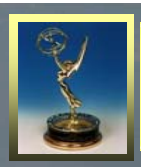
JPEG INNOVATIONS WORKSHOP
TOKYO, JAPAN
February 23rd (Wed.), 2011




Future Technologies
and
Applications for SC29/WG1

February 23rd, 2011
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OUTLINE

Old Days of JPEG

New ICT Policy of Japan

What is needed under Web3.0

Future of SC29/WG1

Old Days of JPEG

Start of JPAG

1982.9 - 1985.9
WG8 (Dr.Z.Muscati)

1985.9 - 1986.11
WG8 (Dr.H.Yasuda)

1986.11 - 1988.5
WG8 (Dr.H.Yasuda)

CCEG	JPEG
(Mr.B.Trocherie)	(Mr.G.Hudson:Mr.G.Wallace)
Computer	Joint
Graphics	Photographic
Coding	Image Coding
Experts	Experts
Group	Group

Completion of JPEG Standard

1988.5 - 1988.11

WG8 (Dr.H.Yasuda)

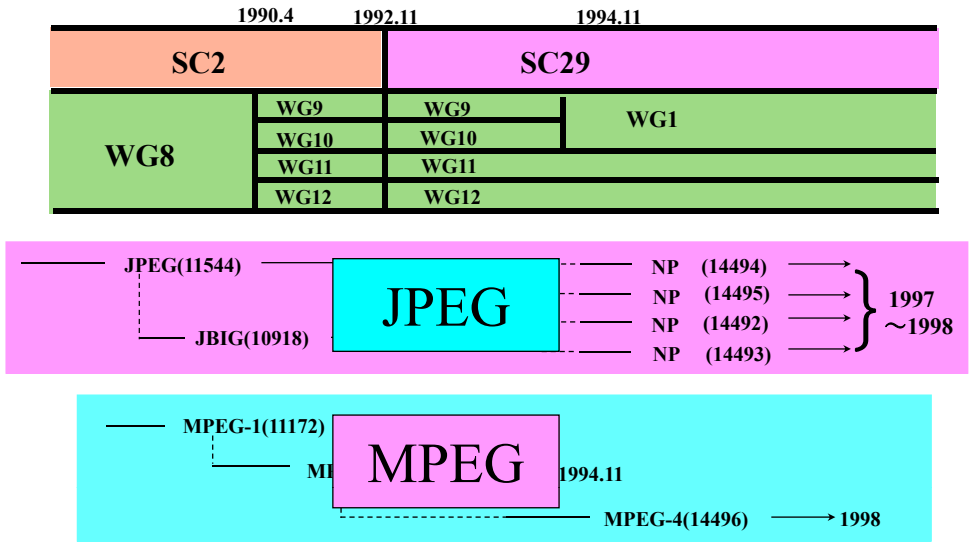
CCEG	JPEG	JBIG	MPEG
(Mr.B.Trocherie)	(Mr.G.Wallace)	(Dr.Y.Yamazaki)	(Dr.L.Chiariglione)
Computer Graphics Coding Experts Group	Joint Photographic Image Coding Experts Group	Joint Bi-level Image Coding Experts Group	Moving Picture Image Coding Experts Group

