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pression

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**The volume
comprises of
papers presented
at the first
CADEC-2019**

**conference held at
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Technology-
Andhra Pradesh,
Amaravati, India.**

**The book contains
computer
simulated results**

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in various areas of
Video
electronics and
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communication
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engineering such
as, VLSI and
embedded
systems, wireless
communication,
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signal processing,
power electronics
and control theory
applications. This
volume will help

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researchers and

engineers to

develop and

extend their ideas

in upcoming

research in

electronics and

communication.

Video

compression

technology aims at

compressing large

amount of video

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Interacting
Engineering
Computer Science

**data for efficient
transmission and
storage without
significant loss of
quality. Most video
compression
techniques rely on
removing temporal
data redundancy
between frames
using motion
estimation and
motion**

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compensation

techniques which

are generally very

computationally

expensive. The

objective of the

research done in

this thesis is to

develop new

efficient motion

estimation

techniques that

reduce the

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**computational
complexity of
motion estimation.**

The thesis

presents a new

prediction

technique referred

to as weighted

sum block

matching (WSBM)

which dynamically

reduces the

computational

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Simulation
Results
Have Shown That
Adding WSBM To
Some Well-known
Search Algorithms
Reduces Their
Computational
Complexity By
6-1.5 Without

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**affecting the visual
quality of the
reconstructed
video frames. The
thesis also
presents two new
algorithms based
on the simplex
optimization
method. the
simplex based
block matching
algorithm (SMPLX)**

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Contributed
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**and the flexible
triangle search
(FTS). Both
techniques use a
triangle that
moves inside the
search area and
checks only
positions that lie
at its vertices. As a
result the
computational
complexity of the**

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**search is reduced
since it depends
directly on the
number of
positions checked.**

**The techniques
can change the
size and
orientation of the
search triangle
during the search.**

**The changes make
the search highly**

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**flexible and
efficient and
reduce the number
of search
positions to be
checked
compared to those
in other search
algorithms. The
SMPLX uses
equations based
on the simplex
optimization**

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method to
Video
compute the new
Compression The
triangle size and
Springer
orientation. The
International
FTS, on the other
hand, was
Implementing And
implemented to be
Computer Science
more suitable for a
digital search grid
by using look-up
tables and integer
computations. The
two algorithms

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**were implemented
as part of the**

H.263 and H.264

encoders. Both

algorithms were

compared to the

state of the a.

H.264 Motion

Estimation and

Motion

Compensation

New Motion

Estimation

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**Techniques and
Their SIMD
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for Video Coding
Motion Estimation
and Encoding
Algorithms for
Hierarchical
Representation of
Digital Video
A Motion
Estimation Tool
Fast**

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**Implementations
of Block Motion
Estimation**

**Algorithms in
Video Encoders**

**Video technology
promises to be**

**the key for the
transmission of**

**motion video. A
number of video
compression**

techniques and

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Computer Science
multimedia and
for digital NTSC
and HDTV
applications, and
H.261H.263 for

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Algorithms For
**video telecommu-
nications. These
techniques use
motion
estimation
techniques to
reduce the
amount of data
that is stored and
transmitted for
each frame. This
book is about
these motion**

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Algorithms For
**estimation
algorithms, their
complexity,
implementations,
advantages, and
drawbacks. First,
we present an
overview of video
compression
techniques with
an emphasis to
techniques that
use motion**

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Survey In
Computer Science
estimation, such
as MPEG and
H.261/H.263.

Then, we give a
survey of current
motion

estimation search
algorithms,

including the
exhaustive search
and a number of
fast search
algorithms. An

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And
Computer Science
evaluation of
current search
algorithms, based
on a number of
experiments on
several test video
sequences, is
presented as well.
The theoretical
framework for a
new fast search
algorithm,
Densely-Centered

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Algorithms For
**Uniform-P Search
(DCUPS), is
developed and
presented in the
book. The
complexity of the
DCUPS algorithm
is comparable to
other popular
motion
estimation
techniques,
however the**

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**algorithm shows
superior results
in terms of
compression
ratios and video
qUality. We
should stress out
that these new
results, presented
in Chapters 4 and
5, have been
developed by
Joshua**

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International
Search: A Fast
Motion
Estimation
Computer Science
Algorithm" (FAU,
1996).

