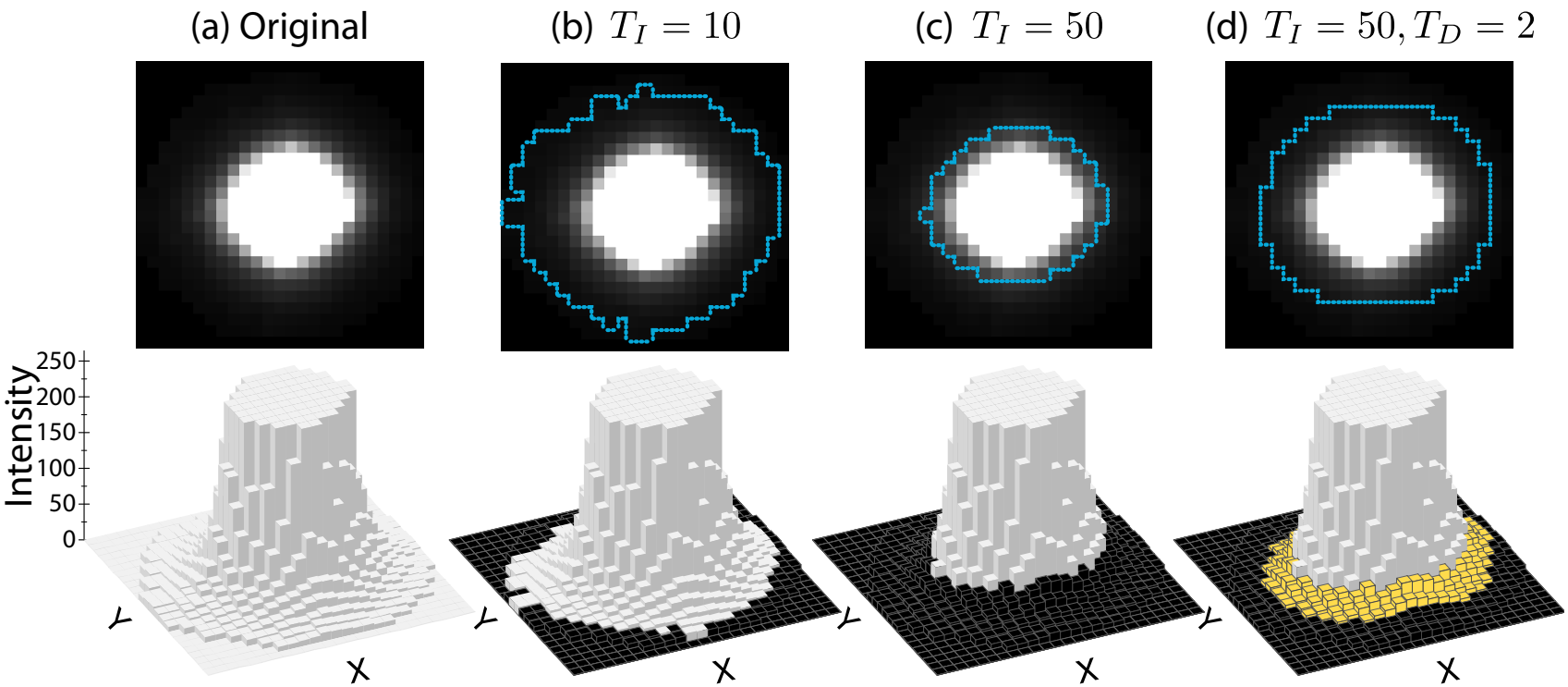


- **Problem**
  - recognition of light spots
  - computation of centers of the light spots
  - camera pose calculation