Toward JPEG-2000

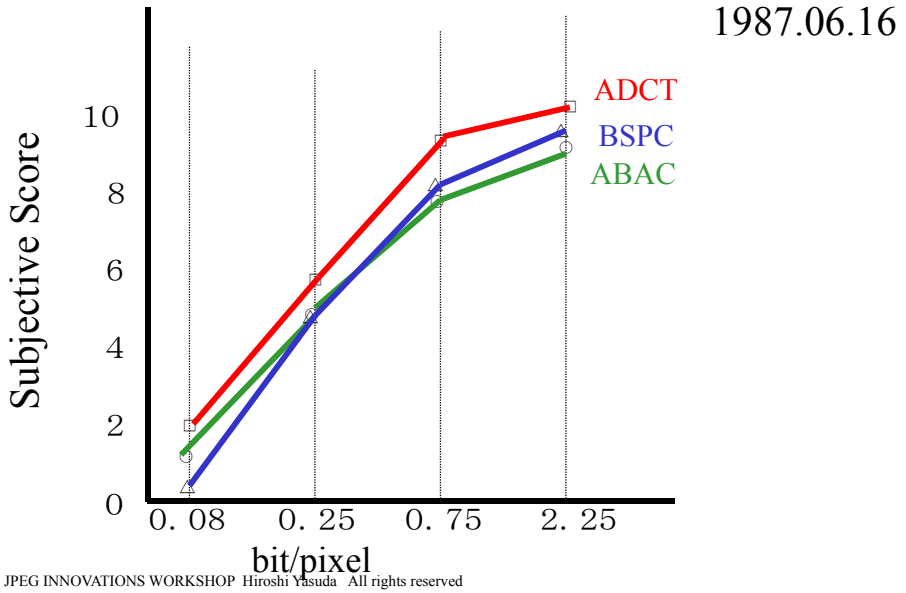
Working Group 8
Convenor
Dr.Hiroshi Yasuda

- TAG (Technical Advisory Group)
  (Chairperson: Mr.Charles F. Touchton)
- CGEG (Computer Graphics Coding Experts Group)
  (Chairperson: Mr. Bernard Trocherie)
- JPEG (Joint Photographic image coding Experts Group)
  (Chairperson: Mr.Gregory K. Wallace)
- JBIG (Joint Bi-level image coding Experts Group)
  (Chairperson: Dr.Yasuhiro Yamazaki --Dr.Horst Hampel)
- MPEG (Moving Picture image coding Experts Group)
  (Chairperson: Dr. Leonardo Chiariglione)
  - MPEGAUDIO(MPEG AUDIO coding experts group)
    (Chairperson: Dr.Hans G: Musmann)
  - MPEGVIDEO (MPEG VIDEO coding experts group)
    (Chairperson: Dr. Didier J. LeGall)
  - MPEGSYSTEM (MPEG SYSTEM experts group)
    (Chairperson: Mr. Allen H. Simon)
- MHEG (Multimedia and Hypermedia coding Experts Group)
  (Chairperson: Mr. Francis Kretz)

History of JPEG/MPEG



Contest of JPEG



Evaluation Paper (1)

The Selection Of A Still Picture Compression Technique For International Standardisation

ISO/JTC1/SC2/WG8 N723
APRIL 1988

Graham P Hudson

Chairman Of The ISO/CCITT Joint Photographic Experts Group
British Telecom Research Laboratories
Martlesham Heath, Ipswich IP5 7RE
United Kingdom

Introduction

As a result of much increased commercial interest from, in particular, major computer and telecommunications companies there has been intense effort in the international standards bodies to select a photographic image compression technique for future image storage and communications applications. The focal point of this activity has been the Joint Photographic Experts Group (JPEG) of ISO/IEC and CCITT.

The JPEG was formed at the end of 1986 under the umbrella of the ISO working group (now ISO/IEC/JTC1/SC2/WG8 - Coded Representation Of Picture and Audio Information). It brings together ISO picture coding knowlegde with CCITT telecommunication service expertise (from the New Image Communications [NIC] group of CCITT Study Group VIII). Its aim was to select and develop a compression/ decompression technique for natural colour and grey scale images. The technique will form the basis for both an ISO standard and a CCITT recommendation.

A specification for a compression technique was formulated for a potential range of services and applications including photographic videotex, still picture transmission, document photographic coding and image databases. To support such a range of applications the technique should be adaptable to a wide range of image resolutions and to varying image quality. It should also be capable of providing progressive (multi-stage with improving quality) or sequential image build-up.