With the
increasing
popularity of

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**technologies such
as Internet
streaming video
and video
conferencing,
video
compression has
become an
essential
component of
broadcast and
entertainment
media. Motion**

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Books
And
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**Estimation (ME)
and
compensation
techniques, which
can eliminate
temporal
redundancy
between adjacent
frames
effectively, have
been widely
applied to
popular video**

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Algorithms For
compression
Video
coding standards
such as MPEG-2,
MPEG-4.

Traditional fast
block matching
algorithms are
easily trapped
into the local
minima resulting
in degradation on
video quality to
some extent after

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**decoding. Since
Evolutionary
Computing
Techniques are
suitable for
achieving global
optimal solution,
these techniques
are introduced to
do Motion
Estimation
procedure in this
thesis. Zero**

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Motion

**prejudgement is
also included**

**which aims at
finding static**

macroblocks

**(MB) which do
not need to**

perform

remaining search

**thus reduces the
computational**

cost. Simulation

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Algorithms For
results obtained
Video
show that the
Compression The
proposed Clonal
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Particle Swarm
Instructional
Optimization
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algorithm given a
Engineering And
very good
Computer Science
improvement in
reducing the
computations
overhead and
achieves very
good Peak Signal

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to Noise Ratio

(PSNR) values,
which makes the
techniques more
efficient than the
conventional
searching

algorithms. To
reduce the
Motion vector
overhead in
Bidirectional
frame prediction,

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Algorithms For
in this thesis

novel

Bidirectional

Motion

Estimation

algorithm based

on PSO is also

proposed and

results shows

that the proposed

method can

significantly

reduces the

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Algorithms For

computational

complexity

involved in the

Bidirectional

frame prediction

and also least

prediction error

in all video

sequences.

Motion Modeling

and Video

Processing

Algorithms,

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Real-Time Video
Compression:
Techniques and

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introduces the XYZ video compression technique, which operates in three dimensions, eliminating the overhead of motion estimation. First, video compression standards, MPEG and H.261/H.263, are described. They

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both use asymmetric compression algorithms, based on motion estimation. Their encoders are much more complex than decoders. The XYZ technique uses a symmetric algorithm, based on the Three-

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Dimensional
Video
Discrete Cosine
Compression (3D-
DCT). 3D-DCT was
originally
suggested for
compression about
twenty years ago;
however, at that
time the
computational
complexity of the
algorithm was too

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high, it required large buffer memory, and was not as effective as motion estimation.

We have resurrected the 3D-DCT-based video compression algorithm by developing several enhancements to the original

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to
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algorithm. These enhancements make the algorithm feasible for real-time video compression in applications such as video-on-demand, interactive multimedia, and videoconferencing. The demonstrated results, presented

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in this book,
suggest that the
XYZ video
compression
technique is not
only a fast
algorithm, but also
provides superior
compression ratios
and high quality of
the video compared
to existing standard
techniques, such as

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MPEG and

H.261/H.263. The
elegance of the XYZ
technique is in its
simplicity, which
leads to

inexpensive VLSI
implementation of
any XYZ codec. Real-
Time Video

Compression:
Techniques and
Algorithms can be

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used as a text for
graduate students
and researchers
working in the area
of real-time video
compression. In
addition, the book
serves as an
essential reference
for professionals in
the field.

As technology
advances,

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multimedia
Video
applications
Compression The
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exponentially in
International
day-to-day life.

Multimedia
applications such as
video telephony,
Computer Science
video conferencing,
TV, streaming
video/audio online,
and many other
applications are in

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demand in video industry. These applications usually require high bandwidth, large storage, and high latency time to send on network.

To conserve resources, it is required to compress the video data before sending

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them to the network by sender side. It is also required to decompress the video data at receiver end before broadcasting. Many different video codec standards such as H.261, MPEG-1, MPEG-2, H.263, and H.264

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Algorithms For
are implemented.

Video
H.264 is latest
international video
compression The
codec standard.

