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Eye Tracking System on Embedded Platform

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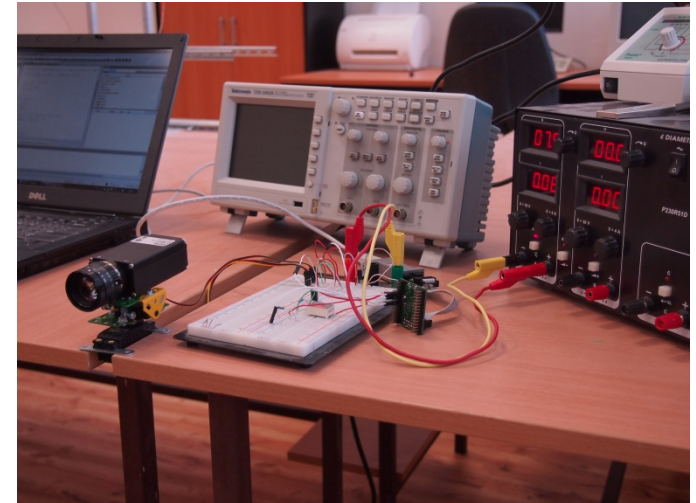
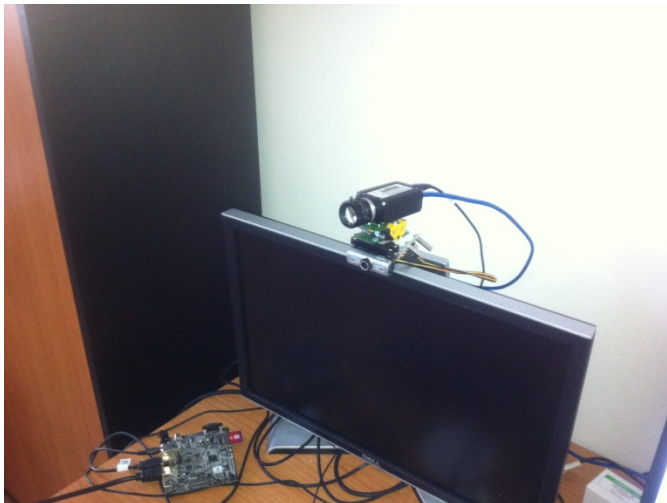
INTRODUCTION

- Main motivation for this system was the need for high definition image of eye which is fundamental for accurate gaze tracker.
- Accurate gaze tracker can be used to control PC with common GUI by gaze to help disabled people interact with PC or to improve PC work efficiency.
- High definition image is acquired from PTZ camera which is controlled by output of Eye Tracker.
- System should be composed of common components and should have compact dimensions, for easy use and implementation.



OBJECTIVES

- Evaluate eye position on embedded platform from image from standard webcam.
- Create servo driven mount for high definition camera with narrow field of view.
- Create servo driver with USB interface.
- Design simple communication protocol between servo unit and embedded platform.



MATERIAL & METHOD

- Eye position evaluation software was developed directly on Pandaboard evaluation board (Cortex A9) in C++ using feature based object detector from OpenCV library.
- Prototype of servo driven camera mount was built from two RC servos and building kit Merkur.
- Servo drive interface was based on Atmel ATMEGA32U4 providing PWM signals controlling servos and USB interface to communicate with evaluation board.
- Communication protocol between servo drive and evaluation board is using virtual COM port on USB and was implemented into both devices.



RESULTS

- Presented system is very well reflecting expectations and can be used as a part of accurate gaze tracker.
- Processing time of one frame is approx. 50ms which is sufficient for this application but it can be improved using embedded platform with higher performance.
- Direction accuracy of camera is sufficient and can be improved by distance measuring device.