Evaluation Paper (2)

A particular motivation is the advent of higher bandwidth communication available in the future such as the 64 kbit/s Integrated Services Digital Network. A primary requirement will be to deliver good quality images in under 5 seconds. The CCIR digital studio video format of 720 x 575 pixels where each pixel is represented by 16 bits was taken as the reference resolution for the evaluation and testing. To achieve the desired transmission time a compression of greater than 16 to 1, an average compression of 1 bit/pixel is required.

Selection Process

Twelve techniques were registered as candidates for international standardisation at a meeting in Darmstadt last March (1987). These included transform, predictive, block truncation and vector quantisation techniques. Each candidate had to provide a complete description of the principles of the technique and its functionality.

The initial selection process was based on two main criteria, subjective quality and technical features, and each was assigned a total of 50% of the marks. For the subjective testing, results had to be produced from four international test pictures - Zelda, toys against a blackboard, boats and lighthouse, and Barbara with toys at 0.25, 1.0 and 4.0 bit/pixel. These compression values represent significant stages in a progressive picture build-up sequence - initial impression, good quality main stage and indistinguishable picture .

The testing took place last June (1987) at KTAS's image processing facilities in Copenhagen. The subjective testing procedure was based on the double stimulus method, described in CCIR recommendation 500, where each compressed picture is displayed alternately with the original picture. Technical features judged included decoder and encoder complexity compatibility and adaptivity. These were judged by the panel of international experts following a presentation of each technique.

Evaluation Paper (3)

Three techniques were chosen as the basis for final development by groups of international experts. These were a transform technique -Adaptive Discrete Cosine Transform (ADCT), submitted by the ESPRIT 563-PICA project; a predictive technique -Adaptive Binary Arithmetic Coding (ABAC) contributed by IBM; and a third hybrid technique from the Japanese Natural Image Standardisation Group - Block Separated Progressive Coding (BSPC).

For the final subjective testing results were produced for five new non-standard test pictures at the even more demanding compressions values of 2.25, 0.75, 0.25 and 0.083 bit/pixel. The newly introduced very high compression stage, 0.083 bit/pixel, provides a picture that can be used for browsing or for indexing a picture database.

The final selection meeting was held this January (1988), again at KTAS. The double stimulus method was again used and test runs were conducted with both picture subjects and compression values mixed and separated. The run with mixed pictures and compressions was considered by the experts to be the most valid and the average scores of all 31 viewers for all five pictures are shown in the figure below. Exceptionally good quality results were shown for all the five pictures at 0.75 bit/pixel. At 2.25 bit/pixel subjectively indistinguishable quality was obtained and images indentical to the original (no loss of information) were achieved at about 8-9 bit/pixel.

To show the practical implementability of the techniques the developers demonstrated prototype terminals operating at 64 kbit/s from picture databases. Hardware decoders were demonstrated for ADCT and BSPC. ABAC was decoded by software in an IBM PC RT. It is believed that for the first time ADCT was also shown being decoded at 64 kbit/s by software. This was achieved with a CAF 80386 based PC.

Conclusion

In the subjective testing the ADCT technique achieved significantly higher quality results at all compression values than the ABAC and BSPC techniques. The prototype real time decoders exhibited indicated that all techniques will be economically implementable. Also the demonstrations and presentations showed that the mandatory technical features can be met by all techniques. The results of the subjective tests are now being analysed and the technical

Evaluation Paper (4)

demonstrations and presentations showed that the mandatory technical features can be met by all techniques. The results of the subjective tests are now being analysed and the technical features and complexity are to be scrutinised. The ADCT technique will now be refined and developed to ensure that all JPEG requirements can be met. A draft standard should be produced during the next year.

Acknowledgements

The progress described in this paper has resulted from considerable effort and the cooperation of all members of the JPEG and in particular to the representatives of the following companies who have attended all the selection meetings - CCETT, CSELT, DEC, IBA, IBM, KDD, KTAS, NTT, Siemens and BT.

Acknowledgement is made to the Director of Research and Technology of British Telecom for permission to publish this paper.

