Consortium GARR

8° BORSISTI DAY
"ORIO CARLINI"
MERCOLEDÌ 14 DICEMBRE 2016 - ROMA

Protocolli Buyer-Seller resistenti ad attacchi di collusione per la distribuzione sicura in rete di contenuti video

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Nelle puntate precedenti

Il problema

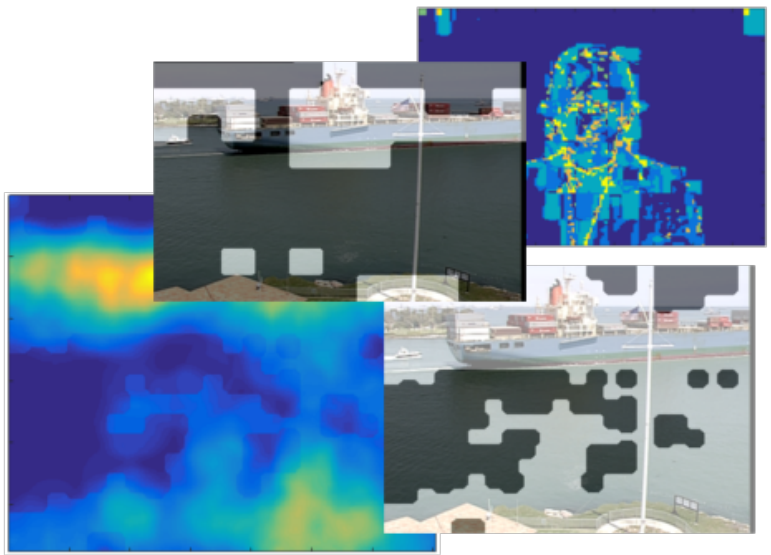
autenticazione di contenuti video

L'idea

marchiatura H.265 nel dominio compresso

La soluzione

- StreamEye + Matlab + ffmpeg
- HM 16.7 + Matlab



Trimestre I

Gli obiettivi

- approfondire lo standard H.265,
- investigare l'implementazione HM 16.7.

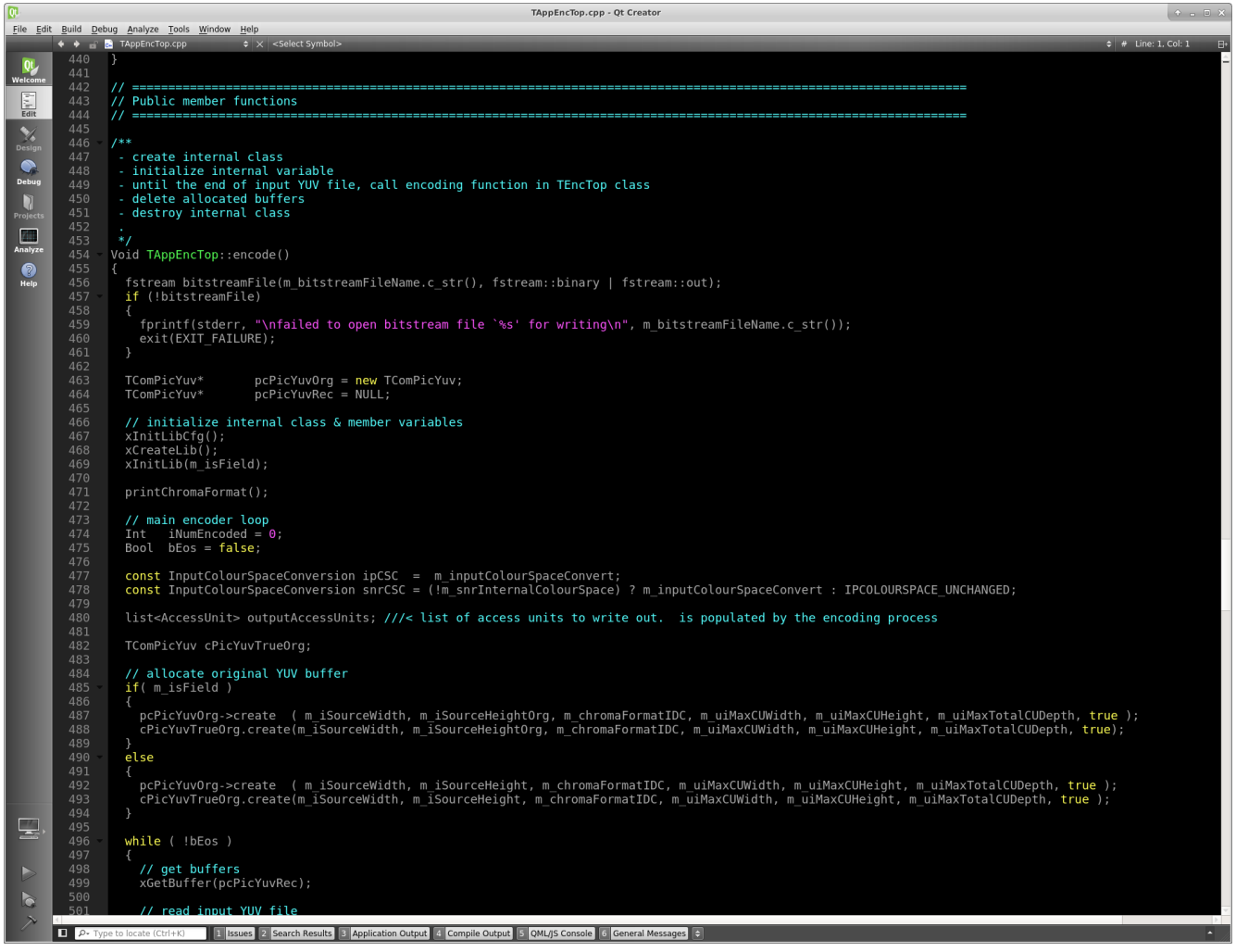
HEVC/H.265

H.264

HEVC

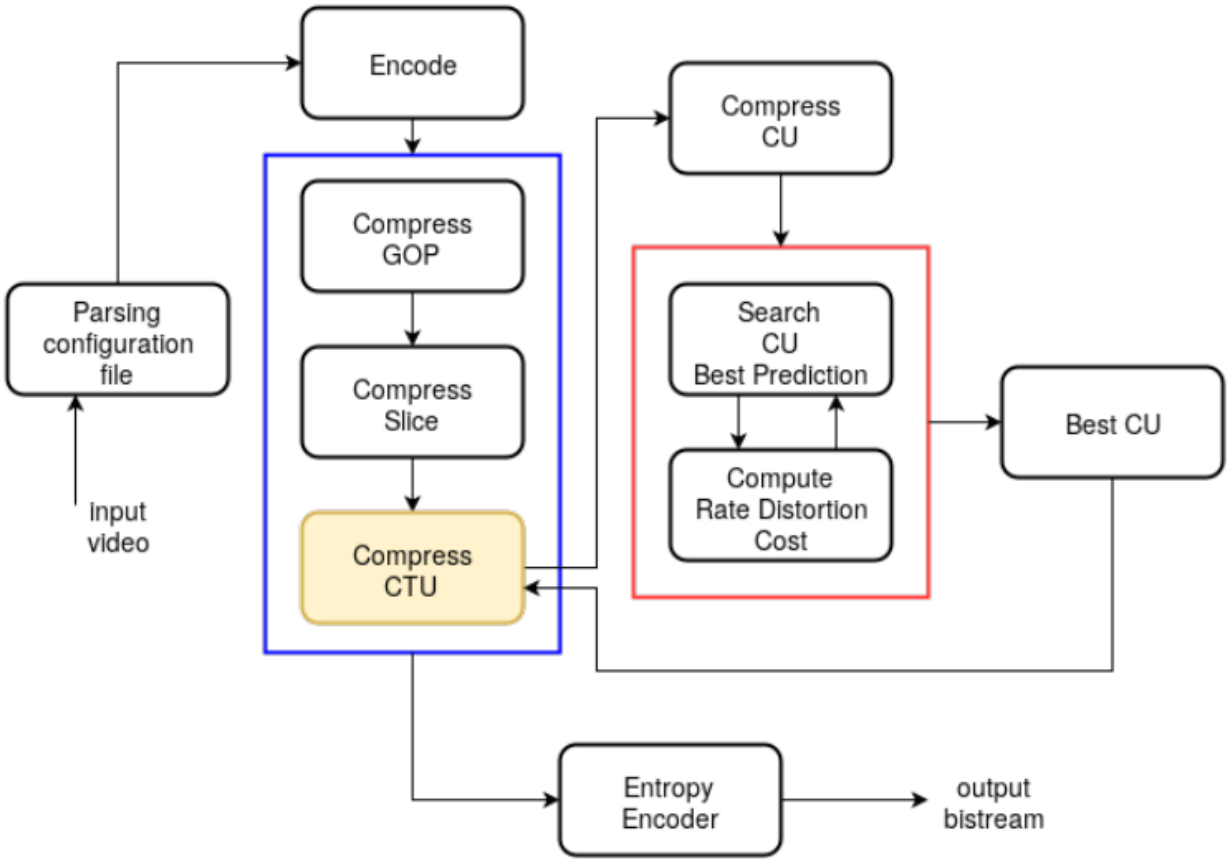
- frame suddiviso in *Coding Tree Unit*,
- *Coding Unit* da 64×64 pixel,
- CU suddivisa in *Prediction Unit* e *Transform Unit*,
- 35 intra mode.