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This protocol was
developed jointly
by International
Telecommunication
Union -

Computer Science
Telecommunication
Standardization
Sector (ITU-T) and
International

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Organization for
Video
Standardization
(ISO). The objective
of this project is to
explore different
blocks of H.264 in
MATLAB

environment. This
project first briefly
describes about
encoding and
decoding process,
and then it

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discusses more details about different modules of encoder and decoder, and the related algorithms. Finally, it compares the result of different algorithms based on compression ratio, peak signal to noise ratio, time required

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for encoding process, and storage. A video file is given as input to encoder, the video file is converted to a number of frames using video codec, and fixed size macro block is defined in each frame for encoding process. Motion

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search algorithm
finds motion vector
after macro block
definition, then
compensated

image is generated
based on reference
frame and motion
vector by video
codec. Redundancy

is removed from
current frame by
subtracting

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Algorithms For
compensated
image.

Compression of
residual
information is
performed using
transformation,
quantization, and
entropy coder.

Compressed data
are given as inputs
to decoder, and
decoder process the

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image to

reconstruct image.

To enhance image

quality and reduce

blocking artifact,

the image frame is

passed through

filter. The project is

completed

successfully by

reconstructing

video with

reasonable quality.

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Fast Motion
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Algorithms for
H.264 Video Coding
Efficient Motion
Estimation and
Quantization
Algorithms for Low-
bit-rate Video
Coding
Development of

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Highly Efficient

Motion Estimation

Algorithms in Video

Coding

Classification-Based

Adaptive Search

Algorithm for Video

Motion Estimation

The need of video

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Algorithms For

*compression in the
modern age of*

visual

communication

cannot be over-

emphasized. This

monograph will

provide useful

information to the

postgraduate

students and

researchers who

wish to work in the

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Algorithms For
domain of VLSI

design for video
processing

applications. In this
book, one can find

an in-depth

discussion of

several motion

estimation

algorithms and

their VLSI

implementation as

conceived and

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*Algorithms For
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Computer Science*

*developed by the
authors. It records
an account of
research done
involving fast three
step search,
successive
elimination, one-bit
transformation and
its effective
combination with
diamond search
and dynamic pixel*

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techniques. Two
appendices provide
a number of

instances of proof
of concept through
Matlab and Verilog
program segments.

In this aspect, the
book can be
considered as first
of its kind. The
architectures have

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Computer Science*

*been developed
with an eye to their
applicability in
everyday low-power
handheld
appliances
including video
camcorders and
smartphones.*

*The objective of my
research is
reducing the
complexity of video*

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*coding standards in
real-time scalable
and multi-view
applications.*

*Techniques and
Algorithms*

*Fast Motion And
Estimation Science*

*Techniques and
Algorithms for
H.264/AVC Video
Compression*

Fast Feature-based

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*Efficient Block-
matching Motion
Estimation*

*Algorithms for
Video Coding And
Motion Estimation*

*Algorithms for
Video Compression*

***Este trabalho
teve por objetivo
estudar***

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**algoritmos de
estimação de
movimento
baseados na
técnica de
casamento de
bloco a fim de
avaliar a
importância da
sua escolha na
construção de
um codificador
para uso em
compressão de**

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*seqüência de
imagens. Para
isto foram
estudados quatro
algoritmos
baseados na
técnica de
casamento de
bloco, sendo
verificada a
interdependência
existente entre
os vários
parâmetros que*

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*os compõem, tais
como, tamanho
da área de busca,
critérios de
medida de
distorção entre
blocos e
tamanhos de
blocos, em
relação à
qualidade da
imagem
reconstruída.*
MPEG-4 is the

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**multimedia
standard for
combining
interactivity,
natural and
synthetic digital
video, audio and
computer-
graphics. Typical
applications are:
internet, video
conferencing,
mobile
videophones,**

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**multimedia
cooperative
work,
teleteaching and
games. With
MPEG-4 the next
step from block-
based video
(ISO/IEC
MPEG-1,
MPEG-2, CCITT
H.261, ITU-T
H.263) to
arbitrarily-**

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*shaped visual
objects is taken.
This significant
step demands a
new methodology
for system
analysis and
design to meet
the considerably
higher flexibility
of MPEG-4.*