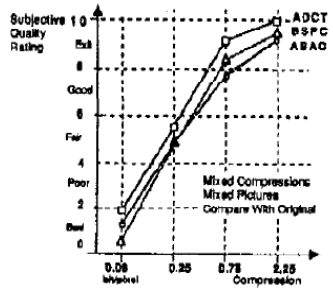
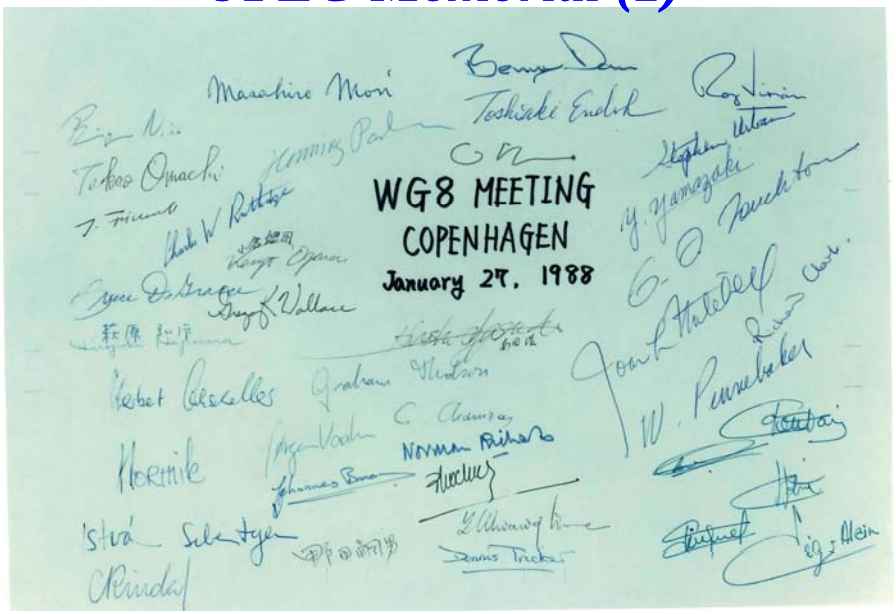


Figure Showing The Average Scores For All Five Pictures For Each Compression Value

JPEG Memorial (1)



JPEG Memorial (2)

New ICT Policy of Japan

Completion of NEW ICT Policy

Target 1: e-Government for The People

Transparency → Visual & Tangible

Target 2: Vitalize Local Area

Safe & Efficient → My Hospital

Target 3: Globalization & New Industries

Content Innovation → 3D Imaging

See http://www.kantei.go.jp/jp/singi/it2/dai52/gijisidai.html

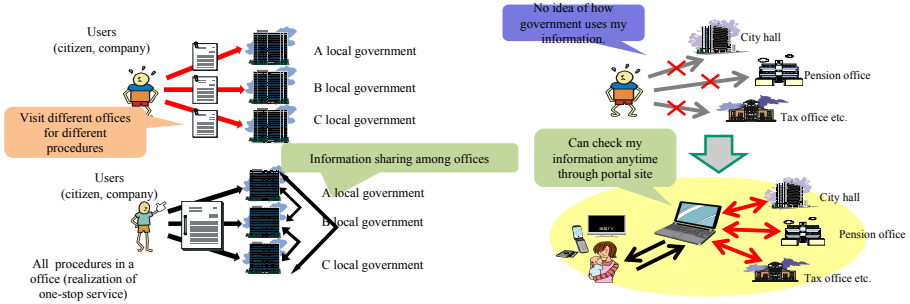
Realization of e-Government for The People

◆Target

・In order to realize one-stop service for major application procedures and certification acquisitions 24 hours 7 days by 2020, over 50% of citizens can use the service with terminals at convenience stores, etc. by 2013.
・Citizens observe government and control their personal information: at government by 2013, at local government by 2020.
・Publicizing government information in forms available for secondary use by 2013, through Internet by principle.