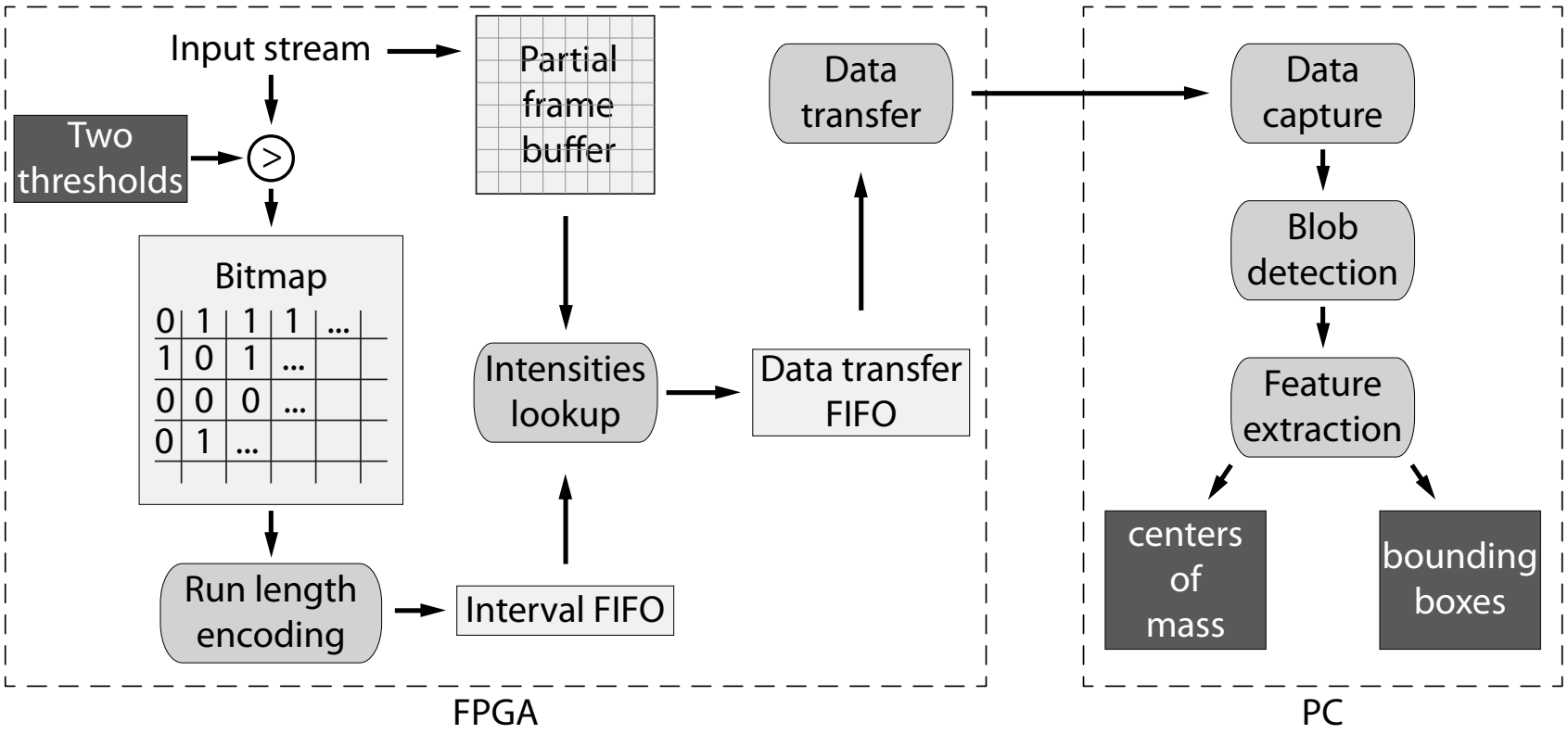
A Flexible Approach

- On FPGA
  - find foreground pixels
  - transfer the foreground pixels to the PC
- On PC
  - center of mass computation
  - match camera image with known pattern
  - compute camera position and orientation
- Advantages
  - center of mass computation is deferred
  - PC can use a wide range of algorithms to solve the problem

Finding Foreground Pixels: Two Thresholds

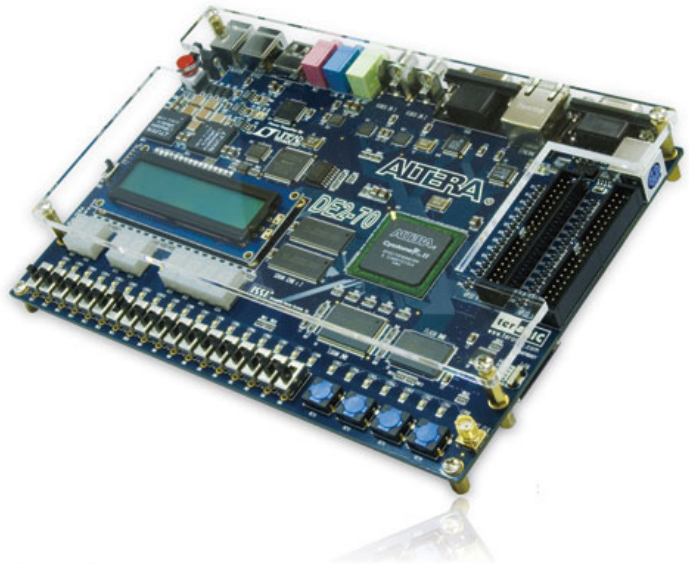


System Design



Hardware

- DE2-70 board
  - FPGA with $\approx$ 70k logic elements
  - 10/100 Ethernet interface
  - 1,024,000 bits block RAM



- mvBlueCOUGAR-X 100 camera from MATRIX VISION
  - Max. frame rate: 117 Hz
  - Resolution: 752x480 12 bits grayscale
  - Exposure time: 10 μs – 460 *ms*