Codice HM 16.7

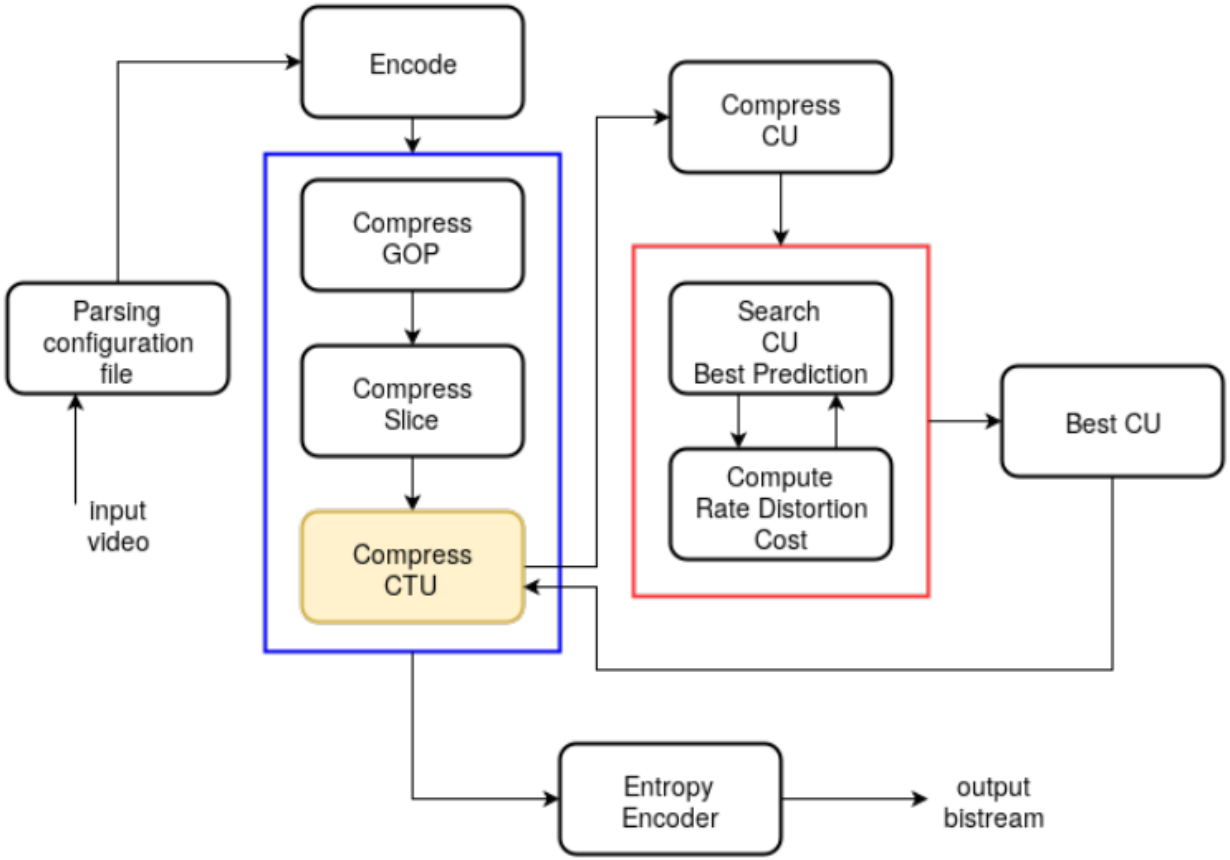



```
}

// ==================================================================================================================
// Public member functions
// ==================================================================================================================

/**
 - create internal class
 - initialize internal variable
 - until the end of input YUV file, call encoding function in TEncTop class
 - delete allocated buffers
 - destroy internal class
 .
 */
Void TAppEncTop::encode()
{
  fstream bitstreamFile(m_bitstreamFileName.c_str(), fstream::binary | fstream::out);
  if (!bitstreamFile)
  {
    fprintf(stderr, "\nfailed to open bitstream file `%s' for writing\n", m_bitstreamFileName.c_str());
    exit(EXIT_FAILURE);
  }

  TComPicYuv*       pcPicYuvOrg = new TComPicYuv;
  TComPicYuv*       pcPicYuvRec = NULL;

  // initialize internal class & member variables
  xInitLibCfg();
  xCreateLib();
  xInitLib(m_isField);

  printChromaFormat();

  // main encoder loop
  Int   iNumEncoded = 0;
  Bool  bEos = false;

  const InputColourSpaceConversion ipCSC  =  m_inputColourSpaceConvert;
  const InputColourSpaceConversion snrCSC = (!m_snrInternalColourSpace) ? m_inputColourSpaceConvert : IPCOLOURSPACE_UNCHANGED;

  list<AccessUnit> outputAccessUnits; ///< list of access units to write out.  is populated by the encoding process

  TComPicYuv cPicYuvTrueOrg;

  // allocate original YUV buffer
  if( m_isField )
  {
    pcPicYuvOrg->create  ( m_iSourceWidth, m_iSourceHeightOrg, m_chromaFormatIDC, m_uiMaxCUWidth, m_uiMaxCUHeight, m_uiMaxTotalCUDepth, true );
    cPicYuvTrueOrg.create(m_iSourceWidth, m_iSourceHeightOrg, m_chromaFormatIDC, m_uiMaxCUWidth, m_uiMaxCUHeight, m_uiMaxTotalCUDepth, true);
  }
  else
  {
    pcPicYuvOrg->create  ( m_iSourceWidth, m_iSourceHeight, m_chromaFormatIDC, m_uiMaxCUWidth, m_uiMaxCUHeight, m_uiMaxTotalCUDepth, true );
    cPicYuvTrueOrg.create(m_iSourceWidth, m_iSourceHeight, m_chromaFormatIDC, m_uiMaxCUWidth, m_uiMaxCUHeight, m_uiMaxTotalCUDepth, true );
  }

  while ( !bEos )
  {
    // get buffers
    xGetBuffer(pcPicYuvRec);

    // read input YUV file
```

HM in blocchi



HM in blocchi



Un file per ogni info estratta:

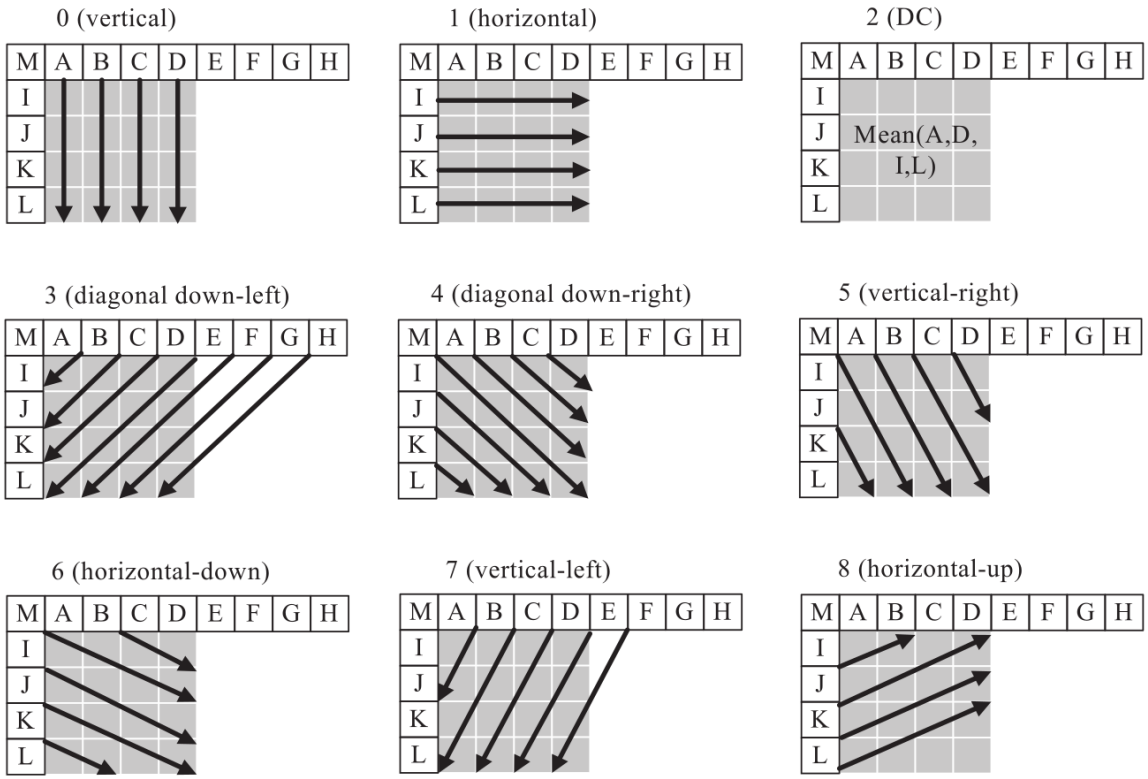
PU, TU, intra mode, inter mv, ...

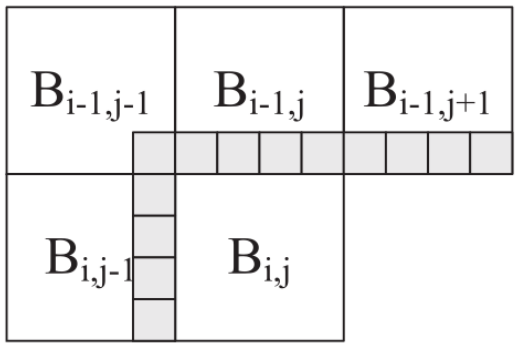
Trimestre II

Gli obiettivi

- studiare nuovi algoritmi di marchiatura,
- investigare e modificare l'implementazione HM 16.7.

Liu - Intra drift

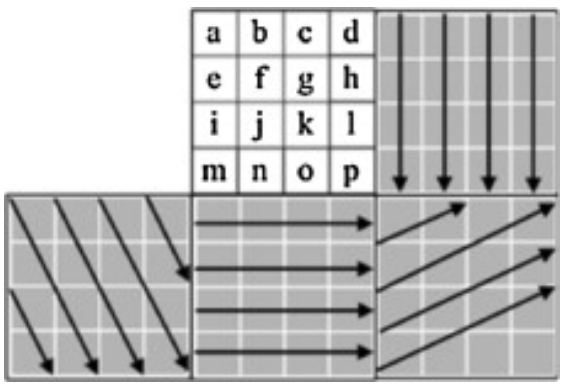




- codifica tramite MB adiacenti,
- modifiche al MB causano **intra drift**.

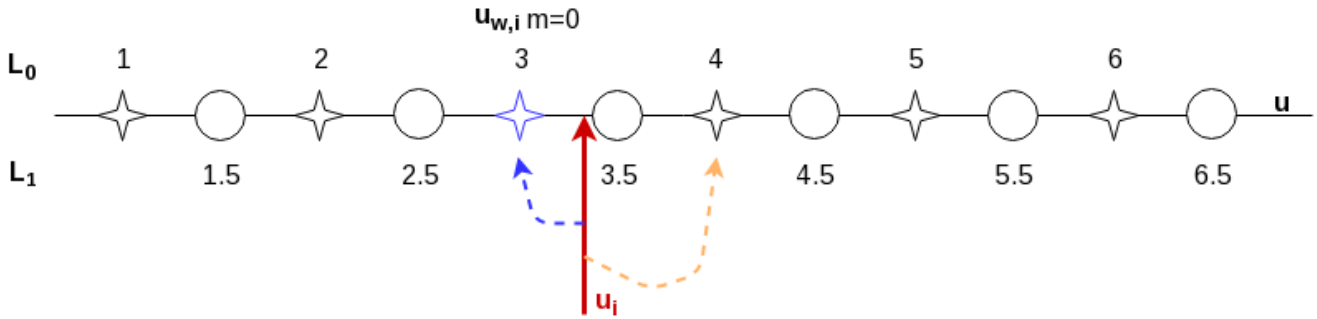
Liu - Intra drift

	Current MB	Mode: 4x4: 0,3,7 16x16: 0
Mode: 4x4: 0,1,2,4,5,6,8 16x16: 0,1,2,3	Mode: 4x4: 1,8 16x16: 1	Mode: 4x4: 0,1,2,3,7,8 16x16: 0,1,2,3



- il MB o subMB che rispetta la configurazione dei modi è modificabile,
- valido per MB intra predetti con partizione 4×4 e 16×16,
- tutti i macroblocchi devono essere già codificati.

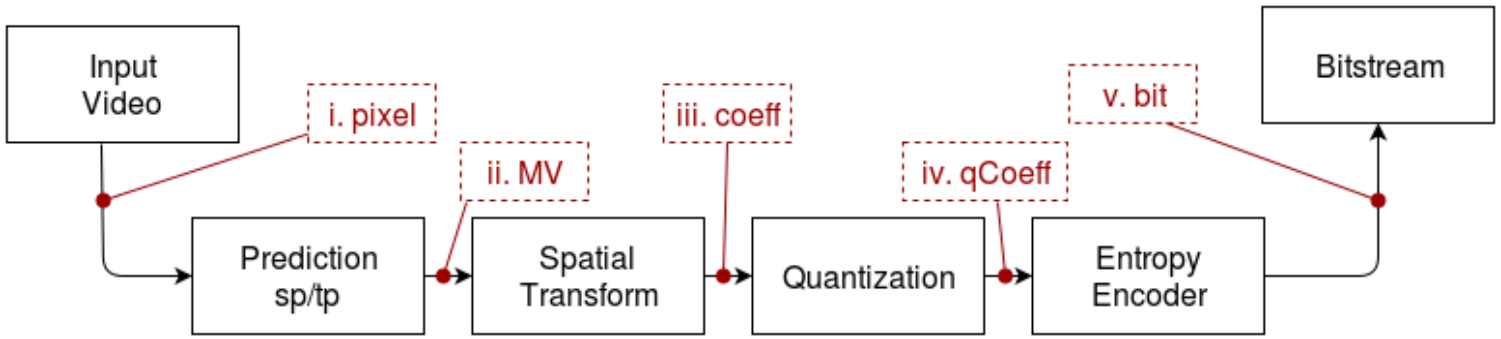
Zareian QIM



- il segnale viene diviso in elementi x_i *pari* e y_i *dispari*,
- $z = \sqrt{\frac{\sum_i x_i^2}{\sum_i y_i^2}}$ e $Q_m(z) = \delta \cdot \text{rd}\left(\frac{z + m\frac{\delta}{2}}{\delta}\right) - m\frac{\delta}{2}$
- il marchio viene inserito come: $x_i^{'} = \sqrt{\frac{z_q}{z}} x_i \quad y_i^{'} = \sqrt{\frac{z}{z_q}} y_i$,
- il marchio viene stimato come:

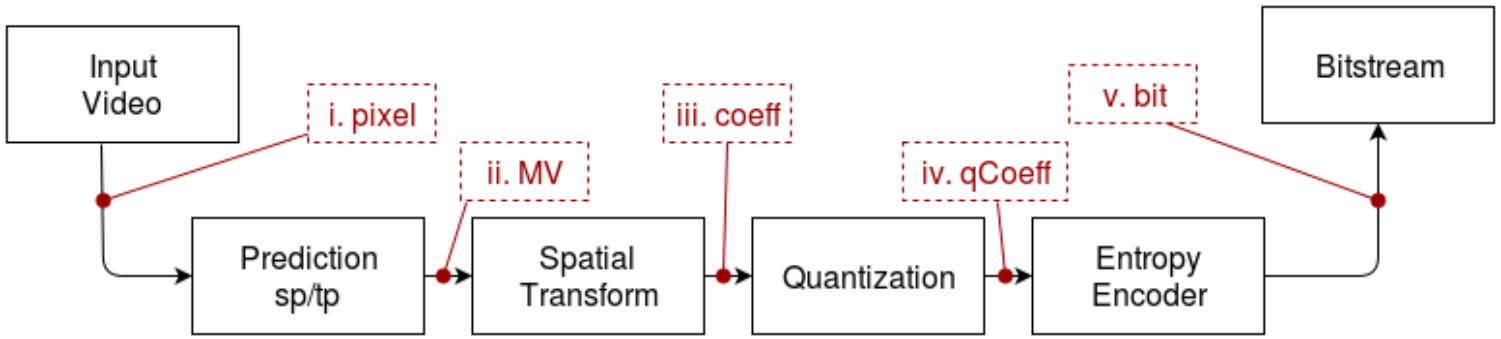
$$\hat{m} = \arg \min_{m \in \{1,0\}} |z^{''} - Q_m(z^{''})|.$$

Liu-Zareian con HM



- studiare quali MB-subMB non causano *intra drift*,
- modificare i coefficienti quantizzati,
- usare Zareian-QIM.

Liu-Zareian con HM



- studiare quali MB-subMB non causano *intra drift*,
- modificare i coefficienti quantizzati,
- usare Zareian-QIM.

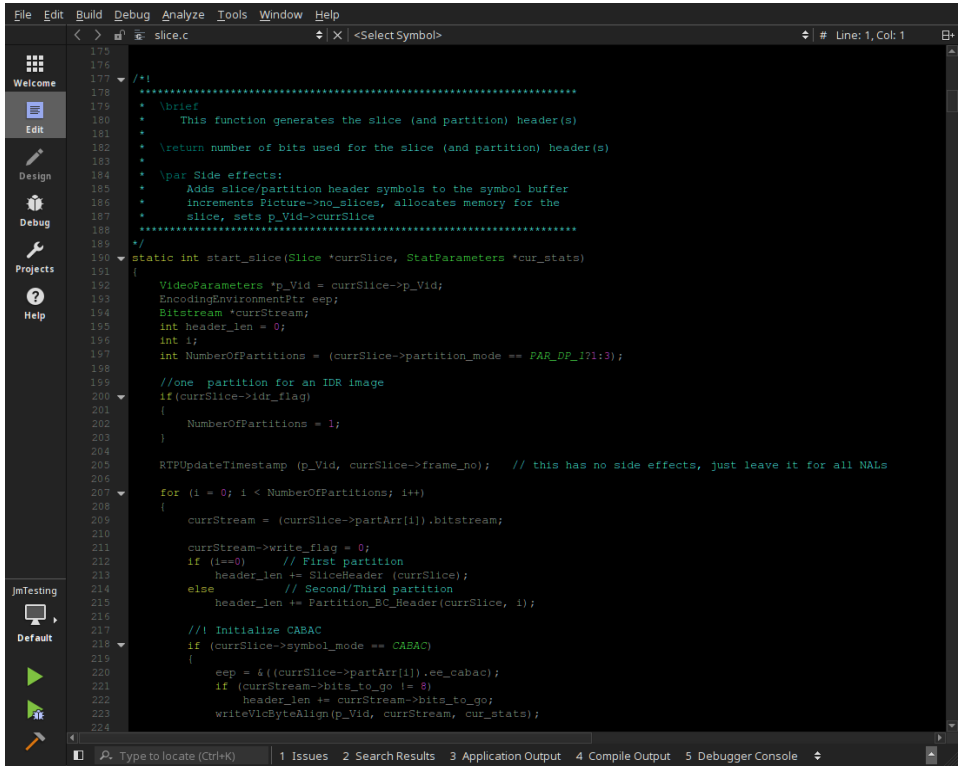
PROBLEMA: le modifiche apportate all'encoder tramite HM 16.7 non si ripercuotono sul bitstream finale.

Trimestre III

Gli obiettivi

- investigare H.264 e l'implementazione JM 19.0,
- implementare gli algoritmi di marchiatura in JM.

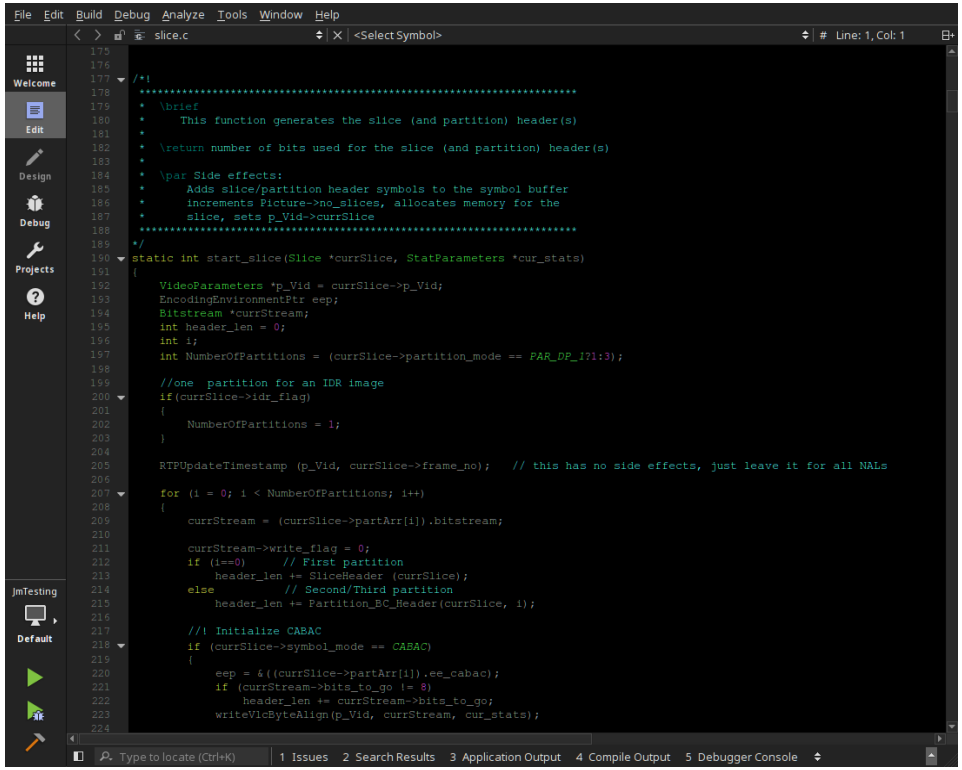
Analisi del codice JM



Approcci possibili:

- Contattare gli autori
- *Rubber duck debugging*
- *Debugging journal*

Analisi del codice JM

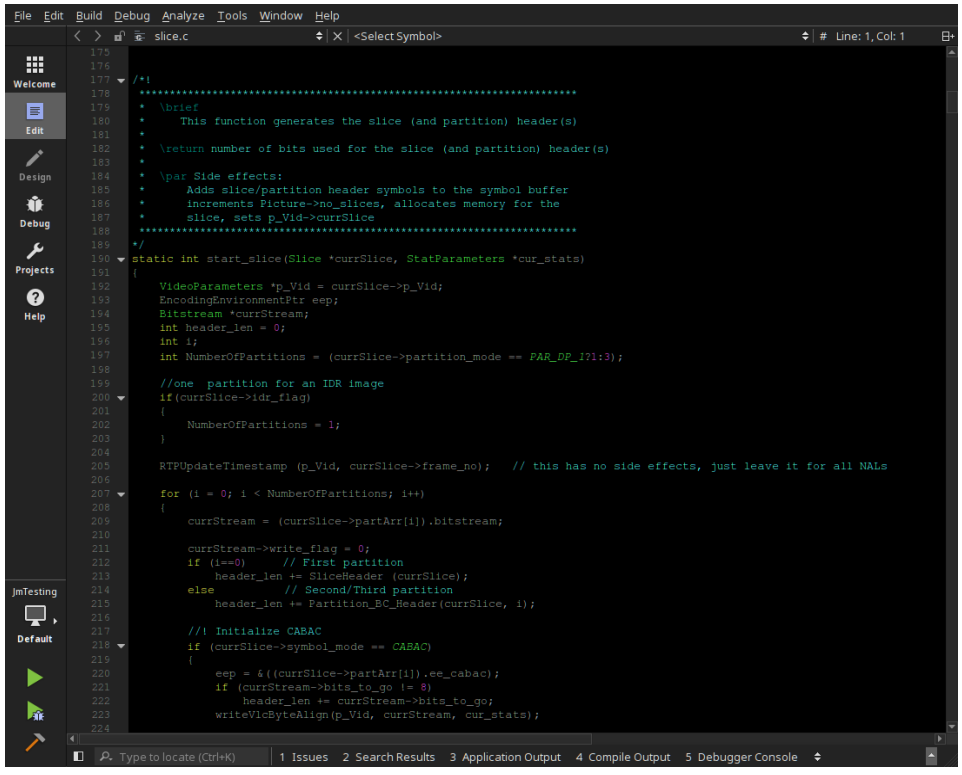


Approcci possibili:

- Contattare gli autori:$\sim$ 49

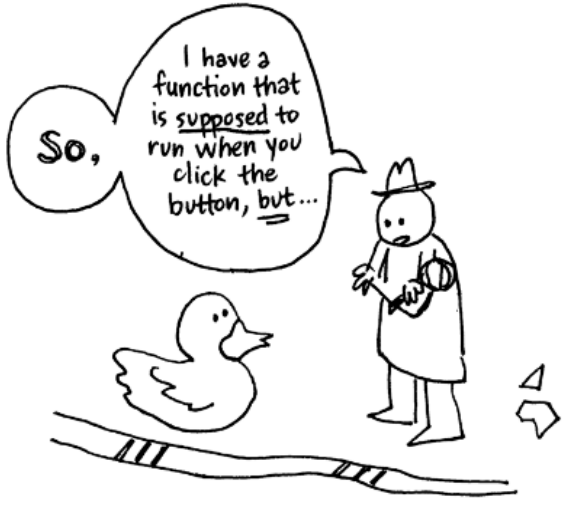
Apple Computer, Dolby Laboratories, Ericsson Radio Systems, Fraunhofer-Institute (HHI), LSI Logic, Microsoft Corp., Motorola Inc., Nokia Corporation,Nokia Inc., RealNetworks, Sejong Univ., Siemens AG, Telenor Broadband Services, TELES AG,Thomson, University of Hannover, Videolocus

Analisi del codice JM



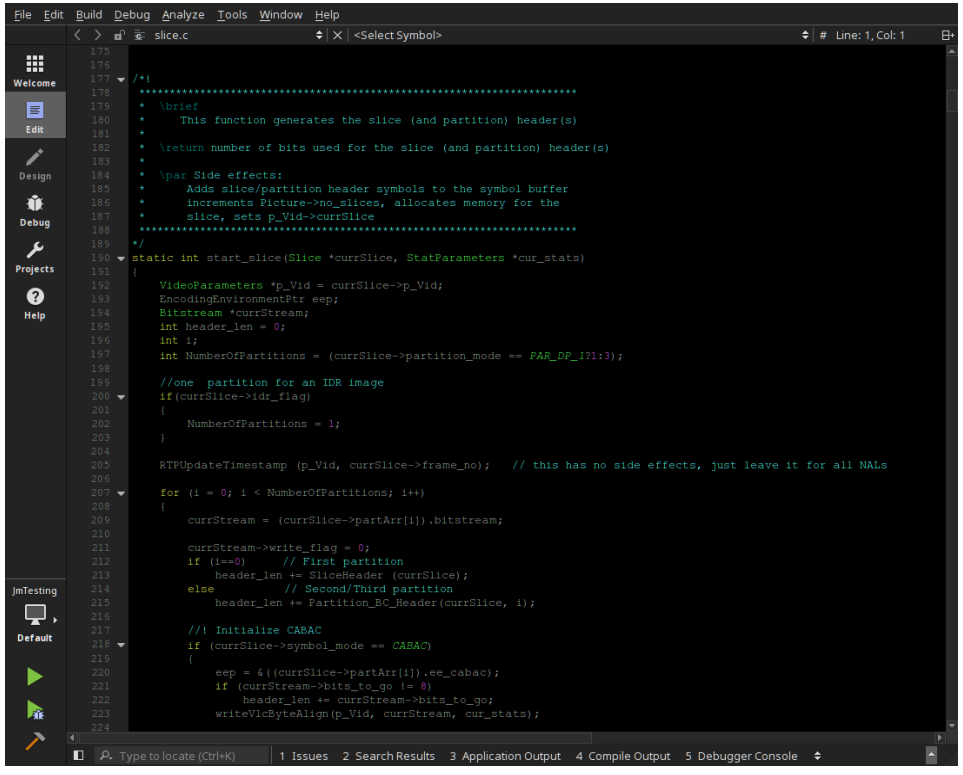
Approcci possibili:

- *Rubber duck debugging*



https://p5js.org/tutorials/debugging.htm

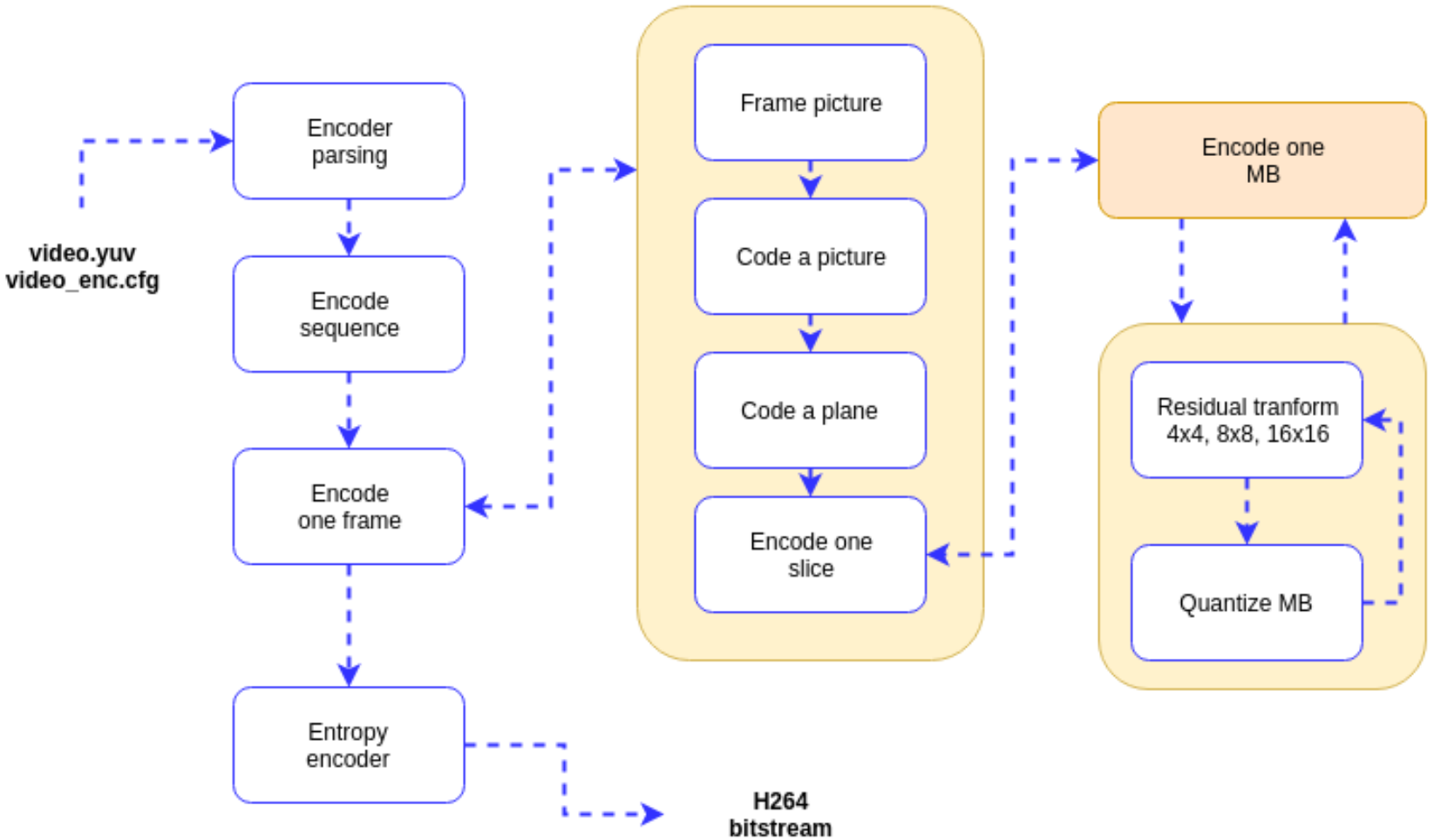
Analisi del codice JM



Approcci possibili:

- Contattare gli autori
- *Rubber duck debugging*
- *Debugging journal*

JM encoder in blocchi

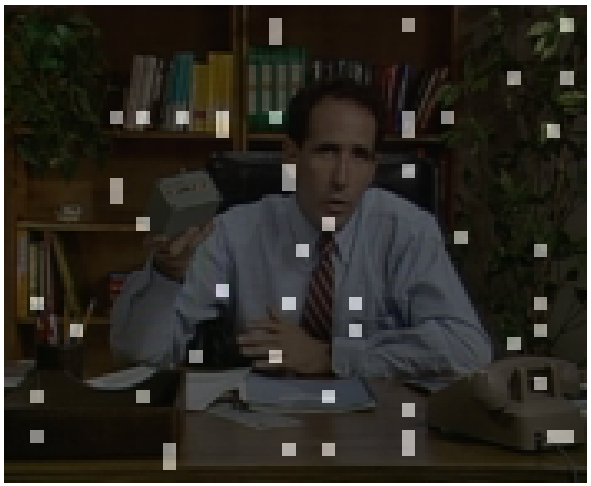


JM dati

```
[frame=0, mB=47, cooX=48, cooY=32, subPartX=4, subPartY=4, mbType=9]
[ipredmode] 6 8 1 8
[ipredmode] 7 7 8 0
[ipredmode] 1 6 3 5
[ipredmode] 6 1 1 1

[quantCoeffs (0, 0)] -1, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 1)] -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 2)] 0, 0, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 3)] 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (1, 0)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (1, 1)] 0, 0, 0, 0, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (1, 2)] 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (1, 3)] 0, 1, 2, -2, -3, -1, 0, 1, 2, 2, -2, -2, 0, 1, 2, -1,
[quantCoeffs (2, 0)] -3, 2, 1, 3, -3, -3, 0, 3, 1, 0, 1, -2, 0, 0, 0, 0,
[quantCoeffs (2, 1)] -2, 5, 6, 0, -4, 1, -2, -2, -3, -2, 1, 0, 2, 0, 0, 0,
[quantCoeffs (2, 2)] -19, -12, -2, 0, 5, 0, 6, -4, 10, 0, 1, -2, -3, -5, -2, 1,
[quantCoeffs (2, 3)] 5, -7, 17, 10, -11, -1, -2, 5, 0, -2, -1, -3, -1, 2, 1, -1,
[quantCoeffs (3, 0)] 0, -1, 1, 0, 1, 0, 0, 0, 0, -1, 0, -1, -1, 1, 0, 0,
[quantCoeffs (3, 1)] -1, -1, -3, 0, 7, -3, 1, 0, -4, -2, 3, -2, 2, 0, -1, 0,
[quantCoeffs (3, 2)] -3, 7, 4, 0, 2, -6, 5, -1, -2, -1, 1, 0, 0, -2, 0, 0,
[quantCoeffs (3, 3)] -9, -13, 10, 14, -9, -1, 0, -1, 5, 0, 1, -5, 0, -1, 1, -1,

[pixelRes (0, :)] -2, -1, 0, 0, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, 1, 1,
[pixelRes (1, :)] -2, -1, 0, 0, -1, -1, -1, -1, 1, 1, 1, 1, -1, 0, 0, 1,
[pixelRes (2, :)] -2, -1, 0, 0, -1, -1, -1, -1, 1, 1, 1, 1, 1, 0, 0, -1,
[pixelRes (3, :)] -2, -1, 0, 0, -1, -1, -1, -1, -1, -1, -1, -1, 1, 1, -1, -1,
[pixelRes (4, :)] -1, -1, -1, -1, 1, 1, 1, 1, 1, 1, -1, -1, -1, 0, 4, 3,
[pixelRes (5, :)] -1, -1, -1, -1, -1, -1, -1, -1, 1, 1, -1, -1, 0, 1, 2, 0,
[pixelRes (6, :)] 1, 1, 1, 1, -1, -1, -1, -1, 1, 1, -1, -1, 2, 2, -1, 9,
[pixelRes (7, :)] 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, -1, -1, 0, 2, -3, -20,
[pixelRes (8, :)] 0, 2, 2, 0, 0, 3, 7, 5, 0, 2, 1, 0, -2, -1, 0, -19,
[pixelRes (9, :)] -6, -7, -4, -1, 8, 7, 1, -1, 1, 2, -1, 4, 5, -1, 0, -5,
[pixelRes (10, :)] -4, -1, -6, -13, 6, 1, -20, -17, -3, -3, -2, 1, -1, 2, -1, -6,
[pixelRes (11, :)] -2, 10, 3, -16, 0, -2, -19, -9, -3, -4, 4, 0, -19, 0, 15, 19,
[pixelRes (12, :)] -22, -6, -17, -31, 8, 18, 38, 59, 6, 9, 6, -16, -12, 13, 30, 32,
[pixelRes (13, :)] -34, -40, 1, 2, -5, 1, 7, 27, 9, 4, 9, -19, -40, -33, 0, 14,
[pixelRes (14, :)] -33, -47, 12, 5, -20, -12, -21, -12, 3, -4, 2, -25, -33, -37, -25, -8,
[pixelRes (15, :)] -18, -28, -8, -3, -5, 7, 3, -24, -7, -5, 0, -14, -9, 0, -4, -15,
```

- file.txt costruito in codifica (ed eventuale decodifica),
- descrive le caratteristiche di codifica per ciascun intra MB nel video,
- intra mode, coefficienti quantizzati, residuo in pixel.

JM con Liu-Zareian



L'idea di marchiatura:

- codifica H.264 con $QP = 10$,
- identificazione dei macroblocchi non sensibili a *intra drift*,
- forza del marchio gestita con $\delta \in [0.3, 0.9]$,
- modifica della DC-quantizzata di alcuni sottoblocchi 4×4,
- marchio a 20 bit generato casualmente a partire da un seed.

Test preliminari I

- video CIF e QCIF,
- impercettibilità a $\sim$ 51dB,
- attacchi con JM e x264 a vari livelli QP.

W strength	**libx264 - attack**								
	husky			salesman			suzie		
	q5	q20	q30	q5	q20	q30	q5	q20	q30
0.3	6	1	5	4	4	5	3	4	3
0.4	5	8	5	9	3	7	3	1	2
0.5	9	6	5	7	5	5	4	4	2
0.6	*10*	*4*	*8*	*10*	*8*	*4*	*4*	*4*	*3*
0.7	9	7	6	9	5	6	3	3	3
0.8	9	9	6	8	7	5	4	2	0
0.9	7	8	7	9	8	7	4	4	1

Test preliminari I

- i bit estratti non crescono con la forza del marchio,
- i bit estratti dovrebbero diminuire al crescere della compressione,
- risultati simili con attacco JM.