*Motion
estimation is a
central part of*

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***MPEG-1/2/4 and
H.261/H.263***

video compression The

compression

standards and

has attracted

much attention

in research and

industry, for the

following

reasons: it is

computationally

the most

demanding

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**algorithm of a
video encoder
(about 60-80% of
the total
computation
time), it has a
high impact on
the visual quality
of a video
encoder, and it is
not standardized,
thus being open
to competition.**

Algorithms,

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Architectures for
MPEG-4 Motion
Estimation**
covers in detail
every single step
in the design of a
MPEG-1/2/4 or
H.261/H.263
compliant video
encoder: **Fast
motion**

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algorithms
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analysis tools
Detailed
complexity
analysis of a
software
implementation
of MPEG-4 video
Complexity and
visual quality
analysis of fast
motion**

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algorithms
within MPEG-4
Design space on
motion
estimation VLSI
architectures
Detailed VLSI
design examples
of (1) a high
throughput and
(2) a low-power
MPEG-4 motion
estimator.**

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MPEG-4 Motion
Estimation is an
important
introduction to
numerous
algorithmic,
architectural and
system design
aspects of the**

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**multimedia
standard
MPEG-4. As
such, all
researchers,
students and
practitioners
working in image
processing, video
coding or system
and VLSI design
will find this
book of interest.
Fast Algorithms**

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Using Frequency
Domain
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Multimedia
Block Matching
Algorithm for
Video Coding
Motion
Estimation for
Video Coding
Image and Video***

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Multimedia***

Engineering The

The work on this
thesis then contrives
a number of fast
algorithms for
motion estimation.

The adoption of
motion vector
composition (MV
composition) for a
fast motion

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Computer Science**

**estimation scheme in
a low-delay
hierarchical P-frame
structure is firstly
proposed. It
expedites the motion
estimation process
for distant reference
frames in the
hierarchical P
structure. In
addition, a vector
selection algorithm is**

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tailor-made with the
proposed
hierarchical P coding
scheme to further
improve the coding
efficiency.

Simulation results
show that the
proposed scheme can
deliver a remarkable
complexity savings
and coding efficiency
improvement on

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**coding a frame in
low temporal layers
of the hierarchical P
structure. The rest of
this work proposes to
perform motion
locus prediction
before motion
estimation. By this
motion locus
prediction, a suitable
search range can be
adjusted adaptively**

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**for motion
estimation. Thanks
to the rapid
development of
MVC and 3D videos,
the state-of-the-art
3D coding
framework provides
multi-view plus
depth video (MVD)
in which the depth
map is additional
information to be**

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**encoded in the coded
bitstreams. Depth
maps record the
distances of various
objects in the scene
from a viewpoint.**

**With the depth maps
from MVD**

**sequences, we reveal
the depth variation
and the spatial
correlation between
blocks as well as the**

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temporal correlation
Video
between the depth
Compression The
maps and the motion
Springer
in texture, motion
International
locus perdition can
Series
be achieved for
Engineering And
speeding up the
Computer Science
texture coding in an
HEVC encoder. The
depth information
brings new room for
designing an
efficient adaptive

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**search range (ASR)
algorithm in HEVC.
Simulation results
show that the
proposed ASR
algorithms can offer
a significant And
complexity reduction
with negligible loss
of coded video
quality.**

**This second edition
provides easy access**

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**to important
concepts, issues and
technology trends in
the field of
multimedia**

**technologies,
systems, techniques,
and applications.**

**Over 1,100 heavily-
illustrated pages —
including 80 new
entries — present
concise overviews of**

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all aspects of
software, systems,
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developing media to
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electronically.

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**A Complete
Framework for the
Analysis, Design and**

**Implementation of
Motion Estimation
Algorithms for a**

**Video Coding
Hardware Engine**

Motion

**estimation is a
key issue in the
field of moving**

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In the framework
of video coding,
it is combined
with motion
compensation in
order to exploit
the spatio
temporal
correlation of
image sequences
along the motion
trajectory. It
then achieves

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one of the most
important

compression The

factors of a

video coder. By

dividing each

frame into

rectangular

blocks, motion

vectors are

obtained via the

block matching

algorithms

(BMA). The full

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search algorithm
(FS) is a brute
force BMA. It
searches all
possible
locations inside
the search
window in the
reference frame
to provide an
optimal
solution.
However, its
high

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computational
Video
complexity makes
it often not The
suitable for
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real-time
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implementation.
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Many fast but
Engineering And
sub-optimal
Computer Science
algorithms are
introduced to
improve the
performance of
video coders.
The present book

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analyses three
prospects of
improving the
quality of
existing video
coding schemes.
Namely, one at a
time
optimization,
adaptive search
stagey and
feature domain
based criteria.
Video frame rate

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n-compensated
methods offer
better quality
interpolated
frames since the

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interpolation is performed along the motion trajectory. In addition, computational complexity, regularity, and memory bandwidth are important for a real-time implementation.

Motion-
compensated

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frame rate up-
conversion (MC-
FRC) is composed
of two main
parts: motion
estimation (ME)
and motion-
compensated
frame

interpolation
(MCFI). Since ME
is an essential
part of MC-FRC,
a new fast

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motion
estimation (FME)
algorithm The
capable of
producing sub-
sample motion
vectors at low c
omputational-
complexity has
been developed.
Unlike existing
FME algorithms,
the developed
algorithm

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considers the
low complexity
sub-sample

accuracy in
designing the
search pattern
for FME. The
developed FME

algorithm is
designed in such
a way that the
block distortion
measure (BDM) is
modeled as a

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parametric
Video
surface in the
vicinity of the
integer-sample
motion vector;
this modeling
enables low comp
utational-
complexity sub-
sample motion
estimation
without pixel
interpolation.
MC-FRC needs

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more accurate
motion

trajectories for
better video
quality; hence,
a novel true-
motion

estimation (TME)
algorithm

targeting to
track the
projected object
motion has been
developed for

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video processing
applications,
such as motion-
compensated
frame
interpolation
(MCFI),
deinterlacing,
and denoising.

Developed TME
algorithm
considers not
only the
computational

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Algorithms For
complexity and
regularity but
also memory The

bandwidth. TME
is obtained by

imposing
implicit and
explicit
smoothness

constraints on
block matching
algorithm (BMA).
In addition, it
employs a novel

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adaptive

clustering

algorithm to

keep the low-

complexity at

reasonable

levels yet

enable

exploiting more

spatiotemporal

neighbors. To

produce better

quality

interpolated

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frames, dense
Video motion field at
the compression The
interpolation
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International obtained for
Series In both forward and
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Computer Science vectors (MVs);
then,
bidirectional
motion
compensation
using forward

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and backward MVs

is applied by
mixing both
elegantly.

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A Thesis
Fast Motion
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and
Deinterlacing

The book deals with the development of a methodology to estimate the motion field between two

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frames for video coding applications. This book proposes an exhaustive study of the motion estimation process in the framework of a general video coder. The conceptual explanations are discussed in a simple language and with the use of suitable figures. The book will serve as a guide for new

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researchers working in
the field of motion
estimation techniques.

This book discusses
data communication
and computer
networking,
communication
technologies and the
applications of IoT
(Internet of Things),
big data, cloud
computing and
healthcare informatics.

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It explores, examines and critiques intelligent data communications and presents inventive methodologies in communication technologies and IoT. Aimed at researchers and academicians who need to understand the importance of data communication and advanced technologies in IoT, it offers

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different perspectives to help readers increase their knowledge and motivates them to conduct research in the area, highlighting various innovative ideas for future research.

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**hardware still
cannot
accommodate the
demand for large
amounts of visual
data. Without the
generation of
high-quality
video bitstreams,
limited hardware
capabilities will
continue to stifle**

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***the advancement
of multimedia
technologies.***

***Thorough
grounding in
coding is needed
so that
applications such
as MPEG-4 and
JPEG 2000 may
come to fruition.
Image and Video***

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*provides a solid,
comprehensive
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the fundamentals
and algorithms
that lead to the
creation of new
methods for
generating high*

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streams. The
authors present a
number of
relevant
advances along
with international
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to the Second
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chapter
describing the***

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recently

*developed video
coding standard,
MPEG-Part 10*

*Advances Video
Coding also*

*known as H.264 .
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*concepts and
algorithms of*

*JPEG2000 . Color
systems of digital*

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standards and
profiles Visual
data, image, and
video coding will
continue to
enable the
creation of
advanced
hardware,
suitable to the*

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***demands of new
applications.***

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image and video
compression,
this book yields a
unique, self-
contained***

***reference for
practitioners
to build a basis
for future study,***

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*research, and
development.
Knowledge of
motion fields is
crucial to several
applications such
as video coding,
image scene
analysis and
noise reduction.
Estimation of this
field is frequently*

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***done using
constraints such
as smoothness
deduced from
physical
considerations of
the process
generating the
video.***

***Smoothness of
motion is a
qualitative***

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statement

**regarding local
relationships of
elements of this
field. In this work,
our primary focus
is on
quantitatively
modeling the
relationships
between
elements of the**

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*motion field at
spatial
neighborhoods of
pixels and in
filtering of
motion. These
are accomplished
by generalizing
popular
techniques in
statistical signal
processing--autor*

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gressive (AR)

**models and
moving average
(MA) filtering.**

**First, we show an
equivalence
between
estimates from**

**AR models
(output of MA
filtering) to the
solution of a**

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***weighted least
squares problem.***

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***This least
squares problem
is then***

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***generalized to
enable modeling
(filtering) of
motion fields.***

***Our AR model for
motion is
significantly***

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***different from
previous
approaches in
that instead of
computing
motion at a pixel
as a linear
combination of
motion at a
spatial
neighborhood of
pixels, we***

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**compute the
motion at a pixel
using the
observable data
(i.e., pixel
intensities)
directly. An
extension of this
temporal AR
model to a joint
spatiotemporal
model is also**

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presented.

***Applications to
interframe
estimation reveal
that interframe
prediction
accuracy is
improved over
previous
methods by as
much as 37%. A
temporal MA***

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filtering

*formulation is
proposed and
applied to
preprocessing
video prior to
coding.*

*Preprocessing
results indicate
that coding gains
using MPEG1 of
20% may be*

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***obtained while
maintaining the
same level of
visual quality of
decoded pre-
processed video
as compared to
the decoded
original
sequence.***

***Extending the
temporal filtering***

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*to a joint
spatiotemporal
filtering, we
propose
algorithms for
noise reduction.
At low and
moderate signal
to noise ratios,
our algorithms
perform
reasonable well,*

*but worse than
the best results
in the literature,
while at high
SNR, they
perform better. It
is believed that
with improved
estimation of
parameters used
in the algorithms,
performance may*

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be improved.

***Aside from the
above main
focus, we also
present
investigations
into two other
issues: (1)***

***Efficient motion
estimation
algorithms for
overlapped block***

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***motion compens
ation--we present
algorithms that
can trade off
computational
complexity for
prediction
accuracy in an
efficient manner
and (2) Supports
to be used in
linear predictive***

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**models--algorithm
ms are presented
which compute
supports yielding
up to 37%
improvements in
prediction over
nearest neighbor
based supports.
Computationally
Efficient Motion
Estimation**

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estimation
algorithms for
video
compression
Search Pattern
Analysis and
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Measurement for**

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Estimation

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New Efficient

Block-based

Motion

Estimation

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Vellore Institute
of Technology,
Amaravati, India,

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2-3 March 2019

**This book is
about a thesis
defended in 2007
that is interested
in the
development of
algorithms for
the estimation of
movement
between two
successive
images for video
processing and**

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coding
applications.

Block matching
techniques are
generally the
most widely
used. In this
context, the best
solution from the
quality point of
view is
represented by
an algorithm of
exhaustive

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research.

**However, this
algorithm
requires a huge
computational
complexity.
Different
suboptimal
solutions have
been proposed in
the literature,
but an
alternative
approach to the**

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problem in the
Video
frequency
domain is still
missing. This
thesis proposes
fast algorithms
to accelerate the
process of a
comprehensive
search using
different
metrics. The
approaches
introduced,

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**unlike several
proposed
solutions, are
not based on the
spatial domain,
rather they use
the domain
frequency. The
proposed
methods make it
possible to
provide
computation
time**

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**deterministic
and fast while
maintaining a
high-quality
motion
estimation
equivalent to an
exhaustive
search.**