People Detection in Video Surveillance

based on Atom development kit

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"The value of an idea lies in the using of it." Thomas Edison
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Glossary

**Advanced Packaging Tool** Default package management system for Debian. [9]

**HeigVD** School of Business and Engineering Vaud. [2] [5]


**PES-IT** PES School of Engineering is a premiere Technical Education College based in Bengaluru, Karnataka. [2] [5]

**Yellowdog Updater, Modified** Default package management system for RedHat. [9]
Acronyms

CCTV Closed-circuit television. [4]

CF Compact Flash. [9]


DNS Domain Name System. [18]


OpenTLD Open Track Learn Detect. [5, 10]

PoI Person of Interest. [1]

TAR the tape archiver. [16]

UDP User Datagram Protocol. [20]

VCA Video Content Analysis. [4]
1 Scope statement

1.1 Project objective

This project will develop and deliver a new tracking system. The new system will be able to select a person on a video stream then track their movement across a large area covered by multiple movie-quality cameras. The system will be developed to be cost effective and easy to maintain. The project should be able to stop tracking a person for sometime then resume searching.

1.2 Proposed Solution

Project Person of Interest (PoI) will design, develop and deliver a new tracking system which will allow user to stay focus on a specific person across a large area covered by multiple movies camera. This project will involve the use of a video recognition system previously developed and available under license.

1.3 Requirements

The following equipment is required for the project:

Intel® Atom™ Innovation Kit

Movie camera One or more cameras/webcam that can be connected to the Innovation Kit

Documentations Documentation will be provided as unfiltered Internet access.

1.4 Deliverables

1.4.1 Proof of concept

Disc Image A digital copy of hard drive (or SD cards) used during the project

Demo A demo board installed and configured.

¹YouTube and Open-source projects repository must not be blocked
1.4.2 Report

A report describing the following part of the project written in English.

- Technical choices
- Configuration
- Deployment
- Tests
- Conclusions

1.4.3 User documentation

If relevant to the project usage, user documentation which states:

- How to track someone interactively
- How to resume searching someone
- How to save a pattern for later search

1.4.4 Presentation documents

All documents, videos, files, and slides used during the presentation must be included.

1.5 Deadline

At the end of the project (20th of June 2012), the following deliverables will be given to Pr. A.Srinivas from PES-IT:

- Proof of concept
- Report
- User documentation
- Presentation documents

Only the report will be given on 20th of June to Pr. S.Robert from HeigVD. The remaining deliverables (except the Proof of concept) will be transmitted to Pr. S.Robert during the week following the return of M.Reussner.

1.6 Owner of Deliverables

This project is developed for two different schools PES-IT (India) and HeigVD (Switzerland). The Deliverables of the project will be owned by the two aforementioned schools.
1.7 Milestones

Every Friday at 8 pm (local time UTC+05:30), a summary of the work done during the week will be sent to Pr. S.Robert (Pr. A.Srinivas can request a copy of these email if needed). On the 20th of April 2012, an intermediate report will be given to Pr. A.Srinivas and Pr. S.Robert for review.

1.8 Approved change requests

Every change on the project has to be discussed and approved by Pr. A.Srinivas and forwarded to Pr. S.Robert.

1.9 Acceptance criteria

This project evaluation will be based on

- project presentation
- project documentation
- project results

1.10 Signatures

Bengaluru, June 20, 2012

<table>
<thead>
<tr>
<th>Pr. A.Srinivas (PES-IT)</th>
<th>Pr. S.Robert (HeigVD)</th>
<th>Reussner Matthieu</th>
</tr>
</thead>
</table>

\[2\] The date was later changed to 4th of May
2 Summary

Currently, the rate at which Closed-circuit television (CCTV) are installed across the world is increasing rapidly. From the first use in 1942 in Germany to the surveillance system in London, a lot of progress have been made. They are now used for different purposes ranging from monitoring dangerous industrial processes to traffic monitoring, to the fight against crime.

Since the first use of these cameras, much research has been carried out leading to tremendous development. Steady progress has led to cheaper systems, which has led to mass deployment (particularly) in public spaces. According to CCTV advocates, these cameras are supposed to deter crime, provide evidence in criminal cases, and allow people to feel safer.

However, opponents of CCTV systems claim that systematic use of monitoring leads to the loss of privacy and has a negative impact on civil liberties such as right of privacy, political meeting, etc...

The objective of this diploma project is to build an affordable Video Content Analysis (VCA) which will be able to follow a moving object across a wide area covered by multiple sensors. An example use case might be that of tracking a specific person in a mall if suspected of theft.

In order to achieve this goal, the specification provides two tasks which are simultaneously distinct and complementary. The first task will be to set up a monitoring system using multiple embedded systems. Secondarily, to integrate some intelligence into the monitoring system.
3 Introduction

This report describes the objectives and results of a Bachelor’s thesis done in collaboration between PES-IT and HeigVD. This project was conducted between February 20, 2012 and June 20, 2012 in Bangalore (Karnataka, India).

The first goal of this project is to study the capability of a tracking software developed by “Zdenek Kalal” during his PhD thesis. This software (called Open Track Learn Detect (OpenTLD) or “Predator”), visually identifies an object and tracks it wherever it moves, regardless of the object’s ability to disappear and re-appear in the video stream. The second objective is to develop and implement an algorithm that is demonstrative of a typical use case. Finally the last objective of this project is to distribute the search of an object across a large area using multiple cameras plugged into multiple embedded systems.

For this project, a broad range of technologies and software were used. Among them Open Source Computer Vision Library, OpenTLD and ”The Spread toolkit”.
4 Planning

4.1 Part One of the project (45 days)

As detailed in the work log, the project did not follow the schedule for several reasons including two weeks of work not related to the project and various problems with OpenTLD.

![Figure 4.1: Desired schedule](image-url)
4.2 Part Two of the project (45 days)

After seeing difference between the desired planning and the real one, during the first part of the project. No real planning has been done for this part. The work done has been recorded in the work log.
5 Materials and software

5.1 Intel® Atom™ Innovation Kit Board 2

Figure 5.1: Pineview board overview

5.1.1 Overview

The kit is a fully integrated computer on one card (CPU, RAM, GPU, etc.). It was released on 11 January 2010. According to Intel, the kit halts the power of the previous version and is particularly suitable for embedded device.

5.1.2 Specifications

CPU Intel® PNV-M SC N450 1.6GHz; Intel® PNV-D DC D410/D510/ D525

South-bridge Intel® ICH8-M Chip-set

System Memory One 200-pin SODIMM Up to 2GB DDR2 667MHz SDRAM/ One 204-pin SODIMM 4GB DDR3 800MHz SDRAM (EMX-PNV-D525)

Video Output Dual View, VGA, 18-bit LVDS, Optional 48-bit LVDS Output

High Definition Audio Codec Realtek ALC888 Supports 5.1+2-CH HD Audio

Ethernet Dual Intel® 82583V Gigabit Ethernet

Expansion 1 PCI, 1 Mini PCI Express, CompactFlash reader
5.2 CompactFlash card

![SanDisk 16Gb FlashCard](image)

Figure 5.2: SanDisk 16Gb FlashCard

5.2.1 Overview

Compact Flash (CF) is a "Mass storage device" format developed in 1994 by SanDisk. It was later (1995) standardized by the "CompactFlash Association".

According to the "CompactFlash Association", even though the CompactFlash standards were first developed for cameras, it is now broadly use in embedded systems.

5.3 Gnu/Linux Gentoo

![Gentoo logo](image)

Figure 5.3: Gentoo logo

5.3.1 Overview

Gentoo Linux is an operating system based on Gnu/Linux kernel. Unlike most of other Gnu/Linux distribution, Gentoo is a rolling release—meaning the system can be updated at any time. As all modern distribution, Gentoo provide a "package management system" called "portage". Portage provides the ability to download, configure, compile, and install software. It may be differentiated from other "package manager" like Advanced Packaging Tool or Yellowdog Updater, Modified by its unique proficiency to enable or disable features of the selected program.
5.3.2 Specifications

**Flexibility** Gentoo can be customized for just about any need—from supercomputers to embedded systems.

**Speed** Gentoo can be optimized to match local hardware.

**Packages** Gentoo provides 19,234¹ packages. This variety ensures that the needed program for any project will be available.

5.4 OpenTLD

5.4.1 Overview

OpenTLD² is an implementation of the Predator algorithm for tracking objects without prior learning. The object is selected on the first frame of a video³. Predator then tracks it, learning its appearance in order to detect it. OpenTLD is able to improve its detection rate over time as it processes additional frames with the object.

5.4.2 Specifications

**Training** No off-line training

**Time constraint** Real-time performance on QVGA video stream

**Object tracking** TLD tracks only one object

**Interoperability** Windows, Mac OS X and Linux

**Input** video stream from a single camera

**Licensing** GPL version 3.0 and Commercial

5.5 OpenCV

![OpenCV logo](image)

---

¹ On February 28 2012, multiples versions of the same program are count only once
² The C/Cpp version was choosen
³ From a video file or camera
5.5.1 Overview

Open Source Computer Vision Library is a computer library for image processing released under an BSD license.

5.5.2 Specifications

**Algorithms** Version 2.3.1 include more than 2500 optimized algorithms for image processing and computer vision

**Bindings** C++, C, Python, Perl

**Interoperability** Windows, Mac os X, Linux, Android

5.6 The Spread Toolkit

5.6.1 Overview

Spread Toolkit is an open source library that provides messaging services across different computers. It provides a layer of abstraction to most of the communications across different nodes of a network.

5.6.2 Specifications

**Broadcast** Multi-cast message sending

**Group message** Messages can be sent to 1 host, 1 group, or anyone

**Strength** Reliability and ordering can be assured

**Wellknown** Part of the funding was provided by Defense Advanced Research Projects Agency (DARPA) and National Security Agency (USA) (NSA).

5.7 Microsoft LifeCam VX-1000 Webcam - Black - USB

![Webcam used for the project](image.jpg)

Figure 5.5: Webcam used for the project
5.7.1 Specifications

**Resolution** 0.3 mega-pixel - 640 x 480

**Drivers** GSPCA

**Size** Width 2.2 in / Depth 2.1 in

5.8 Library Curl

![libcurl logo](image)

**Figure 5.6: libcurl logo**

5.8.1 Overview

Libcurl allows the transfer of data using various protocols, from HTTP to Gopher. This library is used to send email through SMTP.

5.8.2 Specifications

**Protocols** FTP, FTPS, Gopher, HTTP, HTTPS, SCP, SFTP, TFTP, Telnet, DICT, the file URI scheme, LDAP, LDAPS, IMAP, POP3, SMTP and RTSP.

**Interoperability** Solaris, NetBSD, FreeBSD, OpenBSD, Darwin, HPUX, IRIX, AIX, Tru64, Linux, Unix-Ware, HURD, Windows, Symbian, Amiga, OS/2, BeOS, Mac OS X, Ultrix, QNX, OpenVMS, RISC OS, Novell NetWare, DOS

**License** Open source license based on MIT/X

5.9 Library Off-The-Record

5.9.1 Overview

Off the Record library provides the base64 encoding function used to encode images inside an email.
6 Schema

6.1 Global

As shown on figure 6.1, the project once deployed is composed of different elements:

Sensor Multiple sensors as described in 6.2

Network A network which allow multi-cast data(without firewall to get best result if possible)

Object of interest An item (person or object) who will be tracked by the sensor network

Security officer Someone who will watch the video stream and report any suspicious activity

6.2 Sensor

Atom Board This is the "brain" of the sensor, all calculations happen here.

Movie camera This is the "eye" of the sensor.
Reussner Matthieu

**Power supply** To be fully autonomous, the sensor can be plugged into a battery or if the system needs to stay on for an extended period of time, directly into sector AC.

**Network connection** This allows the sensor to share pictures to the other sensors and to the Security officer.

![Sensor Diagram](image)
7 Installation

7.1 Operating system

This section assumes that the reader has prior knowledge of the Unix command line interface (CLI) and is using a Gnu/Linux distribution. This section covers the basis for installing a Gentoo system—more information can be found in the "Gentoo Handbook"[9]

7.1.1 Downloading and installing the base system

Preparing the Disks

Even though it is possible to use only one partition for the operating system, it’s almost never done in practice. The first step is to split the cf card in smaller partitions. This step was done using fdisk from a terminal though it can also be done using a graphical user interface (GUI).

```
1 steelbook ~ # fdisk /dev/sdb
2
3 Command (m for help): p
4
5 Disk /dev/sda: 3997 MB, 3997163520 bytes
6 255 heads, 63 sectors/track, 485 cylinders, total 7806960 sectors
7 Units = sectors of 1 * 512 = 512 bytes
8 Sector size (logical/physical): 512 bytes / 512 bytes
9 I/O size (minimum/optimal): 512 bytes / 512 bytes
10 Disk identifier: 0x00054b7c
11
12 Device Boot Start   End     Blocks  Id  System
13 /dev/sdb1 * 62 198275 99107 83 Linux
14 /dev/sdb2 198276 2150531 976128 83 Linux
15 /dev/sdb3 2150532 7806959 2828214 83 Linux
16
17 Command (m for help):
```

Listing 7.1: Partition on the CF card

As shown on figure[7.1] 3 partitions were created.

- **sdb1** Size: 100 Mo, FS Type: ext2, Flags: Boot, Mount Point: /boot
- **sdb2** Size: 1.0 Go, FS Type: swap
- **sdb3** Size: 2.8 Go, FS Type: ext3, Mount Point: /
Creating file-systems

The different file systems were created using the following commands:

```plaintext
1 steelbook ~ # mkfs.ext2 /dev/sdb1
2 [...]
3 steelbook ~ # mkfs.ext3 /dev/sdb3
4 [...]
5 steelbook ~ # mkswap /dev/sdb2
6 [...]
```

Listing 7.2: Creation of the file system on the CF card

Mounting file-system

After splitting the CF and creating a filesystem on the resulting partition, mount the filesystems with the following commands:

```plaintext
1 steelbook ~ # mkdir -p /mnt/gentoo
2 steelbook ~ # /dev/sdb3 /mnt/gentoo
3 steelbook ~ # mkdir /mnt/gentoo/boott
4 steelbook ~ # mount /dev/sdb1 /mnt/gentoo/boott
```

Listing 7.3: Mounting partition

Downloading the base system and Portage files

Unlike most of Gnu/Linux distribution, Gentoo’s base layout is provided as a simple tape archiver (TAR) archive. It can be downloaded from various mirrors:

```plaintext
1 steelbook ~ # cd /mnt/gentoo/
2 steelbook gentoo # wget http://gentoo.cs.nctu.edu.tw/gentoo/releases/x86/current-stage3-stage3-i686-20120221.tar.bz2
3 steelbook gentoo # tar xjpf stage3*.tar.bz2
4 [...]
5 steelbook gentoo # cd
7 steelbook ~ # tar xjpf portage-latest.tar.bz2
8 [...]
```

Listing 7.4: Downloading and extracting Gentoo stage 3 and Portage files

Copying modified configuration files

The following files must be replaced by those provided:

- `/etc/udev/rules.d/70-persistent-net.rules`
- `/env.sh`
- `/etc/kernels/kernel-config-x86-3.2.1-gentoo-r2`
- `/etc/make.conf`

---

\[nctu.edu.tw\] was chosen for its speed from PES-IT. From Switzerland, the best choice is mirror.switch.ch
7.1.2 Enter the new installation environment

Once all the previous operations have been completed, the next operation is to change the root (/) value:

```
1 steelbook ~ # cp -L /etc/resolv.conf /mnt/gentoo/etc/
2 steelbook ~ # mount -t proc none /mnt/gentoo/proc
3 steelbook ~ # mount -o bind /dev /mnt/gentoo/dev
4 steelbook ~ # chroot /mnt/gentoo/env.sh
```

Listing 7.5: Changing root value

7.1.3 Installing and configuring the Kernel

On Gentoo, the process of configuring, building, and installing a kernel can be done with genkernel. This tool automates the process.

```
1 (chroot) hostname ~ # emerge genkernel =sys-kernel/gentoo-sources-3.2.1-r2
2 [...] 
3 (chroot) hostname ~ # cd /usr/src/
4 (chroot) hostname src ~ # rm linux
5 (chroot) hostname src ~ # ln -s linux-3.2.1-gentoo-r2 linux
6 (chroot) hostname src ~ # genkernel all & echo "Time to have a nap or dring some tee"
7 [...] 
```

Listing 7.6: Building the kernel

7.1.4 Installing and configuring the Boot-loader

EXTLinux from SysLinux was chosen as the project boot-loader, mainly because of it’s size and speed. It can be installed on the CF card with the following commands:

```
1 (chroot) hostname ~ # emerge sys-boot/syslinux
2 (chroot) hostname ~ # mkdir /boot/extlinux/
3 (chroot) hostname ~ # cd /boot/extlinux/
4 DEFAULT gentoo
5 
6 LABEL gentoo
7 KERNEL /kernel-genkernel-x86-3.2.1-gentoo-r2
8 INITRD /initramfs-genkernel-x86-3.2.1-gentoo-r2
9 APPEND real_root=/dev/sda3
10 
11 ctrl-d
12 (chroot) hostname ~ # extlinux --install /boot/extlinux
13 (chroot) hostname ~ # cd /boot
14 (chroot) hostname boot #ln -s . boot
```

Listing 7.7: Installing the boot-loader
7.1.5 Configuring the Network

Configuring interface name and IPv4 address

For this project, a trick was used to only have 1 cf card image but different IPv4 address without a DHCP server. The physical interfaces are renamed based on their MAC address. This is done by matching the "ATTRaddress" variable from /etc/udev/rules.d/70-persistent-net.rules with the MAC address, then a unique name must be assigned. Consequently, all init services who require net as a dependency will not be able to start without "-D" option.

Then interface name must match their configuration in /etc/conf.d/net as show on Listing 19.2. The last part of the network configuration is adding the name of the embedded inside hosts file. By doing this, the network will not need a Domain Name System (DNS) server.

Configuring multi-cast address

A new static route must be created to the multi-cast address. The kernel will then be able to receive and dispatch multi-cast data. This is done as shown on Listing 19.2.

7.1.6 Installing and configuring of miscellaneous applications and library

The following packages need to be installed on the embedded system:

- **iproute2**: command line tool to deal with routing and IP address
- **awesome**: Windows manager
- **xorg-server**: X servers
- **opencv**: A collection of various computer vision algorithms
- **dhcpcd**: DHCP client
- **xterm**: terminal
- **mplayer**: Media Player for Linux
- **libotr**: provides functions to send email
- **net-misc/curl**: provides functions to send email

```
1 (chroot) hostname ~ # emerge iproute2 net-misc/dhcpcd xterm xorg-server mplayer
   media-libs/opencv x11-wm/awesome net-misc/curl net-libs/libotr
2 [...]
3 (chroot) hostname ~ # useradd -m graphic
4 (chroot) hostname ~ # echo 'exec /usr/bin/awesome' > /home/graphic/.xinitrc
```

Listing 7.8: Installation and configuration of miscellaneous applications

7.2 Messaging service

As specified on section 5.6, Spread is used as a messaging bus to transmit data across the different embedded systems.
7.2.1 Installing the Spread toolkit

The spread toolkit is tagged as `arch`, which means it is considered as not sufficiently tested to be included in the default branch. Since this package is highly specific, it is usually tagged as unstable. Before installing this package, the protection needs to be overridden (11-34).

```bash
(chroot) hostname ~ # emerge net-misc/spread --autounmask-write -av
```

Calculating dependencies... done!

```
[ebuild N ""] net-misc/spread-4.1.0 0 kB
```

Total: 1 package (1 new), Size of downloads: 0 kB

The following keyword changes are necessary to proceed:

```
#required by net-misc/spread (argument)
```

```
=net-misc/spread-4.1.0 x86
```

Would you like to add these changes to your config files? [Yes/No] Yes

Autounmask changes successfully written. Remember to run etc-update.

```
[...]
(chroot) hostname ~ # etc-update
```

Scanning Configuration files...

The following is the list of files which need updating, each configuration file is followed by a list of possible replacement files.

```
1) /etc/portage/package.keywords (1)
```

Please select a file to edit by entering the corresponding number.

```
(don’t use -3, -5, -7 or -9 if you’re unsure what to do)
```

```
(-1 to exit) (-3 to auto merge all remaining files)
```

```
(-5 to auto-merge AND not use ‘mv -i’) 
```

```
(-7 to discard all updates) 
```

```
(-9 to discard all updates AND not use ‘rm -i’): 1
```

Replacing /etc/portage/package.keywords with /etc/portage/._cfg00000.package.

```
mv: overwrite ‘/etc/portage/package.keywords’? yes
```

Exiting: Nothing left to do; exiting. :) 

```
(chroot) hostname ~ # emerge net-misc/spread
```

```
[...]
```

Listing 7.9: Installing the messaging system

7.2.2 Configuring the Spread toolkit

All aspect of the configuration of the Spread toolkit is done by altering the file /etc/ spread.conf The appropriate file for the project is provided on Listing 19.9
8 Transmission of data

8.1 Schema

![Diagram showing transmission of data across the network.](image)

Figure 8.1: Transmission of data across the network

8.2 Overview

As shown on figure 8.1, the data is packed and then compressed before being sent on the network. On the opposite side, they are uncompressed before being used.

8.3 Technical description

As the spread toolkit limits the payload size to 100 Kilo Octet and 2 pictures with a resolution of 320x240x1 (width X height X depth) weight about 192 Ko, it was not possible to send this amount of data without compressing it. The z library was chosen as it provides a good trade-off between size and CPU usage. On average, after compression, the data (2 pictures + context) weighs 79.257 Ko. This allows the compressed data to be sent inside 1 packet, which limits the delay between transmitting and receiving the pictures.

As shown on figure 8.2, the data is similar to Matryoshka dolls. They are first compressed with zlib, and then wrapped by the spread toolkit. All the data is then sent to a multi-cast address (224.0.0.1) as User Datagram Protocol (UDP) message. This methodology allows the sender to pass the data in a single transmission to many receivers without overloading the network.
8.4 Implementation

8.4.1 Data

For this project the data that will be transmitted is packed in a structure as shown on Listing 19.13. The fields used are described below:

- **pic1** memory space to store the previous picture (needed by openTLD to track)
- **pic2** memory space to store the actual picture
- **LBBx** X coordinates of the top-left corner of the box bounding the previous object
- **LBBy** Y coordinates of the top-left corner of the box bounding the previous object
- **LBBwidth** Width of the box bounding the previous object
- **LBBheight** Height of the box bounding the previous object
- **BBx** X coordinates of the top-left corner of the box bounding the object
- **BBy** Y coordinates of the top-left corner of the box bounding the object
- **BBwidth** Width of the box bounding the object
- **BBheight** Height of the box bounding the object
- **timer** Timestamp of the second picture
- **status** Object is present on the actual picture
9 Notifications

9.1 Schema

![Notifications Figure](image)

Figure 9.1: Notifications

9.2 Technical description

Every time an alert is triggered, the main embedded board sends an E-mail. As shown in figure 9.2, the E-Mail includes some information about the camera and as attachment, a picture from the detected object.

9.3 Implementation

The notification system is implemented using 2 libraries

- libcurl
- libotr from cypherpunks
9.3.1 libcurl

The curl library is used during this project for the following task:

**Connection** to the smtps server

**Verification** of the ssl/tls certificate

**Generating** most of the header

**Sending** the email

9.3.2 libotr

The Off-The-Record (OTR) library from "Cypherpunks" allows any kind of message to be encrypted. During this project, the library is used not to encrypt data but to encode it as base64.
10 Results

10.1 Definition

To measure the quality of the results, two notions are essential:

Recall is the number of object correctly found divided by the total number of object

Precision is the number of relevent object found divided by the total number of object found.

10.2 Methodology

Two movies of about 30 seconds are recorded then split into frames. Each frame is then labelled as positive or negative. If the frame is labeled as positive, the position of the object is also compared with the real position. The program is then run on each video and the results compared with the manual labelling.

10.3 Raw data

Table 10.1 summarizes the result of the experiments. In the FINAL report, the results will be discussed in greater detail.

<table>
<thead>
<tr>
<th></th>
<th>Movie 1</th>
<th>Movie 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall</td>
<td>27%</td>
<td>24%</td>
</tr>
<tr>
<td>Precision</td>
<td>97%</td>
<td>89%</td>
</tr>
<tr>
<td># of frames</td>
<td>549</td>
<td>415</td>
</tr>
<tr>
<td># of positives frames</td>
<td>286</td>
<td>251</td>
</tr>
<tr>
<td># of negatives frames</td>
<td>263</td>
<td>164</td>
</tr>
</tbody>
</table>

Table 10.1: Result of the first part (rounded value)

10.4 Interpretation

As shown in table 10.1 Recall is too low for this system to work in real life.
10.4.1 Recall

Within the context of the object detection, the recall is the ratio of object found. Table 10.1 clearly show that most occurrence of the person are not found.

10.4.2 Precision

Within the context of the object detection, the precision is the ratio of real object found versus the false positive. Table 10.1 show that the number of false positive is low.
11 Problems

11.1 Network

The internet connection of PESIT is filtered by a network appliance called "FortiGate". During the realisation of this project, three different compartments of the "box" were observed:

- Block of some website (tcp port 80 and 443) but no alteration of other data
- Man In The Middle for ssl connection
- Block of every thing except tcp port 0,53,80,443

The first blocking techniques can easily be circumvented. The third one required a computer outside the network listing for incoming connection on one of the "free" port.

11.1.1 Block of specific website

Nothing has to be done. smtp.gmail.com was not blocked.

11.1.2 Man In The Middle

As shown on listing 11.1, the certificate for Google smtp can’t be trusted. The Certificate Authority who sign it is not "Google Internet Authority" but "Fortinet"

```
1 * Server certificate:
2   subject: C=US; ST=California; L=Mountain View; O=Google Inc; CN=smtp.gmail.com
3   start date: 2011-11-18 01:57:17 GMT
4   expire date: 2012-11-18 02:07:17 GMT
5   issuer: C=US; ST=California; L=Sunnyvale; O=Fortinet; OU=Certificate Authority
           CN=FortiGate CA; emailAddress=support@fortinet.com
6   SSL certificate verify result: self signed certificate in certificate chain (19)
    , continuing anyway.
```

Listing 11.1: Certificate informations

The correct certificat can be seen on figure 11.2

```
1 * Server certificate:
2   subject: C=US; ST=California; L=Mountain View; O=Google Inc; CN=smtp.gmail.com
3   start date: 2011-11-18 01:57:17 GMT
4   expire date: 2012-11-18 02:07:17 GMT
5   issuer: C=US; O=Google Inc; CN=Google Internet Authority
6   SSL certificate verify ok.
```

Listing 11.2: Certificate informations
This block is more an annoyance than something really efficient. In this case, adding the following line and creating a disposable gmail account is enough.

```c
1 curl_easy_setopt(curl, CURLOPT_SSL_VERIFYHOST, 0L);
```

Listing 11.3: Certificate informations

### 11.1.3 General Block

Presently, all tcp port but 53,80,443 are blocked by the fortigate bastion. The only way around is to use a server listening on one of the “free” port. The server will then retransmit the data to smtp.gmail.com.

As shown in figure 11.4 acces in denied to Google smtp.

```bash
1 $ openssl s_client -showcerts -connect smtp.gmail.com:465 < /dev/null
2 connect: Connection timed out
3 connect: errno =110
```

Listing 11.4: Denying access to smtps

As the block will not be present once the system is deployed, an elegant solution based on OpenSSH “localforward” is used. The necessary step are shown in figure 19.14 and 19.15.

### 11.1.4 Consequences on the project

About 1.5 day was lost due to the changes of the network policies. The changes don’t imply any modification of the project itself.

### 11.2 Predator

The version of OpenTLD used during this project is not able to recognize the object under the following circumstances:

- Rapid movement of the object
- Long disappearance of the object
- Partial view of the object if moving

#### 11.2.1 Consequences on the project

The most important part of the project is based on OpenTLD, any change impact the whole work done during the last 2 month.

Following the problems encountered, the project can’t be use as define in the "Scope statement”. The risk of missing something important / dangerous is too big.

For instance, a thief trying to leave the premise of PESIT, is likely going to run. In this case, the system will not be able to follow him.

---

1The ”Proxy” has acces to plain text data
2From alantrrs on github
12 Change from the initial objectives

12.1 Reason

Following the disappointing results observed in 10.1 and after a talk with Pr.A.Srinivas, it was decided to change the orientation of the research.

12.2 Conservation of some part of the project

The main subject (object detection) of the project is kept as well as the following parts:

- Embedded system
- Notifications system
- Transmission between the embedded boards

The main change on the project is the algorithm responsible to detect the objects of interest. In the first part, OpenTLD was the choosen algorithm, this part is done using Haar-like features from OpenCV. Also, the part responsible for sending and receiving has to be updated. On the first part, only one object was tracked, during the second, multiple occurences of an object can be tracked at the same time.
13 Cascade of Boosted Classifiers Based on Haar-like Features

13.1 Description

Haar-like features are heavily used in computer object recognition, mostly for its calculation speed and its adaptability.

A set of pictures of the particular object of interest is processed offline, a file containing all the results is created. Later all the region of interest of the pictures are then compared with the file.

13.2 Theory

Haar-like features work by splitting the picture into squares. For each square the algorithm sums all the pixel, then calculate the difference between these number. The difference is then converted as binary based on a threshold. The thresholded values are then compared to the “database” of value. Figure 13.1 show the different steps needed to detect an eye.

![Figure 13.1: Steps of haar-like features detection](image)

(a) Original picture  (b) Training result  (c) Splitting

(d) Binary conversion  (e) Comparing  (f) (optional) drawing
13.3 Generation of the Haarcascade with OpenCV

6 steps are required to generate a Haarcascade classifier:

**Collecting** a large collection of images with and without the object of interest

**Cropping** all the pictures containing the Object of interest

**Packing** all the positives images in a single vector file

**Training** of the classifier

**Merging** all the trained cascade in a single xml file

**Testing** the haar-like cascade to detect an object

13.3.1 Installation of the training program

Generating haarcascade is a CPU Intensive process, which can’t be done in a timely fashion on the embedded board. For this reason, another computer with an Intel i5 CPU and 4 Go of ram was used. The system use Ubuntu 11.10 code name Oneiric Ocelot as an operating system and OpenCV 2.3.

Thanks to M.Gijs Molenaar, the installation is as straightforward as

- add 2 repository
- updating local package cache
- installing a package

The following commands install OpenCV on Ubuntu 11.10 without going through the though process of compiling OpenCV and it’s dependencies.

```
1 buildCascade ~ $ sudo su -
2 Password: 1234
3 buildCascade ~ # add-apt-repository ppa:gijzelaar/cuda
4 [...]
5 buildCascade ~ # add-apt-repository ppa:gijzelaar/opencv2.3
6 [...]
7 buildCascade ~ # apt-get update
8 [...]
9 buildCascade ~ # apt-get install libcv-dev
10 [...]
```

Listing 13.1: Installing OpenCV on Ubuntu

13.3.2 Sources images

The Collection of sources images need to be split in 2 different group. One containing all the pictures of car called positive and one with all the remaining pictures called negative.
Positives images

The positive images need to be cropped to contain only one object, then "tagged". During this project, "Gwenview" is used for this task.

Once this task completed, a file containing the following fields need to be written:

- filename
- number of object in the picture
- top left x coordinate of the object
- top left y coordinate of the object
- width of the object
- height of the object

The following listing 13.2 shows the content of a sample file

```bash
# [filename] [number of objects] [[x y width height] [ ... 2nd object] ...]
positive/image_00000_1.png 1 0 310 268
```

Listing 13.2: Sample from positive.txt

The labeling phase can be done with the following script:

```bash
#!/usr/bin/env bash

for foo in $(file positive/* | tr -d ' ')
do
    FILENAME=$(echo $foo | cut -d : -f1)
    SIZE=$(echo $foo | cut -d , -f2)
    WIDTH=$(echo $SIZE | cut -d x -f1)
    HEIGHT=$(echo $SIZE | cut -d x -f2)
    echo $FILENAME 1 0 $WIDTH $HEIGHT
done
```

Listing 13.3: Labelling

Negative images

The negative pictures don’t need to be cropped. Neither did they need to be tagged. The only task is to generate a text file containing the path of all the pictures. The easy way to do it, is to use “find negative/ > negative.txt”.

13.3.3 Generation of the vector

The vector of positive pictures is generated by the following command:

```bash
opencv-createsamples -info positive.txt -vec vecfile.vec \ 
-num $($(cat positive.txt | wc -l) -1)
```

Listing 13.4: Generation of the vector

The command shown in listing 13.4 counts the number of pictures listed in positive.txt then generate a vector using the opencv-createsamples application.
13.3.4 Training of the classifier

The commands shown in listing 13.5 generate a classifier using 3.6Go of RAM in the haar folder, then convert it to an xml file named haarCascade.xml.

```
1 opencv=haartraining −data haar −vec vecfile.vec −bg negative.txt −nstages 25 −mem 3600 −mode all
2 ./convert_cascade −−size=“30x33” haar haarCascade.xml
```

Listing 13.5: Training of the classifier

13.4 Test of the classifier

13.4.1 Subjective assessment

Due to time constraints, only subjective tests have been made. The results seem to be promising with no false positive and high detection rate.
14 New notification system

A new notification system was developed and integrated to the project. The notification system is called "The WALL"

14.1 Schema

14.1.1 Schema of the Wall

![Image of the Wall]

Figure 14.1: The Wall

14.1.2 Logical connection

14.2 Implementation

The implementation of "The WALL" rests on the following software:

- OpenCV
- Gstreamer

The main system board (embedded0) receive information from the sensors through spread. The system generates an image corresponding to 9 screens and forwards it on the internal network of the wall. The
other embedded systems retrieve the video stream, cut the portion corresponding to their screens and displayed the video.

14.2.1 Technical description

Network

To make the system extensible, images are transmitted in "multicaste". This allow the streaming of the video once to an unlimited number of clients. Inside "The Wall", the ip 224.0.0.1 is used.

Multimedia

The pair of framework GStreamer-OpenCV multimedia is used to generate a video, it is then encapsulated and transmitted via the network. A program specifically developed for the occasion generates the image corresponding to the screen wall, writes the contents to a file type "FIFO". The contents of that file is then injected into a gstreamer’s pipeline. GStreamer is responsible for preparing the data and then transmitting them via the network using the RTP protocol.

14.3 Making

The fabrication of the notification system has been outsourced to a fabricator in Bangalore suburb. The address is Vaishnavi Controls Acoustics, Kanakapura Road, Bangalore-560062
14.4 Product

The final product weighing several dozen kilograms and measuring several meters, it is therefore not possible to produce a copy for HeigVD. Therefore a gallery photo and video are different available at the following address: http://vps.reussner.ch/Wall/. Two representative photos are attached in the annexes.

14.5 Problems

Currently the system is not fully achieved. More than half (5/8) of the Embedded systems in possession of PESIT are defective. To validate the concepte, it was decided to use desktop computer temporarily. This change lead to heavy modifications to the operating system and to the project source code of the project.

14.6 Realisation

14.6.1 Installation of the operating system on the embedded board

As specified in the "Problems" section, the GNU/Linux distribution used had to be changed to support PC. Currently a minimal version of ubuntu is used. It was generated using "debootstrap" scripts as shown below:

```
1 root@steelbook # mkdir /mnt/cle
2 root@steelbook # mount /dev/sdb3 /mnt/cle
3 root@steelbook # mkdir /mnt/cle/boot
4 root@steelbook # mount /dev/sdb1 /mnt/cle/boot/
5 root@steelbook # debootstrap --verbose --variant=minbase --arch i386 precise /mnt/cle/
6 root@steelbook # mount -o bind /dev /mnt/cle/dev
7 root@steelbook # mount -t proc none /mnt/cle/proc
8 root@steelbook # cp -L /etc/resolv.conf /mnt/cle/etc/
9 root@steelbook # chroot /mnt/cle /bin/bash
10 root@chroot # apt-get update
11 root@chroot # apt-get install libgtk2.0-0 net-tools iproute linux-image \n12 gstreamer-tools gstreamer0.10-plugins-base gstreamer0.10-plugins-good \n13 xinit psmisc gstreamer0.10-ffmpeg awesome x11-xserver-utils
14 root@chroot # cat -> /etc/hostname
15 embedded0
16 ^D
17 root@chroot # mkdir /boot/extlinux
18 root@chroot # cat -> /boot/extlinux/extlinux.conf
19 DEFAULT ubuntu
20
21 LABEL ubuntu
22 KERNEL /vmlinuz-3.2.0-23-generic-pae
23 INITRD /initrd.img-3.2.0-23-generic-pae
24 APPEND real_root=/dev/sda3 root=/dev/sda3
25 ^D
26
27
28 root@chroot: # cat -> /root/.xinitrc
29 xset -dpms
30 xset s noblank
31 xset s off
32 /root/wall 'hostname|grep -o [0-9]' &
33 exec /usr/bin/awesome
```
Once the first system is configured, the fastest way to deploy other system is to make a deep copy of the memory card using “dd” as presented below. The name of the embedded system must match the following schema:

- **embedded0** for the screen 0
- **embedded1** for the screen 1
- **embedded8** for the screen 8
- **embedded9** for the full picture in one screen (debug feature)

### Listing 14.2: Deep copy

1. root@steelbook # dd if=/dev/sdb of=/dev/sd__X__ bs=8M
2. root@steelbook # mount /dev/sdc3 /mnt/cle
3. root@steelbook # mount-t proc none /mnt/cle/proc
4. root@steelbook # cp -L /etc/resolv.conf /mnt/cle/etc/
5. root@steelbook # chroot /mnt/cle /bin/bash
6. root@steelbook:# wget https://launchpad.net/~jrjohansson/+archive/spread/+build/2124936/+files/spread_4.1.0-0ubuntu2_i386.deb
7. root@steelbook:# wget https://launchpad.net/~jrjohansson/+archive/spread/+build/2124936/+files/libspread2_4.1.0-0ubuntu2_i386.deb
8. [...]
9. root@steelbook:# gpg –keyserver keyserver.ubuntu.com –recv CA70E6A9087475A0
10. root@steelbook:# gpg –export –armor CA70E6A9087475A0 | apt-key add –
11. root@steelbook:# apt-get update
12. [...]
13. Fetched 8035 kB in 60 s (132 kB/s)
14. Reading package lists... Done
15. root@steelbook:# apt-get install opencv
16. Reading package lists... Done
17. Building dependency tree

The system embedded0 need other programs and configurations:
Reading state information... Done
The following extra packages will be installed:
  libcuda4 libcufft4 libdc1394−22 libjpeg62 libnpp4 libopencv2.3 libtbb2 libusb
−1.0−0
Recommended packages:
  libcuda1
The following NEW packages will be installed:
  libcuda4 libcufft4 libdc1394−22 libjpeg62 libnpp4 libopencv2.3 libtbb2 libusb
−1.0−0 openvc
0 upgraded, 9 newly installed, 0 to remove and 0 not upgraded.
Need to get 33.7 MB of archives.
After this operation, 221 MB of additional disk space will be used.
Do you want to continue [Y/n]? Y
(...)
root@steelbook:~# dpkg −i libspread2_4.1.0−0ubuntu2_i386.deb spread_4.1.0−0
  ubuntu2_i386.deb
Selecting previously unselected package libspread2.
(Reading database ... 20004 files and directories currently installed.)
Unpacking libspread2 (from libspread2_4.1.0−0ubuntu2_i386.deb) ...
Selecting previously unselected package spread.
Unpacking spread (from spread_4.1.0−0ubuntu2_i386.deb) ...
Setting up libspread2 (4.1.0−0ubuntu2) ...
Setting up spread (4.1.0−0ubuntu2) ...
Adding group ‘spread’ (GID 105) ...
Done.
Warning: The home dir /var/run/spread you specified already exists.
Adding system user ‘spread’ (UID 103) ...
Adding new user ‘spread’ (UID 103) with group ‘spread’ ...
The home directory ‘/var/run/spread’ already exists. Not copying from ‘/etc/skel’.
adduser: Warning: The home directory ‘/var/run/spread’ does not belong to the user you are currently creating.‘
Processing triggers for libc-bin ...
ldconfig deferred processing now taking place
root@steelbook:~# rm libspread2_4.1.0−0ubuntu2_i386.deb spread_4.1.0−0ubuntu2_i386.
deb

Listing 14.3: Installation and configuration of miscellaneous applications
15 Source code and cf images

The project is split in 3 different programs. Each program includes a Makefile for easy compilation.

**wall** The program used to display the video on the notification system

**sensor** The program who detect the object and send the video

**master** The program who receive all the picture and video stream, generate the wall picture and stream it

It should be noted that if the computer used for compilation runs on Ubuntu, the program will not compile "as is". Two things need to be changed.

**Source code** In every source file, the following line need to be replace:

```cpp
1 //remove this line
2 #include <opencv2/opencv.hpp>
3 //add the following line
4 #include "opencv2/objdetect/objdetect.hpp"
5 #include "opencv2/highgui/highgui.hpp"
6 #include "opencv2/imgproc/imgproc.hpp"
```

Listing 15.1: Installation and configuration of miscellaneous applications

**Makefile** Every Makefile related to OpenCV need to be edited

```make
1 #replace this line with
2 LDFLAGS='pkg-config --libs opencv' -lz
3 #this
4 LDFLAGS='pkg-config --libs opencv|sed s/-lopencv_contrib///g' -lz
```

Listing 15.2: Installation and configuration of miscellaneous applications

15.1 shared

This folder contains 2 configuration files for the project. The resolution of the webcam can be changed here.

15.2 wall

This program need to be executed on each embedded system of the wall. It required the screen id as argument. For example: ./wall 0 for the screen 0. This program is started by xinit as stated in /root/.xinitrc.
fullscreenRTP.c  This source file is the program who display the RTP stream generate by master.

15.3 master

This folder contain the following source files and scripts used on embedded0 to receive the tagged frames from the sensor, generate the wall and stream it.

server.sh  Stream the picture of the wall from fifo.avi to the other embedded system
master.h  configuration file for master program
master.cpp  Source code

15.4 sensor

sensor.h  configuration file for sensor program
sensor.cpp  Source code

15.5 wall.dd

Backup image of the CF card of the embedded system for the wall. It should not be forgotton to change the hostname and clear the MAC address

15.6 sensor.dd

Backup image of the CF card of the embedded system for the the sensor. It should not be forgotton to change the hostname and clear the MAC address

\[1\] Most of the source code come from the website: https://gitorious.org/blog-examples/blog-examples/trees/master/fullscreen_video_with_gst_gtk no license has been apply
16 Deployment

16.1 Required Material

The following material is needed to deploy the project:

- 9 screens + power supply + cables (VGA or DVI)
- 9 embedded system for ”The Wall” + power supply
- 1 switch 9 ports for ”The Wall” + cables
- Multiples embedded system + webcam as sensor (up to 20)

16.2 Notification system (The Wall)

The easiest way to deploy ”The Wall”, is usually to use the application ”dd”. This can be done using the following commands

```
1 root@steelbook # dd if=/dev/sdb of=/dev/sd_.X_. bs=8M
2 root@steelbook # mount /dev/sd_.X_.3 /mnt/cle
3 root@steelbook # echo embedded_.Y_. > /mnt/cle/etc/hostname
4 root@steelbook # > /mnt/cle/etc/udev/rules.d/70-persistent-net.rules
5 root@steelbook # umount /mnt/cle
```

Listing 16.1: Installation and configuration of miscellaneous applications

16.3 Master node

The master node can either be install on any Wall node or alone. If installed in a Wall node, please follow the instruction in 16.1 first, then follow the instructions 14.3 then finally

```
1 root@steelbook # mount /dev/sd_.X_.3 /mnt/cle
2 root@steelbook # cat - > /mnt/cle/root/..xinitrc
3 /root/wall `hostname`|grep -o [0-9]` &
4 #Put this in a loop to catch kill by OOK
5 /root/server.sh &
6 sleep 2
7 /root/master &
8 #end of loop
9 exec /usr/bin/awesome
10 ^-D
```
### 16.4 Sensor

Deployment of the sensor is very similar to deployment of the wall node. The following command can be used:

```bash
root@steelbook # umount /mnt/cle
Listing 16.2: Installation and configuration of miscellaneous applications

1 root@steelbook # dd if=sensor dd of=/dev/sd_x bs=8M
2 root@steelbook # mount /dev/sd_x /mnt/cle
3 root@steelbook # cat - > /mnt/cle/etc/conf.d/net
4 config_eth0="192.168.19...SENSOR_ID_PLUS_1... netmask 255.255.255.0 brd 192.168.19.255"
5 routes_eth0="239.0.0.0/8 dev eth0"
6 "-D"
7 root@steelbook # > /mnt/cle/etc/udev/rules.d/70-persistent-net.rules
8 root@steelbook # echo "192.168.19...SENSOR_ID_PLUS_1... embedded...SENSOR_ID..."
9 >> /mnt/cle/etc/hosts
10 EventLogFile = /var/log/spread.log
11 EventTimeStamp
12 Spread_Segment 239.0.0.1:4803 {
13      embedded1 192.168.19.1 {
14         D 192.168.19.1
15         C 192.168.19.1
16      }
17  }
18 
19 embedded##_SENSOR_ID... 192.168.19...SENSOR_ID_PLUS_1... {
20      D 192.168.19...SENSOR_ID_PLUS_1... 
21      C 192.168.19...SENSOR_ID_PLUS_1... 
22  }
23 "-D"
Listing 16.3: Installation and configuration of miscellaneous applications
```
17 Conclusion

At the end of my internship, and I'm can say that the project developped during the last 4 month has reached a stable and usable state. Currently the status of the project is a working distributed system of sensor able to recognising an object/person on a video stream and sending alerts to a centralized notification system.

The system developped can be use as a whole or split in differences parts. The current use-case of the full system are: monitoring a very big area, searching for a specific animal in its natural habitat, etc. If not use as a whole, the system can be split in two different parts: detection system and a Synchronize multiple screen. The use cases ranged from advertisement in public places (train station, airport,..) to display of medical informations through person counting.

The project duration was not enough to explore all the aspect of the topic, therefor the following enhancements remain to be explored:

- Representing a person’s position in real time in a building
- Person identification system(can be helpful in prison, colleges, hospitals, etc).
- Extending the display from small screen devices to the Wall.

Having been able to explore the field of intelligent sensor has been very rewarding experience. Having been able to work in the young and dynamic environment of the "Nokia Lab" of PESIT has certainty contributed to the success of this internship. Having the opportunity of achieving a work of diploma abroad, particulary in Bangalore - which is known as the Silicon Valley of Asia - was an immense opportunity.