W strength	**libx264 - attack**								
	husky			salesman			suzie		
	q5	q20	q30	q5	q20	q30	q5	q20	q30
0.3	6	1	5	4	4	5	3	4	3
0.4	5	8	5	9	3	7	3	1	2
0.5	9	6	5	7	5	5	4	4	2
0.6	*10*	*4*	*8*	*10*	*8*	*4*	*4*	*4*	*3*
0.7	9	7	6	9	5	6	3	3	3
0.8	9	9	6	8	7	5	4	2	0
0.9	7	8	7	9	8	7	4	4	1

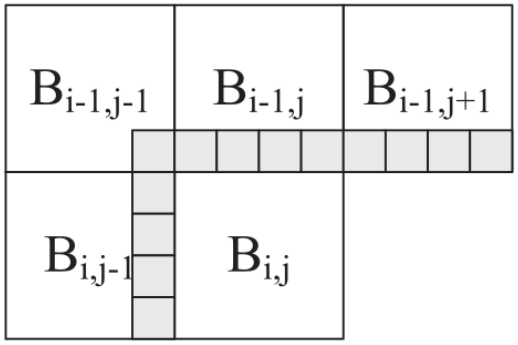
Trimestre IV

Gli obiettivi

- affinare l'algoritmo di marchiatura per JM
- testare qualità e robustezza del marchio

Bug corretti

```
[frame=0, mB=87, cooX=336, cooY=48, subPartX=4, subPartY=4, mbType=9]
[ipredmode] 1 1 1 0
[ipredmode] 1 8 0 0
[ipredmode] 6 6 8 0
[ipredmode] 7 6 6 0

[quantCoeffs (0, 0)] 2, -1, 1, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 1)] -2, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 2)] 0, 0, 2, 0, -2, 0, 0, 0, 0, 0, 0, 0, -1, 0, 0, 0,
[quantCoeffs (0, 3)] 0, 0, -6, 1, 1, -2, 0, 3, 0, 2, 0, 1, 1, 0, -1, 0,
[quantCoeffs (1, 0)] -5, 9, 0, -1, 0, -7, 3, 0, 2, -1, 1, -1, 0, 0, 0, 0,
[quantCoeffs (1, 1)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (1, 2)] -7, -1, -3, 1, -2, 1, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0,
[quantCoeffs (1, 3)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (2, 0)] -8, 2, 2, 0, 2, 0, 1, 0, -4, -2, 0, 0, -1, 0, 0, 0,
[quantCoeffs (2, 1)] -3, 2, 6, -4, -1, -2, 0, -1, 3, -1, -1, 1, -1, 1, 0, 0,
[quantCoeffs (2, 2)] 5, -12, -3, 8, -1, 0, 2, -1, 4, -7, -2, 0, 0, -1, 0, 0,
[quantCoeffs (2, 3)] 6, 1, -7, -2, 3, 1, -2, 4, 2, -1, -1, 0, 0, 1, 0, 0,
[quantCoeffs (3, 0)] 6, 1, -6, -3, 3, -8, 1, 3, 0, 0, 0, -1, 0, 0, 0, 0,
[quantCoeffs (3, 1)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (3, 2)] 7, 6, 7, -6, -2, -10, 2, -3, 2, -1, -1, 0, 0, 0, -1, 0,
[quantCoeffs (3, 3)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,

[pixelRes (0, :)] 2, 4, 7, 8, -1, -3, -6, -8, 5, 11, -5, -71, -3, -2, 1, 2,
[pixelRes (1, :)] 5, 7, 10, 11, -3, -4, -5, -6, 1, 7, 8, -40, -1, -2, -5, -7,
[pixelRes (2, :)] 2, 4, 7, 8, -6, -5, -4, -3, 3, 5, -2, -53, 2, 1, -2, -4,
[pixelRes (3, :)] -3, -2, 1, 2, -8, -6, -3, -1, 4, 12, 0, -64, 2, 4, 7, 8,
[pixelRes (4, :)] -3, 6, 6, 15, -2, -19, -15, -13, -24, -26, -20, -13, -10, -10, -3, -14,
[pixelRes (5, :)] -2, 3, 3, 7, -13, -18, -16, -19, -36, -34, -21, -10, 0, 1, 4, -1,
[pixelRes (6, :)] 2, -3, -3, -7, -5, 27, 25, 1, -7, -12, -14, -10, 13, 13, 9, 15,
[pixelRes (7, :)] 3, -6, -6, -15, 2, 28, 24, 13, 1, -6, -11, -9, 15, 15, 7, 18,
[pixelRes (8, :)] -14, -14, -17, -16, 4, 10, 0, -14, -7, 5, -3, -37, 11, 12, 5, 15,
[pixelRes (9, :)] 12, 0, -19, -31, 2, 26, 18, 9, 10, 24, 22, -10, 18, 19, 21, 31,
[pixelRes (10, :)] -11, -24, -29, -43, -20, -5, -3, -9, 8, 45, 53, 10, 11, 7, 16, 21,
[pixelRes (11, :)] -31, -34, -8, -11, -8, -29, -36, -54, -11, 46, 60, 2, 12, 2, 9, 8,
[pixelRes (12, :)] -21, -5, 31, 37, 17, -15, -38, -15, 5, 55, 52, -28, 18, 19, 34, 29,
[pixelRes (13, :)] -29, -18, 39, 44, 21, 15, -9, 17, 33, 66, 66, 4, 19, 16, 27, 31,
[pixelRes (14, :)] -68, -58, 10, 26, 5, 31, 26, 38, 10, 37, 37, -19, 2, -2, -24, -33,
[pixelRes (15, :)] 37, 34, 56, 65, 19, 42, 37, 23, 6, 6, -14, -64, -9, 8, -7, -20,
```