◆Priority Policies

- After summarizing past ICT investments, install government CIO with practical poser, and promote more efficient government in coordination of its renewal
- Streamline citizen ID system, streamline system, etc. so that citizen can monitor how his/her own information is utilized.
- Government service including acquisition of residence certification available 24 hours 7 days online/offline (with government kiosk terminal, etc.)
- Publicize information in forms available for secondary use through Internet, and create new businesses



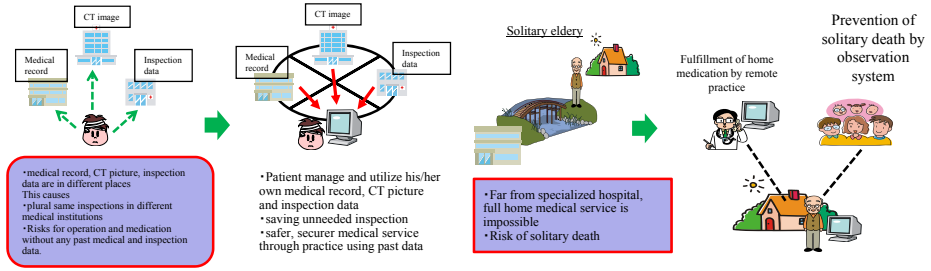
Vitalizing Local Areas

◆Target

・High quality medical service regardless of areas by 2020, medical care, etc. at home for all citizens including the elderly
・Realization of society with full ICT availability by building environment for school education and lifelong education utilizing ICT by 2020.
・Realization of improvement of everyday medical care and local vitalization through "Light Road" to achieve broadband service for all households by around 2015.

◆Priority Policies

- Deliver citizen media nationwide, create and deliver local content incl. local culture and sightseeing information, and promote information sharing among disaster preventing institutions upon disaster, etc.
- Build school education environment for the 21st century for realization of interactive and easy-to- understand classes with children teach and learn with each other.
- Create nationwide information service so citizens can utilize his/her own health and medical information electronically
- Utilize ICT actively to check safety of solitary elderly and to provide information required for home medical care and nursing care



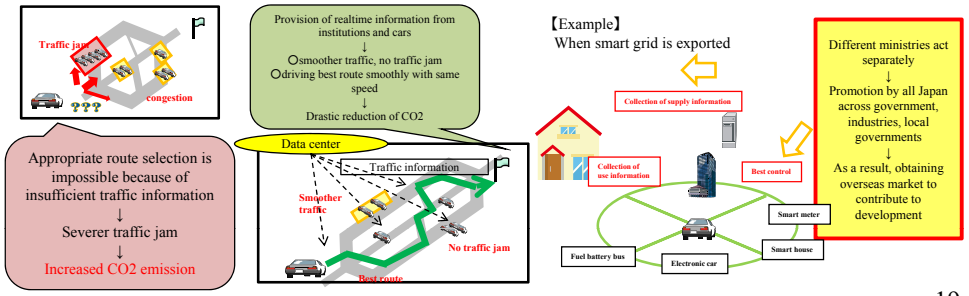
Globalization and New Industries

◆Target

・Creation of new market with about 70 trillion yen by 2020, by introduction of new technology including cloud computing and elimination of unnecessary regulations
・Lowering CO2 emissions by generalization of smart grid, spreading zero-energy house with ICT as standard for new house, promoting reduction of CO2 at home, and decrease traffic jam of major roads nationwide by half using ITS, etc.
・Obtaining intellectual property and international standard of major overseas market by Japanese ICT companies, to achieve international promotion of the technologies by promoting intensive R&D through industry-academia-government collaboration in strategic area by 2013