I would once again thank the following people for the assistance provided during this project: S.Robert, A.Srinivas, Kumari Radha, Nithesh K L, Vishal Gupta, Ahalya Srinivasan, Greeshma N and any members of the "Lab".
18 Bibliography


19 Annexes

19.1 Custom settings for Portage

```bash
# These settings were set by the catalyst build script that automatically
# built this stage.
# Please consult /usr/share/portage/config/make.conf.example for a more
detailed example.
CFLAGS="-O2 -march=i686 -pipe"
CXXFLAGS="${CFLAGS}"
# WARNING: Changing your CHOST is not something that should be done lightly.
CHOST="i686-pc-linux-gnu"
USE="minimal -X -cups opengl -ipv6"

# Gentoo Mirrors="http://mirrors.stuhome.net/gentoo/"
VIDEO_CARDS="intel"
```

Listing 19.1: Main gentoo configuration file

19.2 Network configuration

```bash
# This blank configuration will automatically use DHCP for any net.*
# scripts in /etc/init.d. To create a more complete configuration,
# please review /usr/share/doc/openerc/net.examples and save your configuration
# in /etc/conf.d/net (this file :![]) .

config_eth0="192.168.142.1 netmask 255.255.255.0 brd 192.168.124.255"
routes_eth0="default via 192.168.142.1"

config_eth2="192.168.142.2 netmask 255.255.255.0 brd 192.168.124.255"
routes_eth2="default via 192.168.142.1
224.0.0.0/4 dev eth0"
```

Listing 19.2: Network configuration with multicast route
19.3 Packages configurations

Listing 19.3: Per-package ACCEPT_KEYWOR(ds for profiles

Listing 19.4: Feature selection

19.4 Kernel Configuration

Listing 19.5: Feature selection
<table>
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193 CONFIG_X86_WP_WORKS_OK=y
194 CONFIG_X86_INVLPG=y
195 CONFIG_X86_BSWAP=y
196 CONFIG_X86_POPAD_OK=y
197 CONFIG_X86_INTEL_USERCOPY=y
198 CONFIG_X86_USE_PPRO_CHECKSUM=y
199 CONFIG_X86_TSC=y
200 CONFIG_X86_CMPXCHG64=y
201 CONFIG_X86_MOVD=y
202 CONFIG_X86_MINIMUM_CPU_FAMILY=5
203 CONFIG_X86_DEBUGCTLMSR=y
204 CONFIG_CPU_SUP_INTEL=y
205 CONFIG_CPU_SUP_CYRIX_32=y
206 CONFIG_CPU_SUP_AMD=y
207 CONFIG_CPU_SUP_CENTAUR=y
208 CONFIG_CPU_SUP_TRANSMETA_32=y
209 CONFIG_CPU_SUP_UMC_32=y
210 CONFIG_HPET_TIMER=y
211 CONFIG_DMI=y
CONFIG_NR_CPUS=8
CONFIG_SCHED_SMT=y
CONFIG_SCHED_MC=y
CONFIG_PREEMPT_NONE=y
CONFIG_X86_LOCAL_APIC=y
CONFIG_X86_IQ_APIC=y
CONFIG_X86_MCE=y
CONFIG_X86_MCE_INTEL=y
CONFIG_X86_MCE_THRESHOLD=y
CONFIG_X86_THERMAL_VECTOR=y
CONFIG_VM86=y
CONFIG_REBOOTFIXUPS=y
CONFIG_MICROCODE=m
CONFIG_MICROCODE_INTEL=y
CONFIG_MICROCODE_OLD_INTERFACE=y
CONFIG_X86_MSR=m
CONFIG_X86_CPUID=m
CONFIG_HIGHMEM4G=y
CONFIG_PAGE_OFFSET=0xC0000000
CONFIG_HIGHMEM=y
CONFIG_ARCH_FLATMEM_ENABLE=y
CONFIG_ARCH_SPARSEMEM_ENABLE=y
CONFIG_ARCH_SELECT_MEMORY_MODEL=y
CONFIG_ILLEGAL_POINTER_VALUE=0
CONFIG_SELECT_MEMORY_MODEL=y
CONFIG_FLATMEM_MANUAL=y
CONFIG_FLATMEM=y
CONFIG_FLAT_NODE_MEM_MAP=y
CONFIG_SPARSEMEM_STATIC=y
CONFIG_HAVE_MEMBLOCK=y
CONFIG_PAGE_FLAGS_EXTENDED=y
CONFIG_SPLIT_PTLOCK_CPUS=4
CONFIG_ZONE_DMA_FLAG=1
CONFIG_BOUNCE=y
CONFIG_VIRT_TO_BUS=y
CONFIG_DEFAULT_MMAP_MIN_ADDR=4096
CONFIG_ARCH_SUPPORTS_MEMORY_FAILURE=y
CONFIG_HIGHTE=y
CONFIG_X86_RESERVE_LOW=64
CONFIG_MTRR=y
CONFIG_MTRR_SANITIZER=y
CONFIG_MTRR_SANITIZER_ENABLE_DEFAULT=0
CONFIG_MTRR_SANITIZER_SPARSE_REG_NR_DEFAULT=1
CONFIG_X86_PAT=y
CONFIG_ARCH_USES_PG_UNCACHED=y
CONFIG_ARCH_RANDOM=y
CONFIG_SECCOMP=y
CONFIG_HZ_100=y
CONFIG_HZ=100
CONFIG_SCHED_HRTICK=y
CONFIG_KEXEC=y
CONFIG_CRASHDUMP=y
CONFIG_PHYSICAL_START=0x100000
CONFIG_RELOCATABLE=y
CONFIG_X86_NEED_RELOCS=y
CONFIG_PHYSICAL_ALIGNMENT=0x100000
CONFIG_HOTPLUG_CPU=y
CONFIG_COMPAT_VDSO=y
CONFIG_ARCH_ENABLE_MEMORY_HOTPLUG=y
CONFIG_CPU_FREQ=y
CONFIG_CPU_FREQ_TABLE=m
CONFIG_CPU_FREQ_STAT=m
CONFIG_CPU_FREQ_STATDETAILS=y
CONFIG_CPU_FREQ_DEFAULT_GOV_PERFORMANCE=y
276 CONFIG_CPU_FREQ.GOV_PERFORMANCE=y
277 CONFIG_CPU_FREQ.GOV.POWERSAVE=m
278 CONFIG_CPU_FREQ.GOV.USERSPACE=m
279 CONFIG_CPU_FREQ.GOV.ONDEMAND=m
280 CONFIG_CPU_FREQ.GOV_CONSERVATIVE=m
281 CONFIG_X86.Powernow_K6=m
282 CONFIG_X86.Powernow_K7=m
283 CONFIG_X86.GX_SUSPMOD=m
284 CONFIG_X86.SPEEDSTEP_CENTRINO=m
285 CONFIG_X86.SPEEDSTEP_CENTRINO_TABLE=y
286 CONFIG_X86.SPEEDSTEP_JCH=m
287 CONFIG_X86.SPEEDSTEP_SMI=m
288 CONFIG_X86.P4_CLOCKMOD=m
289 CONFIG_X86.CPU_FREQ.NFORCE2=m
290 CONFIG_X86.LONGRUN=m
291 CONFIG_X86.E POWERSAVING=m
292 CONFIG_X86.SPEEDSTEP_LIB=m
293 CONFIG_CPU_IDLE=y
294 CONFIG_CPU_IDLE.GOV_LADDER=y
295 CONFIG_PCI=y
296 CONFIG_PCI_GOANY=y
297 CONFIG_PCI_BIOS=y
298 CONFIG_PCI_DIRECT=y
299 CONFIG_PCI_DOMAINS=y
300 CONFIG_ARCH_SUPPORTS_MSI=y
301 CONFIG_PCI_MSI=y
302 CONFIG_HID_IRQ=y
303 CONFIG_PCI_LABEL=y
304 CONFIG_ISA_DMA_API=y
305 CONFIG_AMD_NB=y
306 CONFIG_PCIE=m
307 CONFIG_PCIE=m
308 CONFIG_PCIE_LOAD_CIS=y
309 CONFIG_CARDBUS=y
310 CONFIG_YENTA=m
311 CONFIG_YENTA_O2=y
312 CONFIG_YENTA_RICOH=y
313 CONFIG_YENTA_TI=y
314 CONFIG_YENTA_ENE_TUNE=y
315 CONFIG_YENTA_TOSHIBA=y
316 CONFIG_PD6729=m
317 CONFIG_82092=m
318 CONFIG_PCIE_NONSTATIC=y
319 CONFIG_HOTPLUG_PCI=m
320 CONFIG_HOTPLUG_PCIE=m
321 CONFIG_HOTPLUG_PCIE_J3=m
322 CONFIG_HOTPLUG_PCIE_CPCI=m
323 CONFIG_HOTPLUG_PCIE_CPCI_ZT5550=m
324 CONFIG_HOTPLUG_PCIE_CPCI_GENERIC=m
325 CONFIG_HOTPLUG_PCIE_CPCI_GENERIC=m
326 CONFIG_BINFMT_ELF=y
327 CONFIG_CORE_DUMP_DEFAULT_ELF_HEADERS=y
328 CONFIG_HAVE_AOUT=y
329 CONFIG_BINFMT_AOUT=m
330 CONFIG_BINFMT_MISC=m
331 CONFIG_HAVE_ATOMIC_IOMAP=y
332 CONFIG_HAVE_TEXT_PKE_SMP=y
333 CONFIG_NET=y
334 CONFIG_PACKET=y
335 CONFIG_UNIX=y
336 CONFIG_XFRM=y
337 CONFIG_XFRM_USER=m
338 CONFIG_NET_KEY=m
339 CONFIG_INET=y
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404 CONFIG SCSI TGT=m
405 CONFIG SCSI_NETLINK=y
406 CONFIG SCSI_PROC_FS=y
407 CONFIG BLK_DEV_SD=y
408 CONFIG CHR_DEV_ST=m
409 CONFIG CHR_DEV_HOST=m
410 CONFIG BLK_DEV_SR=y
411 CONFIG BLK_DEV_SR_VENDOR=y
412 CONFIG CHR_DEV SG=m
413 CONFIG SCSI_MULTI_LUN=y
414 CONFIG SCSI_CONSTANTS=y
415 CONFIG SCSI_LOGGING=y
416 CONFIG SCSI_SCAN_ASYNC=y
417 CONFIG SCSI_WAIT_SCAN=m
418 CONFIG SCSI_SP1_ATTRS=m
419 CONFIG SCSI_FC_ATTRS=m
420 CONFIG SCSI_FC_TGT_ATTRS=y
421 CONFIG SCSI_ISCSI_ATTRS=y
422 CONFIG SCSI_ISCSI_TGT_ATTRS=y
423 CONFIG SCSI_ISCSI_CONS=y
424 CONFIG SCSI_ISCSI_ATT=y
425 CONFIG SCSI_ISCSI_TGT_ATTRS=y
426 CONFIG SCSI_ISCSI_ATTRS=y
427 CONFIG SCSI_LOWLEVEL=y
428 CONFIG SCSI_SPI_ATTRS=m
429 CONFIG SCSI_SPI_TGT_ATTRS=y
430 CONFIG SCSI_FC_ATTRS=m
431 CONFIG SCSI_FC_TGT_ATTRS=y
432 CONFIG BLK_DEV_3W XXX_RAID=m
433 CONFIG SCSI_3W_6XXX=m
434 CONFIG SCSI_AICARD=m
435 CONFIG SCSI_AACRAID=m
436 CONFIG SCSI_AIC7XXX=m
437 CONFIG AIC7XXX_CMDS_PER_DEVICE=32
438 CONFIG AIC7XXX_RESET_DELAY_MS=15000
439 CONFIG AIC7XXX_DEBUGMASK=0
440 CONFIG AIC7XXX_REG_PRETTY_PRINT=y
441 CONFIG SCSI_AIC79XX=m
442 CONFIG AIC79XX_CMDS_PER_DEVICE=32
443 CONFIG AIC79XX_RESET_DELAY_MS=15000
444 CONFIG AIC79XX_DEBUGMASK=0
445 CONFIG SCSI_AIC94XX=m
446 CONFIG SCSI_DPT_I2O=m
447 CONFIG SCSIADVANSYS=m
448 CONFIG SCSI_CRC16=new
449 CONFIG MEGA RAID_NEWGEN=y
450 CONFIG MEGA RAID_MM=m
451 CONFIG MEGA RAID_MAILBOX=m
452 CONFIG MEGA RAID_LEGACY=m
453 CONFIG MEGA RAID_SAS=m
454 CONFIG SCSI_HPTIOP=m
455 CONFIG SCSI_BUSLOGIC=m
456 CONFIG SCSI_DMX3191D=m
457 CONFIG SCSI_EATA=m
458 CONFIG SCSI_EATA_TAGGED_QUEUE=y
459 CONFIG SCSI_EATA_LINKED_COMMANDS=y
460 CONFIG SCSI_EATA_MAX_TAGS=16
461 CONFIG SCSI_FUTURE_DOMAIN=m
462 CONFIG SCSI_GDTH=m
463 CONFIG SCSI_IPS=m
464 CONFIG SCSI_INITIO=m
465 CONFIG SCSI_INIA100=m
466 CONFIG SCSI_STEX=m
467 CONFIG SCSI_SYM53C8XX_2=m
468 CONFIG_SCSI_SYM53C8XX_DMA_ADDRESSING_MODE=1
469 CONFIG_SCSI_SYM53C8XX_DEFAULT_TAGS=16
470 CONFIG_SCSI_SYM53C8XX_MAX_TAGS=64
471 CONFIG_SCSI_SYM53C8XX_MMIO=y
472 CONFIG_SCSI_IPR=m
473 CONFIG_SCSI_IPR_TRACE=y
474 CONFIG_SCSI_IPR_DUMP=y
475 CONFIG_SCSI_QLOGIC.FC=1.280=m
476 CONFIG_SCSI_QLA.FC=m
477 CONFIG_SCSI_QLA_ISCSI=m
478 CONFIG_SCSI_LPFC=m
479 CONFIG_SCSI_DC395x=m
480 CONFIG_SCSI_DC390T=m
481 CONFIG_SCSI_DSP32=m
482 CONFIG_SCSI_DSP=m
483 CONFIG_SCSI_LOWLEVEL_PCIE=y
484 CONFIG_PCIE_AHA152X=m
485 CONFIG_PCIE_FDOMAIN=m
486 CONFIG_PCIE_NINJA_SCSI=m
487 CONFIG_PCIE_QLOGIC=m
488 CONFIG_PCIE_SYM53C500=m
489 CONFIG_ATA=y
490 CONFIG_ATA_SFF=y
491 CONFIG_ATA_BMDMA=y
492 CONFIG_ATA_PIIX=y
493 CONFIG_PATA_MPIIX=y
494 CONFIG_PATA_PCIE=m
495 CONFIG_ATA_GENERIC=y
496 CONFIG_J2O=m
497 CONFIG_J2O_LCT_NOTIFY_ON_CHANGES=y
498 CONFIG_J2O_EXT_ADAPTER=y
499 CONFIG_J2O_CONFIG=m
500 CONFIG_J2O_CONFIG_OLD_IOCTL=y
501 CONFIG_J2O_BUS=m
502 CONFIG_J2O_BLOCK=m
503 CONFIG_J2O_SCSI=m
504 CONFIG_J2O_PROC=m
505 CONFIG_NET_DEVICES=y
506 CONFIG_NET_CORE=y
507 CONFIG_MII=y
508 CONFIG_Ethernet=y
509 CONFIG_NET_VENDOR_3COM=y
510 CONFIG_NET_VENDOR_INTEL=y
511 CONFIG_E100=m
512 CONFIG_E1000=m
513 CONFIG_E1000E=m
514 CONFIG_IB=ib
515 CONFIG_IBDCA=m
516 CONFIG_IBGEVF=m
517 CONFIG_NET_VENDOR_825XX=y
518 CONFIG_NET_VENDOR_REALTEK=y
519 CONFIG_R8139CP=y
520 CONFIG_R8139TOO=y
521 CONFIG_R8139TOO_TUNE_TWISTER=y
522 CONFIG_R8139TOO_8129=y
523 CONFIG_R8169=y
524 CONFIG_INPUT=y
525 CONFIG_INPUT_POLLDEV=m
526 CONFIG_INPUT_SPARSEKMAP=m
527 CONFIG_INPUT_MOUSEDEV=y
528 CONFIG_INPUT_MOUSEDEV_PSAX=y
529 CONFIG_INPUT_MOUSEDEV_SCREEN_X=1366
530 CONFIG_INPUT_MOUSEDEV_SCREEN_Y=768
531 CONFIG_INPUT_EVDEV=y
532 CONFIG_INPUT_KEYBOARD=y
533 CONFIG_KEYBOARD_ATKBDM=m
534 CONFIG_KEYBOARD_JKKBD=m
535 CONFIG_KEYBOARD_NEwTON=m
536 CONFIG_KEYBOARD_STOWAWAY=m
537 CONFIG_KEYBOARD_SUNKBD=m
538 CONFIG_KEYBOARD_XTKBDM=m
539 CONFIG_INPUT_MOUSE=y
540 CONFIG_MOUSE_PS2=y
541 CONFIG_MOUSE_PS2_ALPS=y
542 CONFIG_MOUSE_PS2_LOGIPS2PP=y
543 CONFIG_MOUSE_PS2_SYNAPTICS=y
544 CONFIG_MOUSE_PS2_LifeBOOK=y
545 CONFIG_MOUSE_PS2_TRACKPOINT=y
546 CONFIG_MOUSE_PS2_TOUCHKIt=y
547 CONFIG_MOUSE_SERIAL=m
548 CONFIG_MOUSE_VSXXXA=m
549 CONFIG_SERIAL=y
550 CONFIG_SERIAL_I8042=y
551 CONFIG_SERIAL_SERIALPORT=m
552 CONFIG_SERIAL_CT82C710=m
553 CONFIG_SERIAL_PCIEPS2=m
554 CONFIG_SERIAL_LIPPS2=y
555 CONFIG_SERIAL_RAW=m
556 CONFIG_VT=y
557 CONFIG_CONSOLE_TRANSLATIONS=y
558 CONFIG_VT_CONSOLE=y
559 CONFIG_HW_CONSOLE=y
560 CONFIG_VT_HW_CONSOLE_BINDING=y
561 CONFIG_UNIX98_PTYs=y
562 CONFIG_DEVKMEM=y
563 CONFIG_SERIAL_8250=y
564 CONFIG_SERIAL_8250_CONSOLE=y
565 CONFIG_FIX_EARLYCON_MEM=y
566 CONFIG_SERIAL_8250_PCI=y
567 CONFIG_SERIAL_8250_CS=m
568 CONFIG_SERIAL_8250_NR_UARTS=4
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571 CONFIG_SERIAL_8250_MANY_PORTS=y
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573 CONFIG_SERIAL_8250_RSA=y
574 CONFIG_SERIAL_CORE=y
575 CONFIG_SERIAL_CORE_CONSOLE=y
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577 CONFIG_IPMI_HANDLeR=m
578 CONFIG_IPMI_PANIC_EVENT=y
579 CONFIG_IPMI_PANIC_STRING=y
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581 CONFIG_IPMI_SI=m
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583 CONFIG_IPMI_POWEROFF=m
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587 CONFIG_GEN_RTC=y
588 CONFIG_GEN_RTC_X=y
589 CONFIG_SYnCLINK_CS=m
590 CONFIG_CARDMAN_4000=m
591 CONFIG_CARDMAN_4040=m
592 CONFIG_DEVPORT=y
593 CONFIG_I2C=y
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595 CONFIG_I2C_COMPAT=y
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598 CONFIG I2C_ALGOBIT=y
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607 CONFIG I2C_NFORCE2=m
608 CONFIG I2C_SIS5595=m
609 CONFIG I2C_SIS630=m
610 CONFIG I2C_SIS96X=m
611 CONFIG I2C_VIA=m
612 CONFIG I2C_VIAPRO=m
613 CONFIG I2C_OCORES=m
614 CONFIG I2C_SIMTEC=m
615 CONFIG SCx200_ACB=m
616 CONFIG SPI=y
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620 CONFIG_SPI_TLE62X0=m
621 CONFIG_ARCH_WANT_OPTIONAL_GPIOLIB=y
622 CONFIG_SSB_POSSIBLE=y
623 CONFIG_SSB=m
624 CONFIG_SSB_SPROM=y
625 CONFIG_SSB_PCIHOST_POSSIBLE=y
626 CONFIG_SSB_PCIHOST=y
627 CONFIG_SSB_PCMCIAHOST_POSSIBLE=y
628 CONFIG_SSB_PCMCIHOST=y
629 CONFIG_SSB_SDIHOST_POSSIBLE=y
630 CONFIG_SSB_DRIVER_PCIECORE_POSSIBLE=y
631 CONFIG_SSB_DRIVER_PCIECORE=y
632 CONFIG_BCMA_POSSIBLE=y
633 CONFIG_MFD_SM501=m
634 CONFIG_MEDIA_SUPPORT=y
635 CONFIG_VIDEODEV=y
636 CONFIG_VIDEO_V4L2_COMMON=y
637 CONFIG_VIDEO_MEDIA=y
638 CONFIG_MEDIA_ATTACH=y
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675 CONFIG_VIDEO_STV06XX=y
676 CONFIG_VIDEO_GL860=y
677 CONFIG_VIDEO_GSPCA_BENQ=y
678 CONFIG_VIDEO_GSPCA_CONEX=y
679 CONFIG_VIDEO_GSPCA_CPIA1=y
680 CONFIG_VIDEO_GSPCA_ETOMS=y
681 CONFIG_VIDEO_GSPCA_FINEPIX=y
682 CONFIG_VIDEO_GSPCA_JEILINJ=y
683 CONFIG_VIDEO_GSPCA_KINECT=y
684 CONFIG_VIDEO_GSPCA_KONICA=y
685 CONFIG_VIDEO_GSPCA_MARS=y
686 CONFIG_VIDEO_GSPCA_MR97310A=y
687 CONFIG_VIDEO_GSPCA_NV80X=y
688 CONFIG_VIDEO_GSPCA_OV519=y
689 CONFIG_VIDEO_GSPCA_OV534=y
690 CONFIG_VIDEO_GSPCA_OV534_2=y
691 CONFIG_VIDEO_GSPCA_PAC207=y
692 CONFIG_VIDEO_GSPCA_PAC7302=y
693 CONFIG_VIDEO_GSPCA_PAC7311=y
694 CONFIG_VIDEO_GSPCA_SE401=y
695 CONFIG_VIDEO_GSPCA_SN9C2028=y
696 CONFIG_VIDEO_GSPCA_SN9C201X=y
697 CONFIG_VIDEO_GSPCA_SONIX=y
698 CONFIG_VIDEO_GSPCA_SONIXJ=y
699 CONFIG_VIDEO_GSPCA_SPCA500=y
700 CONFIG_VIDEO_GSPCA_SPCA501=y
701 CONFIG_VIDEO_GSPCA_SPCA505=y
702 CONFIG_VIDEO_GSPCA_SPCA506=y
703 CONFIG_VIDEO_GSPCA_SPCA508=y
704 CONFIG_VIDEO_GSPCA_SPCA561=y
705 CONFIG_VIDEO_GSPCA_SPCA1528=y
706 CONFIG_VIDEO_GSPCA_SQ905=y
707 CONFIG_VIDEO_GSPCA_SQ905C=y
708 CONFIG_VIDEO_GSPCA_SQ930X=y
709 CONFIG_VIDEO_GSPCA_STK014=y
710 CONFIG_VIDEO_GSPCA_STV0680=y
711 CONFIG_VIDEO_GSPCA_SUNPLUS=y
712 CONFIG_VIDEO_GSPCA_T613=y
713 CONFIG_VIDEO_GSPCA_TOPRO=y
714 CONFIG_VIDEO_GSPCA_TV8532=y
715 CONFIG_VIDEO_GSPCA_VC032X=y
716 CONFIG_VIDEO_GSPCA_VICAM=y
717 CONFIG_VIDEO_GSPCA_XIRLINK_CIT=y
718 CONFIG_VIDEO_GSPCA_ZC3XX=y
719 CONFIG_VIDEO_PVRUSB2=y
720 CONFIG_VIDEO_PVRUSB2_SYSFS=y
721 CONFIG_VIDEO_PVRUSB2_DEBUGIC=y
722 CONFIG_VIDEO_HDPVR=y
723 CONFIG_VIDEO_EM28XX=y
724 CONFIG_VIDEO_USBVISION=y
725 CONFIG_USB_E161X251=y
726 CONFIG_USB_SN9C102=y
727 CONFIG_USB_PWC=y
728 CONFIG_USB_PWC_DEBUG=y
729 CONFIG_USB_PWC_INPUT_EVD=y
730 CONFIG_USB_ZR364XX=y
731 CONFIG_USB_STKWEBCAM=y
732 CONFIG_USB_S2255=y
733 CONFIG_AGP=y
734 CONFIG_AGP_INTEL=y
735 CONFIG_VGA_ARB=y
736 CONFIG_VGA_ARB_MAX_GPUS=16
737 CONFIG_DRM=y
738 CONFIG_DRM_KMS_HELPER=y
739 CONFIG_DRM_I810=y
740 CONFIG_DRM_I915=y
741 CONFIG_DRM_I915_KMS=y
742 CONFIG_STUB_POULSBO=y
743 CONFIG_VIDEO_OUTPUT_CONTROL=m
744 CONFIG_FB=y
745 CONFIG_FIRMWARE_EDID=y
746 CONFIG_FB_BOOT_VESA_SUPPORT=y
747 CONFIG_FB_CFB_FILLRECT=y
748 CONFIG_FB_CFB_COPYAREA=y
749 CONFIG_FB_CFB_IMAGEBLIT=y
750 CONFIG_FB_VESA=y
751 CONFIG_BACKLIGHT_LCD_SUPPORT=y
752 CONFIG_LCD_CLASS_DEVICE=y
753 CONFIG_LCD_TV350QV=y
754 CONFIG_BACKLIGHT_CLASS_DEVICE=m
755 CONFIG_BACKLIGHT_GENERIC=m
756 CONFIG_BACKLIGHT_PROGEAR=m
757 CONFIG_DISPLAY_SUPPORT=m
758 CONFIG_VGA_CONSOLE=y
759 CONFIG_DUMMY_CONSOLE=y
760 CONFIG_FRAMEBUFFER_CONSOLE=y
761 CONFIG_FRAMEBUFFER_CONSOLE_DETECT_PRIMARY=y
762 CONFIG_FB_CON_DECOR=y
763 CONFIG_FONT_8x8=y
764 CONFIG_FONT_8x16=y
765 CONFIG_HID_SUPPORT=y
766 CONFIG_HID=y
767 CONFIG_HIDRAW=y
768 CONFIG_USB_HID=m
769 CONFIG_HID_PID=y
770 CONFIG_USB_HIDDEV=y
771 CONFIG_HID_A4TECH=m
772 CONFIG_HID_APPLE=m
773 CONFIG_HID_BELKIN=m
774 CONFIG_HID_CHERRY=m
775 CONFIG_HID_CHICONY=m
776 CONFIG_HID_CYPRESS=m
777 CONFIG_HID_EZKEY=m
778 CONFIG_HID_KYE=m
779 CONFIG_HID_KENSINGTON=m
780 CONFIG_HID_LOGITECH=m
781 CONFIG_HID_MICROSOFT=m
782 CONFIG_HID_MONTEREY=m
783 CONFIG_USB_SUPPORT=y
784 CONFIG_USB_COMMON=m
785 CONFIG_USB_ARCH_HAS_HCD=y
786 CONFIG_USB_ARCH_HAS_OHCI=y
787 CONFIG_USB_ARCH_HAS_EHCI=y
788 CONFIG_USB_ARCH_HAS_XHCI=y
789 CONFIG_USB=y
790 CONFIG_USB_ANNOUNCE_NEW_DEVICES=y
791 CONFIG_USB_EHCI_HCD=m
792 CONFIG_USB_EHCIROOT_HUB_TT=y
793 CONFIG_USB_EHCI_ROOT_HUB_TT_NEWSCHED=y
794 CONFIG_USB_OHCI_HCD=m
795 CONFIG_USB_OHCI_HCD_SSB=y
796 CONFIG_USB_OHCI_LITTLE_ENDIAN=y
797 CONFIG_USB_UHCI_HCD=y
798 CONFIG_USB_STORAGE_REALTEK=m
800 CONFIG_MMC=m
801 CONFIG_MMC_BLOCK=m
802 CONFIG_MMC_BLOCK_MINORS=8
803 CONFIG_MMC_BLOCK_BOUNCE=y
804 CONFIG_SDIO_UART=m
805 CONFIG_MMC_SDC始建=m
806 CONFIG_DMA_DEVICES=y
807 CONFIG_INTEL_JOATDMA=y
808 CONFIG_DMA_ENGINE=y
809 CONFIG_NET_DMA=y
810 CONFIG_DCA=y
811 CONFIG_CLKSRC_I8253=y
812 CONFIG_CLKEVENT_I8253=y
813 CONFIG_I8253_LOCK=y
814 CONFIG_CLKBLD_I8253=y
815 CONFIG_FIRMWARE_MEMMAP=y
816 CONFIG_EXT2_FS=y
817 CONFIG_EXT2_FS_XATTR=y
818 CONFIG_EXT2_FS_POSIX_ACL=y
819 CONFIG_EXT2_FS_SECURITY=y
820 CONFIG_EXT3_FS=y
821 CONFIG_EXT3_DEFAULTS_TO_ORDERED=y
822 CONFIG_EXT3_FS_XATTR=y
823 CONFIG_EXT3_FS_POSIX_ACL=y
824 CONFIG_EXT3_FS_SECURITY=y
825 CONFIG_JBD=y
826 CONFIG_FS_MBCACHE=y
827 CONFIG_FS_POSIX_ACL=y
828 CONFIG_FILE_LOCKING=y
829 CONFIG_FSNOTIFY=y
830 CONFIG_DNOTIFY=y
831 CONFIG_INOTIFY_USER=y
832 CONFIG_GENERIC_ACL=y
833 CONFIG_FAT_FS=y
834 CONFIG_MSDOS_FS=m
835 CONFIG_VFAT_FS=y
836 CONFIG_FAT_DEFAULT_CODEPAGE=437
837 CONFIG_FAT_DEFAULT_CODEC="iso8859-1"
838 CONFIG_NTFS_FS=m
839 CONFIG_PROC_FS=y
840 CONFIG_PROC_KCORE=y
841 CONFIG_PROC_VM_CORE=y
842 CONFIG_PROC_SYSCTL=y
843 CONFIG_PROC_PAGE_MONITOR=y
844 CONFIG_SYSFS=y
845 CONFIG_TMPFS=y
846 CONFIG_TMPFS_POSIX_ACL=y
847 CONFIG_TMPFS_XATTR=y
848 CONFIG_CONFIGFS_FS=y
849 CONFIG_PARTITION_ADVANCED=y
850 CONFIG_MAC_PARTITION=N=y
851 CONFIG_MSDOS_PARTITION=y
852 CONFIG_BSD_DISKLABEL=y
853 CONFIG_MINIX_SUBPARTITION=y
854 CONFIG_SOLARIS_X86_PARTITION=y
855 CONFIG_UNIXWARE_DISKLABEL=y
856 CONFIG_LDM_PARTITION=y
857 CONFIG_KARMA_PARTITION=y
858 CONFIG_EFI_PARTITION=y
859 CONFIG_NLS=y
860 CONFIG_NLS_DEFAULT="iso8859−1"
861 CONFIG_NLS_CODECPE=437=y
862 CONFIG_NLS_ISO8859_1=y
863 CONFIG_NLS_ISO8859_15=y
864 CONFIG_NLS_UTF8=y
865 CONFIG_TRACE_IRQFLAGS_SUPPORT=y
866 CONFIG_DEFAULT_MESSAGE_LOGLEVEL=4
867 CONFIG_ENABLE_WARN_DEPRECATED=y
868 CONFIG_ENABLE_MUST_CHECK=y
869 CONFIG_FRAME_WARN=1024
870 CONFIG_MAGIC_SYSRQ=y
871 CONFIG_DEBUG_FS=y
872 CONFIG_DEBUG_KERNEL=y
873 CONFIG_DEBUG_SHIRQ=y
874 CONFIG_SCHEDDEBUG=y
875 CONFIG_DEBUG_RT_MUTEXES=y
876 CONFIG_DEBUG_PLLIST=y
877 CONFIG_DEBUG_MUTEXES=y
878 CONFIG_STACKTRACE=y
879 CONFIG_DEBUG_BUGVERBOSE=y
880 CONFIG_DEBUG_MEMORY_INIT=y
881 CONFIG_ARCH_WANT_FRAME_POINTERS=y
882 CONFIG_FRAME_POINTER=y
883 CONFIG_RCU_CPUSTALL_TIMEOUT=60
884 CONFIG_USER_STACKTRACE_SUPPORT=y
885 CONFIG_NOP_TRACER=y
886 CONFIG_HAVE_FUNCTION_TRACER=y
887 CONFIG_HAVE_FUNCTION_GRAPH_TRACER=y
888 CONFIG_HAVE_FUNCTION_GRAPH_FP_TEST=y
889 CONFIG_HAVE_FUNCTION_TRACE_MCOUNT_TEST=y
890 CONFIG_HAVE_DYNAMIC_FTRACE=y
891 CONFIG_HAVE_FTRACE_MCOUNT_RECORD=y
892 CONFIG_HAVE_SYSCALL_TRACEPOINTS=y
893 CONFIG_HAVE_C_RECORDERCOUNT=y
894 CONFIG_RINGBUFFER=y
895 CONFIG_EVENT_TRACING=y
896 CONFIG_EVENT_POWER_TRACING_DEPRECATED=y
897 CONFIG_CONTEXT_SWITCH_TRACER=y
898 CONFIG_RINGBUFFER_ALLOW_SWAP=y
899 CONFIG_TRACING=y
900 CONFIG_GENERIC_TRACER=y
901 CONFIG_TRACING_SUPPORT=y
902 CONFIG_FTRACE=y
903 CONFIG_BRANCH_PROFILE_NONE=y
904 CONFIG_BLK_DEV_IO_TRACE=y
905 CONFIG_KPROBE_EVENT=y
906 CONFIG_HAVE_ARCH_KGDB=y
907 CONFIG_HAVE_ARCH_KMEMCHECK=y
908 CONFIG_X86_VERBOSE_BOOTUP=y
909 CONFIG_EARLY_PRINTK=y
910 CONFIG_DOUBLEFAULT=y
911 CONFIG_HAVE_MMIOTRACE_SUPPORT=y
912 CONFIG_IOCTL_DELAY_TYPE_0X80=0
913 CONFIG_IOCTL_DELAY_TYPE_0xED=1
914 CONFIG_IOCTL_DELAY_TYPE_1DELAY=2
915 CONFIG_IOCTL_DELAY_TYPE_NONE=3
# Configuration Options

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<tr>
<th>Line</th>
<th>Description</th>
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<td>CONFIG_DEFAULT_IO_DELAY,DEL Type=0</td>
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<td>CONFIG_ASYNC_TX_DISABLE,PQ,VAL,DMA=y</td>
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<td>CONFIG_CRYPTO_TGR192=m</td>
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<td>CONFIG_CRYPTO_WP512=m</td>
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<td>CONFIG_CRYPTO_AES_568=m</td>
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<td>CONFIG_CRYPTO_ANUBIS=m</td>
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<tr>
<td>963</td>
<td>CONFIG_CRYPTO_ARC4=m</td>
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<tr>
<td>964</td>
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<td>965</td>
<td>CONFIG_CRYPTO_BLOWFISH,COMMON=m</td>
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<tr>
<td>966</td>
<td>CONFIG_CRYPTO_CAMELLIA=m</td>
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<td>967</td>
<td>CONFIG_CRYPTO_CAST=m</td>
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<tr>
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<td>CONFIG_CRYPTO_CASTi=m</td>
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<tr>
<td>969</td>
<td>CONFIG_CRYPTO_DES=y</td>
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<td>970</td>
<td>CONFIG_CRYPTO_FCRYPT=m</td>
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<td>CONFIG_CRYPTO_TEA=m</td>
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<td>CONFIG_CRYPTO_TWOFISH=m</td>
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<td>976</td>
<td>CONFIG_CRYPTO_TWOFISH,COMMON=m</td>
</tr>
<tr>
<td>977</td>
<td>CONFIG_CRYPTO_TWOFISH_568=m</td>
</tr>
<tr>
<td>978</td>
<td>CONFIG_CRYPTO_DEFLATE=m</td>
</tr>
<tr>
<td>979</td>
<td>CONFIG_CRYPTO_ANSICPRNG=m</td>
</tr>
</tbody>
</table>
19.5 Persistent net rules

```c
# card 1
# PCI device 0x8086:0x1501 (e1000e)
SUBSYSTEM="net", ACTION="add", DRIVERS="?", ATTR{address}="00:0b:ab:2b:5b:54",
  ATTR{dev_id}="0x0", ATTR{type}="1", KERNEL="eth0", NAME="eth0"
SUBSYSTEM="net", ACTION="add", DRIVERS="?", ATTR{address}="00:0b:ab:2b:5b:55",
  ATTR{dev_id}="0x0", ATTR{type}="1", KERNEL="eth1", NAME="eth1"
```

Listing 19.6: Persistent configuration for network interface

19.6 Network name resolution
# /etc/hosts: Local Host Database

# This file describes a number of aliases-to-address mappings for the for # local hosts that share this file.

# In the presence of the domain name service or NIS, this file may not be consulted at all; see /etc/host.conf for the resolution order.

192.168.142.1 embedded01
192.168.142.2 embedded02
#...

# IPv4 and IPv6 localhost aliases
127.0.0.1 localhost
::1 localhost

Listing 19.7: file hosts

19.7 Autologin

/etc/init.d/spread -D start
/etc/init.d/sshd -D start

if ! fuser /dev/tty7 &> /dev/null; then
  su - graphic -l -c 'exec startx &> ~/.xsession-errors' &
fi

Listing 19.8: Auto-login service

19.8 Spread toolkit configuration

EventLogFile = /var/log/spread.log
EventTimeStamp

Spread_Segment 224.0.0.1:4803 {
  embedded01 192.168.142.1 {
    D 192.168.142.1
    C 192.168.142.1
  }
}

Listing 19.9: Spread main configuration file

19.9 Record video from Webcam
Reussner Matthieu

1 steelido@steelbook ~ $ mencoder tv:// -tv driver=v4l2:width=640;height=480:device=/dev/video0 -nosound -o c lavc -o Downloads/training.avi
2 MEncoder SVN-r33094-4.5.3 (C) 2000–2011 MPlayer Team
3 succes : format : 9 data : 0x0 – 0x0
4 Fichier de type TV detecte.
5 Driver selectionnee : v4l2
6 nom : Video 4 Linux 2 input
7 auteur : Martin Olschewski <olschewski@zpr.uni-koeln.de>
8 commentaire : first try, more to come ;-
9 v4l2: your device driver does not support VIDIOC_G_STD ioctl, VIDIOC_G_PARM was used instead.
10 Selected device : USB camera
11 Capabilities : video capture read/write streaming
12 supported norms:
13 inputs : 0 = sonixj;
14 Current input : 0
15 Current format : unknown (0x4745504a)
16 tv.c : norm_from_string(pal) : parametre de norme bogue. Ajuste a default.
17 v4l2 : ioctl enum norm failed: Inappropriate ioctl for device
18 Erreur : La norme ne peut pas etre appliquee !
19 L'entree selectionnee n'a pas de tuner !
20 v4l2 : ioctl set mute failed: Invalid argument
21 v4l2 : ioctl set control failed: Invalid argument
22 [V] filefmt:9 fourcc:0x4745504a taille:640x480 fps:25.000 ftime:=0.0400
23 Ouverture du filtre video : [ expand osd=1] Expand : -1 x -1, -1 ; -1, osd : 1, aspect : 0.000000, round : 1
24 Ouverture du decodeur video : [ffmpeg] FFmpeg’s libavcodec codec family
25 Codec video choisi : [ffmpeg] vfm : ffmpeg (FFmpeg MJPEG)
26 Ouverture du filtre video : [scale]
27 L'aspect du film est indefini – pas de pre-dimensionnement applique.
28 [sws scaler @ 0xb07740] BICUBIC scaler, from yuv422p to yuv420p using MMX2
29 videocodec : libavcodec (640x480 fourcc=34504d46 [FMP4])
30 Ecriture de l’entete...
31 Codec profile is not( yet ?) available or unspecified, not writing vprp header.
32 Ecriture de l’entete...
33 Codec profile is not( yet ?) available or unspecified, not writing vprp header.
34 Pos : 0.0s 1f (0%) 0.95fps Trem : 0min 0mb A-V:0.000 [0:0]
35 Image sautee !
36 Pos : 0.0s 2f (0%) 1.28fps Trem : 0min 0mb A-V:0.000 [0:0]
37 Image sautee !
38 Pos : 0.0s 3f (0%) 1.79fps Trem : 0min 0mb A-V:0.000 [0:0]
39 N’a pas pu trouver espace colorimetrique correspondant – nouvel essai avec –vf scale...
40 Ouverture du filtre video : [scale]
41 L’aspect du film est indefini – pas de pre-dimensionnement applique.
42 [sws scaler @ 0xb07740] BICUBIC scaler, from yuv422p to yuv420p using MMX2
43 videocodec : libavcodec (640x480 fourcc=34504d46 [FMP4])
44 Ecriture de l’entete...
45 Codec profile is not( yet ?) available or unspecified, not writing vprp header.
46 Ecriture de l’entete...
47 Codec profile is not( yet ?) available or unspecified, not writing vprp header.
48 Pos : 0.0s 3f (0%) 1.79fps Trem : 0min 0mb A-V:0.000 [0:0]
49 [...]
50 1 image(s) repetee(s) !
51 Pos : 0.2s 5f (0%) 2.73fps Trem : 0min 0mb A-V:0.000 [0:0]
52 Abandonne des trames video.
53 Ecriture de l’index...
54 Ecriture de l’entete...
55 Codec profile is not( yet ?) available or unspecified, not writing vprp header.
56 1 image(s) repetee(s) !
57 Pos : 0.2s 5f (0%) 2.73fps Trem : 0min 0mb A-V:0.000 [0:0]
19.10 mount Compact flash

Listing 19.10: Webcam recorder

```
#! /usr/bin/env bash
mount /dev/sdb3 /mnt/gentoo
mount /dev/sdb1 /mnt/gentoo/boot
mount -t proc none /mnt/gentoo/proc
mount -o bind /dev /mnt/gentoo/dev
mount -o bind /usr/portage /mnt/gentoo/usr/portage
mount -o bind /var/tmp/ /mnt/gentoo/var/tmp
chroot /mnt/gentoo /env.sh
umount /mnt/gentoo/{dev,proc/usr/portage,var/tmp,boot}
```

Listing 19.11: Mount then chroot inside cf card

19.11 updating environment settings

Listing 19.12: updating environment settings on CF card

```
#! /bin/bash
env-update
source /etc/profile
export TERM=xterm
export PS1="(chroot) $PS1"
cd
bash
```

19.12 Structure of transmitted data

Listing 19.13: Structure hosting data

```
typedef struct myParam {
    // read param from network
    unsigned char pic1[(CV_FRAME_WIDTH*CV_FRAME_HEIGHT)/sizeof(unsigned char)];
    unsigned char pic2[(CV_FRAME_WIDTH*CV_FRAME_HEIGHT)/sizeof(unsigned char)];
    int LBBx;
    int LBBy;
    int LBWidth;
    int LBHeight;
    int BBx;
    int BBy;
    int BBWidth;
    int BBHeight;
    time_t timer;
    bool status;
} myParam;
```
19.13 Getting around the PESIT internet block

```bash
1  embedded01 $ cat ~/.ssh/config
2  Host mail
3     HostName 176.9.180.154
4     User tunnel
5     port 443
6  IdentityFile ~/.ssh/id_rsa
7  LocalForward 2525 smtp.gmail.com:465
8
9  embedded01 $ ssh-keygen
10 Generating public/private rsa key pair.
11 Enter file in which to save the key (/home/USERNAME/.ssh/id_rsa): <enter>
12 Enter passphrase (empty for no passphrase): <enter>
13 Enter same passphrase again: <enter>
14 Your identification has been saved in /home/USERNAME/.ssh/id_rsa.
15 Your public key has been saved in /home/USERNAME/.ssh/id_rsa.pub.
16 The key fingerprint is:
17 34:ce:2c:cf:94:e7:28:be:73:9b:e7:50 USERNAME@embedded01
18 The key's randomart image is:
19 +---[ RSA 2048]---+
20   |
21   |
22   o
23   = o
24   . S o E
25   * = o
26   + +o
27   + ++o
28   .oB++.
29 +----------------+
30
31
32  embedded01 $
```

Listing 19.14: Configuring ssh connection

```bash
1  permitopen="smtp.gmail.com:465",no-pty,no-X11-forwarding,no-agent-forwarding ssh-rsa AAAAB3 [...]
```

Listing 19.15: Content of authorizedkeys on vps server
20 Work log

20.1 Week 1

February 20, 2012

Maha Shivaratri is a national holiday in India, in honor of Lord Shiva. No work was done this day

February 21, 2012

- First working day at school. Discovering of the university.
- Talk with Pr A.Srinivas about the orientations of the project
- Registering on Intel website

February 22, 2012

- Writing specifications of the project

February 23, 2012

- Writing specifications of the project
- Talk with pr. A.Srinivas and Nitheesh Kl about the embedded system

February 24, 2012

- OS deployment on the target board
- Configuration of the kernel to boot in less than 15 sec

February 25, 2012

- Test of OpenTLD on the embedded board
20.2  Week 2

February 27, 2012

• Modification of OpenTLD source code to make it working with two webcam

February 28, 2012

• setup of the messaging system

February 29, 2012

• setup of the messaging system

March 01, 2012

• writing the documentation about the OS + spread installation

March 02, 2012

• writing the documentation about the OS + spread installation

20.3  Week 3

March 05, 2012

• writing the part responsible of sending the data

March 06, 2012

• writing the part responsible of sending the data+receiving

March 07, 2012

• Bug-fix

March 08, 2012

• Writing a viewer+sender application
March 09, 2012

- Splitting code into 3 Application (viewer, sender, sensor)

March 10, 2012

- Drawing schema, updating report

20.4 Week 4

March 12, 2012

- Writing Introduction, Summary, updating planning

March 13, 2012

- writing function to send an email

March 14, 2012

- writing function to send an email

March 15, 2012

- updating report, demo, bug-fix, fighting again Fortinet proxy

March 16, 2012

- updating report, demo, bug-fix, fighting again Fortinet proxy

20.5 Week 5,6

March 19, 2012 to March 29, 2012

- No work for the internship was done.
- Writing presentation for the Hackaton
- Helping students to install OpenCV for one of their lesson

March 30, 2012

- Talking with Pr A.Srinivas about some change in the project
20.6  Week 7

April 02, 2012

• Recode movie
• Split movie in frames (15’000)

April 03, 2012

• Cropping of the frames

April 04, 2012

• Cropping of the frames

April 05, 2012

• Cropping of the frames

April 06, 2012

• Cropping of the frames

20.7  Week 8

April 09, 2012 to April 11, 2012

• Days off in Chennai, Mahabalipuram, Kanchipuram,...

April 12, 2012

• Updating the report

April 13, 2012

• Install of the computer who will be use to train the haarcascade

20.8  Week 9

April 16, 2012

• Downloading 2000 pictures without a car from google image index
April 17, 2012

- Generating all the needed samples for the training

April 18, 2012

- Interview for Intel Embedded on the project
- Updating the report

April 19, 2012

- Updating the report

April 20, 2012

- Updating the report

20.9 Week 10

April 23, 2012

- Test of the classifier

April 24, 2012

- Removing some picture of car

April 25, 2012

- Training of the new classifier

April 26 and 27, 2012

- Working on my Pet project for the Hackaton at PESIT

20.10 Week 11

April 30, 2012

- Cleaning the Nokia lab
May 01, 2012

- Day off
- Helping students from the “Lab”

May 02, 03, 04, 2012

- Updating the report
- Helping students from the “Lab”
- Teaching

20.11  Week 12

May 07, 2012

- Writing a proposal to include a better notification system on the project

May 08-09-10, 2012

- Helping students from the nokia lab

May 11, 2012

- No work

20.12  Week 13

May 14-18, 2012

- No work has been done this week, I was ill

20.13  Week 14

May 21-23, 2012

- writing the glue code between the notification system and the detection system

May 24-25, 2012

- Helping students from the lab
20.14  Week 15

May 28-29, 2012

• moving the code to the embedded system

May 30, 2012

• generating the mosaic

May 31, 2012

• streaming the mosaic

June 01, 2012

• displaying the wall (mosaic)

20.15  Week 16

June 04, 2012

• reading documentation about gstreamer+gtk

June 05, 2012

• writing the code for the wall

June 06, 2012

• merge of the different part of the code

June 07, 2012

• bug fix

June 08, 2012

• clean up of code
20.16  Week 17

June 11, 2012

• Changing operating system for the wall

June 12, 2012

• Changing operating system for the wall
• writing a demo for the wall

June 13, 2012

• Reconfiguring the wall

June 14, 2012

• Testing the project

June 15, 2012

• Updating the report
• Testing the project
• Helping students

20.17  Week 18

June 18-20, 2012

• Updating the report
• Writing the presentation
• Packing