Bug corretti

```
[frame=0, mB=87, cooX=336, cooY=48, subPartX=4, subPartY=4, mbType=9]
[ipredmode] 1 1 1 0
[ipredmode] 1 8 0 0
[ipredmode] 6 6 8 0
[ipredmode] 7 6 6 0

[quantCoeffs (0, 0)] 2, -1, 1, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 1)] -2, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (0, 2)] 0, 0, 2, 0, -2, 0, 0, 0, 0, 0, 0, 0, -1, 0, 0, 0,
[quantCoeffs (0, 3)] 0, 0, -6, 1, 1, -2, 0, 3, 0, 2, 0, 1, 1, 0, -1, 0,
[quantCoeffs (1, 0)] -5, 9, 0, -1, 0, -7, 3, 0, 2, -1, 1, -1, 0, 0, 0, 0,
[quantCoeffs (1, 1)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (1, 2)] -7, -1, -3, 1, -2, 1, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0,
[quantCoeffs (1, 3)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (2, 0)] -8, 2, 2, 0, 2, 0, 1, 0, -4, -2, 0, 0, -1, 0, 0, 0,
[quantCoeffs (2, 1)] -3, 2, 6, -4, -1, -2, 0, -1, 3, -1, -1, 1, -1, 1, 0, 0,
[quantCoeffs (2, 2)] 5, -12, -3, 8, -1, 0, 2, -1, 4, -7, -2, 0, 0, -1, 0, 0,
[quantCoeffs (2, 3)] 6, 1, -7, -2, 3, 1, -2, 4, 2, -1, -1, 0, 0, 1, 0, 0,
[quantCoeffs (3, 0)] 6, 1, -6, -3, 3, -8, 1, 3, 0, 0, 0, -1, 0, 0, 0, 0,
[quantCoeffs (3, 1)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[quantCoeffs (3, 2)] 7, 6, 7, -6, -2, -10, 2, -3, 2, -1, -1, 0, 0, 0, -1, 0,
[quantCoeffs (3, 3)] 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,

[pixelRes (0, :)] 2, 4, 7, 8, -1, -3, -6, -8, 5, 11, -5, -71, -3, -2, 1, 2,
[pixelRes (1, :)] 5, 7, 10, 11, -3, -4, -5, -6, 1, 7, 8, -40, -1, -2, -5, -7,
[pixelRes (2, :)] 2, 4, 7, 8, -6, -5, -4, -3, 3, 5, -2, -53, 2, 1, -2, -4,
[pixelRes (3, :)] -3, -2, 1, 2, -8, -6, -3, -1, 4, 12, 0, -64, 2, 4, 7, 8,
[pixelRes (4, :)] -3, 6, 6, 15, -2, -19, -15, -13, -24, -26, -20, -13, -10, -10, -3, -14,
[pixelRes (5, :)] -2, 3, 3, 7, -13, -18, -16, -19, -36, -34, -21, -10, 0, 1, 4, -1,
[pixelRes (6, :)] 2, -3, -3, -7, -5, 27, 25, 1, -7, -12, -14, -10, 13, 13, 9, 15,
[pixelRes (7, :)] 3, -6, -6, -15, 2, 28, 24, 13, 1, -6, -11, -9, 15, 15, 7, 18,
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[pixelRes (9, :)] 12, 0, -19, -31, 2, 26, 18, 9, 10, 24, 22, -10, 18, 19, 21, 31,
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[pixelRes (11, :)] -31, -34, -8, -11, -8, -29, -36, -54, -11, 46, 60, 2, 12, 2, 9, 8,
[pixelRes (12, :)] -21, -5, 31, 37, 17, -15, -38, -15, 5, 55, 52, -28, 18, 19, 34, 29,
[pixelRes (13, :)] -29, -18, 39, 44, 21, 15, -9, 17, 33, 66, 66, 4, 19, 16, 27, 31,
[pixelRes (14, :)] -68, -58, 10, 26, 5, 31, 26, 38, 10, 37, 37, -19, 2, -2, -24, -33,
[pixelRes (15, :)] 37, 34, 56, 65, 19, 42, 37, 23, 6, 6, -14, -64, -9, 8, -7, -20,
```
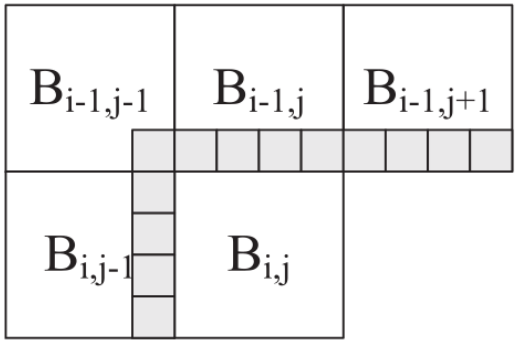



Correzione:

ridurre i *I4MB* modi a quelli nell'angolo superiore sinistro.

Test preliminari II

- video a risoluzione QCIF, CIF, 720p,
- marchio a 10 bit,
- i bit estratti decrescono all'aumentare della compressione.

W estimated		husky			ducks			salesman		
		q5	q20	q30	q5	q20	q30	q5	q20	q30
JM	0.7	8	8	9	10	9	7	8	7	3
	0.8	10	8	7	10	8	7	7	8	5
	0.9	10	10	8	9	8	6	8	8	6
x264	0.7	9	8	7	10	9	5	7	5	4
	0.8	9	6	7	10	9	8	8	5	5
	0.9	9	8	9	9	8	7	8	7	6

Test preliminari II

- i bit estratti decrescono all'aumentare della compressione,
- i bit estratti crescono all'aumentare della forza del marchio.

W estimated		husky			ducks			salesman		
		q5	q20	q30	q5	q20	q30	q5	q20	q30
JM	0.7	8	8	9	10	9	7	8	7	3
	0.8	10	8	7	10	8	7	7	8	5
	0.9	10	10	8	9	8	6	8	8	6
x264	0.7	9	8	7	10	9	5	7	5	4
	0.8	9	6	7	10	9	8	8	5	5
	0.9	9	8	9	9	8	7	8	7	6

Test preliminari II

- i bit estratti decrescono all'aumentare della compressione,
- i bit estratti crescono all'aumentare della forza del marchio,
- ci sono ancora delle anomalie.

W estimated		husky			ducks			salesman		
		q5	q20	q30	q5	q20	q30	q5	q20	q30
JM	0.7	8	8	9	10	9	7	8	7	3
	0.8	10	8	7	10	8	7	7	8	5
	0.9	10	10	8	9	8	6	8	8	6
x264	0.7	9	8	7	10	9	5	7	5	4
	0.8	9	6	7	10	9	8	8	5	5
	0.9	9	8	9	9	8	7	8	7	6

Test preliminari II

- i bit estratti decrescono all'aumentare della compressione,
- i bit estratti crescono all'aumentare della forza del marchio,
- ci sono ancora delle anomalie.

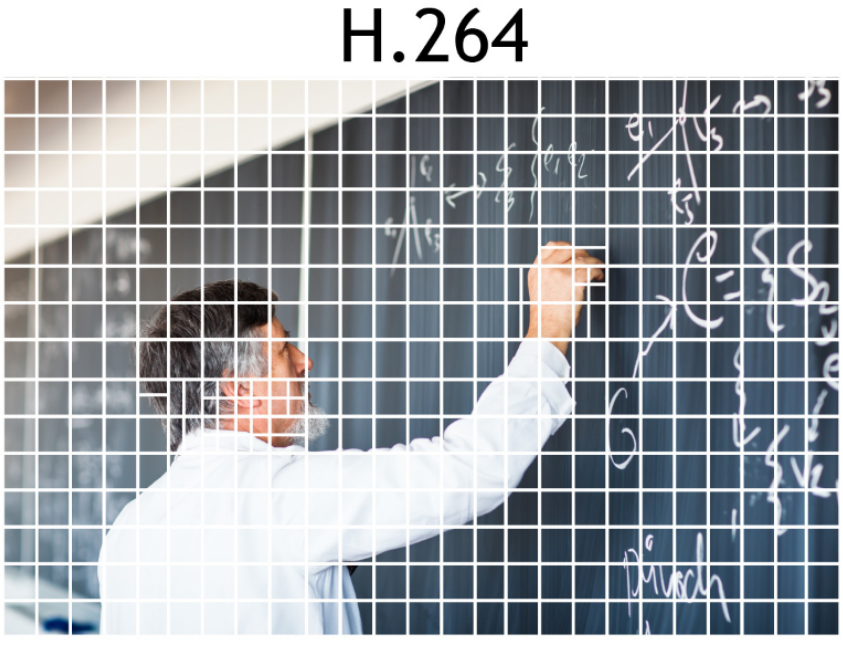
W estimated		husky			ducks			salesman		
		q5	q20	q30	q5	q20	q30	q5	q20	q30
JM	0.7	8	8	9	10	9	7	8	7	3
	0.8	10	8	7	10	8	7	7	8	5
	0.9	10	10	8	9	8	6	8	8	6
x264	0.7	9	8	7	10	9	5	7	5	4
	0.8	9	6	7	10	9	8	8	5	5
	0.9	9	8	9	9	8	7	8	7	6

Risultati provenienti da 3 video e 1 seed

Sviluppi futuri

Gennaio 2017

- correzione anomalie,
- supporto a I16MB,
- estensione dei test di compressione.



Sviluppi futuri

Gennaio 2017

- correzione anomalie,
- supporto a I16MB,
- estensione dei test di compressione.

Oltre Gennaio

- estensione ai P-frame,
- test esaustivi con video completamente marchiato.

Sviluppi futuri

Gennaio 2017

- correzione anomalie,
- supporto a I16MB,
- estensione dei test di compressione.

Oltre Gennaio

- estensione ai P-frame,
- test esaustivi con video completamente marchiato,
- autenticazione tramite un *approccio passivo*.

Video Forensics: ricerca di tracce residue dovute a doppia compressione.

Consortium GARR

8° BORSISTI DAY
"ORIO CARLINI"
MERCOLEDÌ 14 DICEMBRE 2016 - ROMA

Protocolli Buyer-Seller resistenti ad attacchi di collusione per la distribuzione sicura in rete di contenuti video

Borsista: Dott.ssa Dasara Shullani
Tutor: Prof. Alessandro Piva

UNIVERSITÀ DEGLI STUDI FIRENZE
DINFO
DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE