Multiprocessor Implementation of a Face Detection System

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Overview

• Face detection and recognition
  – Important application for smart cameras,
  – Typically characterized by computational and memory intensive operations
  – Require significant performance for real-time realization
  – Multiprocessor implementation is an effective approach for power/performance gains for such systems
Face Detection Algorithm

Initialization

Read Img and downsample

Construct ellipse-shaped face masks

Find correlation between the Img I_d and each mask j

Find max correlation value

Mark the outline of the detected face in the image

Img I

Img I_d
Architecture for Hardware Implementation

Masks created offline

External Memory

Processing Element (PE) 1

Processing Element (PE) 2

Processing Element (PE) n

External Memory Controller

Input Interface

Output Interface

To input I/F

To eternal memory controller

I/F with External Memory Controller

Buffers to hold data from input I/F

CONTROL UNIT

Main Data Processing Unit

I/F with output I/F

Buffers to hold data from external memory

Buffers to hold results from this PE

I/F with input I/F
Architecture for Software Implementation

RI: Reads Image $I$ and downsamples it
BM$_i$: Creates the mask set for PE$_i$
PE$_i$: Computes correlation for mask set BM$_i$ and image $I$ and finds the local best match
FR: Finalize results by finding the best match amongst all the local matches and marking the outline
Pi: Processor id

4 processor implementation