



TAMPEREEN TEKNILLINEN YLIOPISTO

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**VIDEOTESTAUS MOBIILAITTEISSA**

Diplomityö

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## ABSTRACT

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## ALKUSANAT

Tämä (*d-tyo.tex*) on L<sup>A</sup>T<sub>E</sub>X-pohja Tampereen teknillisen yliopiston opinnäytetöitä varten. Samaan pakettiin kuuluu myös tiedosto *tutthesis.cls*, joka sisältää taittoteknisiä lisäyksiä L<sup>A</sup>T<sub>E</sub>X:n alkuperäiseen *report.cls*-luokkatiedostoon.

Lisäksi otsikkosivua varten tarvitaan tiedosto *tty-logo.xxx*, jonka tulee sisältää TTY:n logo. Tiedoston tulee olla joko *.eps*- tai *.pdf*-muodossa riippuen L<sup>A</sup>T<sub>E</sub>X-versiosta.

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## TERMIT JA NIIDEN MÄÄRITELMÄT

MSE	Mean Square Error
SNR	Signal to Noise Ratio
HSV	Human Visual System
VQEG	Video Quality Experts Group
DVq	Digital Video Quality
NR	No Reference

# 1. INTRODUCTION

Every minute there are 100 hours of video uploaded just to Youtube.com. [23]

Analysis, subjective or objective, for video is just starting. In year xx there were xx articles in IEEE Explorer but after two years the amount of articles has skyrocketed and there is no end.

The goal for this thesis is to make state of art analysis of current methods of video testing. I will not study transmission errors over networks. I focus on errors coming from coding, device, optics, ois(optical image stabilization), etc. I try to focus more on non-reference methods but reference video methods are also studied and introduced.

Video quality can be determined with psychophysical experiments, but they are expensive and time consuming to arrange. There are no physical measures like meter for distance to predict the quality of video.

On first chapter I will define what is mobile device. What restrictions it causes in testing and typical ways of mobile testing.

Second chapter will introduce different error types and their causes are introduced.

Third chapter digs in to the state of the art of testing methods: subjective, objective, reference, non-reference, black box and etc.

Fourth chapter shows comparison of different methods or practical example done with matlab. This is under evaluation.

Fifth chapter is for conclusions.

## 2. MOBILE DEVICE

### 2.1 What is mobile device

#### 2.1.1 Restrictions of mobile device

### 2.2 Mobile device testing

#### 2.2.1 Driver level

#### 2.2.2 Middleware

#### 2.2.3 User Interface

#### 2.2.4



## 3. THEORY OF VIDEO TESTING

Testing citing [5]

addign cites to get them visible in the end [8] [22] [9] [1] [11] [21] [18] [20]  
[12] [15] [17] [6] [10] [2] [19] [13] [3] [7] [4] [14]

### 3.1 Algorithmic errors

Algorithms include: -Exposure -White Balance -Focus -Coding/Encoding —Many things in here

#### 3.1.1 Blockiness

-Too low bitstream -how it is seen

#### 3.1.2 Blurr

-shutter speed -temporal noise -spatial noise

#### 3.1.3 Noise

-Colour noise

#### 3.1.4 Blink

-Exposure jumping -

#### 3.1.5 Motion smoothness

#### 3.1.6 Jaggy edge

-bitsteam, codec -how it is seen/detected

#### 3.1.7 Frame drop

-Jitter -Jerkiness

### **3.1.8 Sound Sync**

-

### **3.1.9 Moiré-effect**

### **3.1.10 Aliasing**

## **3.2 Hardware erros**

### **3.2.1 Frame drop**

-also SW error

### **3.2.2 Jellyness**

-Ois and corners

### **3.2.3 CMOS and CCD sensor**

-Noise from sensors -Temporal noise -Rolling shutter -Wobble -Skew -Smear -  
Partial exposure

## **4. DIFFERENT TESTING METHODS**

### **4.1 State of art in Video testing**

#### **4.1.1 Reference testing**

#### **4.1.2 Non-Reference testing**

#### **4.1.3 Objective testing**

#### **4.1.4 Subjective testing**

<http://www.its.bldrdoc.gov/resources/video-quality-research/standards/objective-models.aspx>

The history of video quality model validation [16]

## 5. PRACTICAL EXAMPLE OR COMPARISON OF METHODS

Here we might have some kind of practical example or comparison of state of the art methods

### 5.1 Foo Bar

## 6. CONCLUSIONS AND FUTURE WORK

And here we have the grand conclusions. What ever they might be.

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## A. LIITTEITÄ