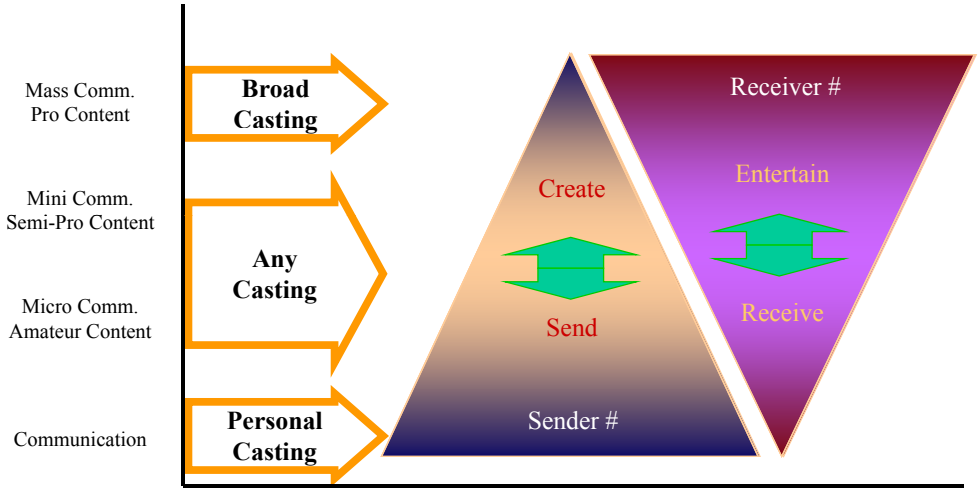
◆Priority Policies

- Promote ICT related R&D intensively to deliver early to market
- Create new business including content by activating ability o digital natives
- Promote cloud computing service by creation of new industry utilizing data
- Energy saving by promotion of smart grid and new house, greening of travel of men and goods, promotion of new technology development to achieve reduction of environmental load
- Build all Japan system across government, industries, ,local governments in strategic area to obtain international standard, etc. in overseas market and to promote export and investment



What is needed under Web3.0 & Image Big Bang

Any Casting: Key for Content Distribution



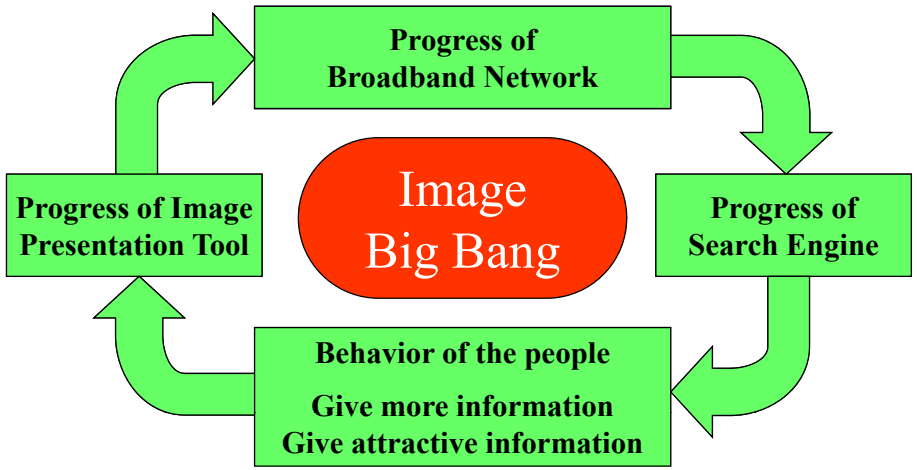
Web3.0 = Control 4 dimension (Time)

	Web1.0	Web2.0	Web3.0
Theme *	centralized them 集中した彼ら	distributed us 分散する私たち	decentralized me 非集中の私
	Anyone Broadcasts	*Everyone in the Community*	***As You Like through Web***

Everyone can make
Instant Transportation
in Space and Time

* From Web Concept Contest by ReadWriteWeb Inc. in 2007
http://www.readwriteweb.com/archives/define_web_30_contest_winners.php

Information Explosion Spiral and Information Oriented Thinking



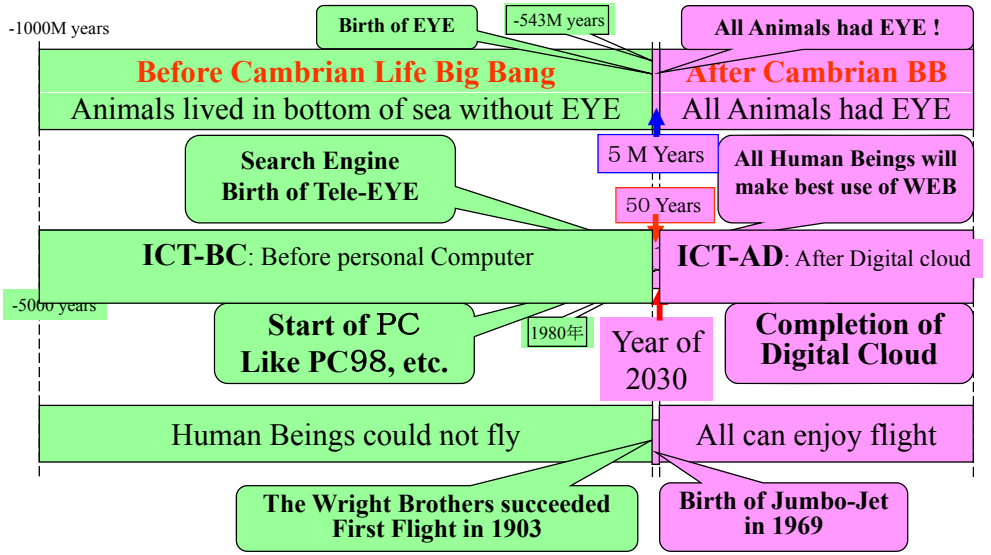
Learn the measure to cope with "Image Big Bang" Now from "Life Big Bang" in Cambrian Era (1)

	Item	Cambrian Life Big Bang	Image Big Bang Now
	Definition of Explosion	So many body Colors So many body Shells Enormous Volume	From Text only to Five Sense Mixed Enormous Number & Volume
Comparison	Object	Animal	Country Culture
	Change in Environment	Suddenly Change to Blue Sky from Misty Sky with Plenty of Sun Light	Completion of Broadband Ubiquitous Internet Infrastructure Possible to gather Images
	Birth	EYE	TELE-EYE (image retrieval Engine)
	To be Positive	Predation	Information Gathering

Learn the measure to cope with "Image Big Bang" Now from "Life Big Bang" in Cambrian Era (2)

	Item	Cambrian Life-Explosion	Information Explosion Now
History	Birth of Earth	4,600 Million Years Before	
	Birth	Life – 3,900 Million Before	First Man – 3Million Years Before
	Next Birth	Mono-cell – 1,200M Before	Homo Sapiens – 30,000 Before
	Growth	Multi-cell – 1,000M Before	4 Civilized Area – 5,000 Before
	Explosion Start	543M Before From Misty to Blue Sky With Birth of "EYE"	1980'th (almost today) Broadband Ubiquitous Infra Birth of "TELE-EYE"
	End	Within 5Million, Trilobite won	50 years only ! Ends in 2030
Remedies	Protection	Shell and Mimicry	Security and Decoy
	Think	Detection Capability	Credibility Sense Capability
	Appeal	Showy Color and Movements	Understandable Appeal like Movie

Time Range Comparison between 2 Big Bangs



Lessons from "Life Big Bang" to "Image Big Bang"

(1) Information Gathering/Archiving within the Country
(2) Global & Quick Access to World Wide Information
(3) Huge Archive for Storing Gathered Information to Reuse
(4) Solve Any Divide to understand Information
(5) Develop Cultural Interpretation support Scheme
(6) Develop Personal Retrieving Engine and Archive
(7) Easy Appeal Method to be understood
(8) Guarantee Safe & Trust Circumstances
(9) Develop Network Infra. and BCI Technologies

Conclusions
Future of SC29/WG1

Promising Applications

Tele-Medicine

Flash-Back

Navigation

Technologies to be Studied

3D Structure Estimation

Motion Estimation

Higher Fidelity on Color

Higher Resolution

Technologies to be Studied