Trend and Prospect on 3D Industry and R&D

March 2010

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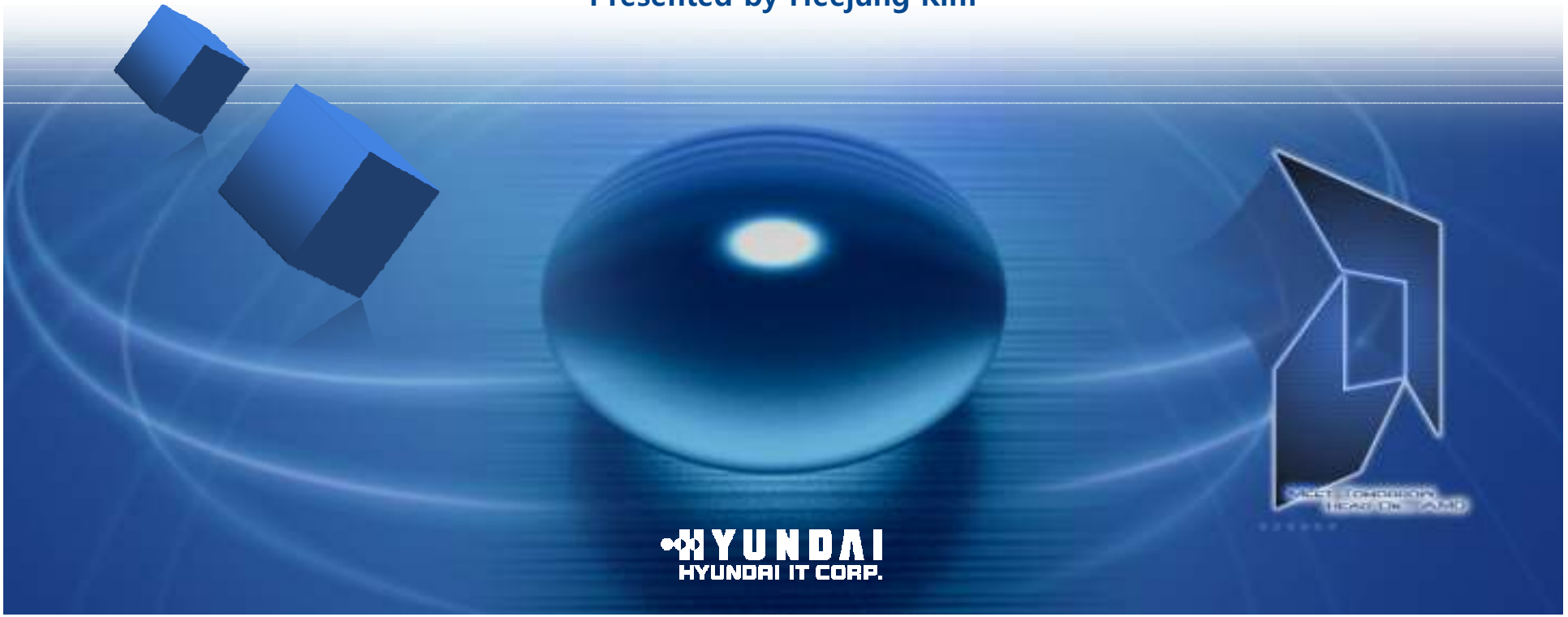

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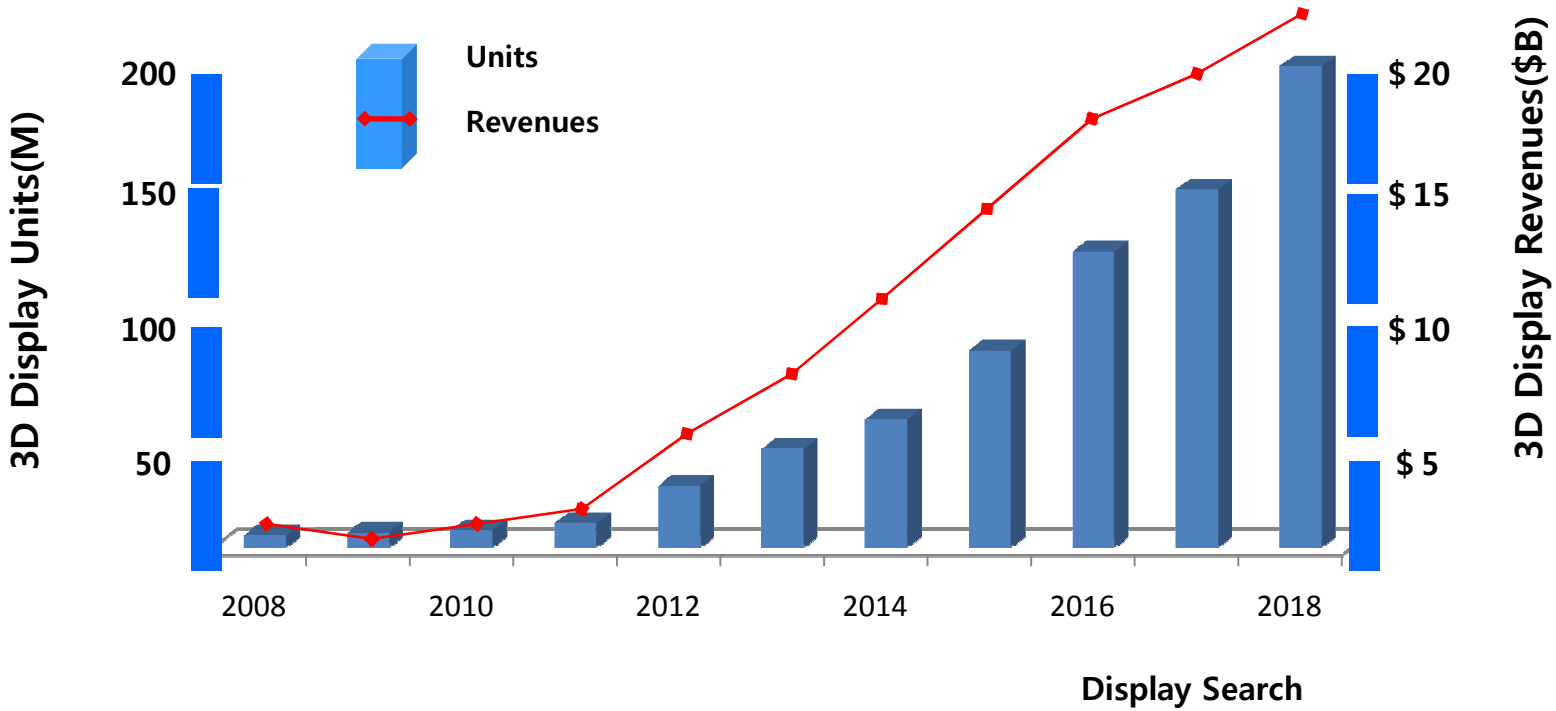
I Prospect on 3D Industry and R&D

I-1 Prospect on 3D market

DISPLAYSEARCH AN NPD GROUP COMPANY — 3D Display, Expected to increase fast up to 22 billion dollars in 2018

Displaybank — 3D Display, expected to increase up to 5.1% in 2015 in display market

Insight Media — 3D TV, expected to increase 31 million units in 2012



I-2 Growth of 3D Market

3D TV/Monitor/Notebook

- 3D TV: 6.8Mil in 2009→31.2Mil in 2012
- 3D Monitor: 40K in 2009→10Mil in 2018
- 3D Notebook: 66K in 2009→17.7Mil in 2018

3D Movie

- 3D Screen: 5K in 2009 → 15K in 2013
  (Domestic 1.2K in 2009 → 4.8K in 2010)
- Opening around 20 Movies of 3D

3D Mobile

- 71Mil in 2018 : Available of 3D display application in Mobile.

3D Glasses

- 3D Glasses : Increase of 3D glasses' needs due to restricting of tech for non-glasses

I-3 3D Applicable Fields

Broadcasting, Advertisement

- 3D terrestrial broadcasting service
- 3D commodity advertisement
- 3D IP Broadcast, 3D DMB
- 3D Web site

Game, Culture

- 3D game, DVD title
- 3D movie
- 3D display communication
- 3D animation

Aerospace, Military

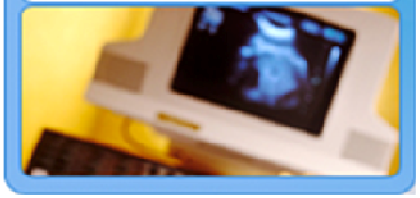
- 3D simulation
- 3D remote sensing
- Image mimic military training
- Satellite orbit adjustment

Industry machinery and tools

- 3D CAD, architecture
- 3D image urban design
- 3D interior design
- Industrial camera equipment

Medical care, education

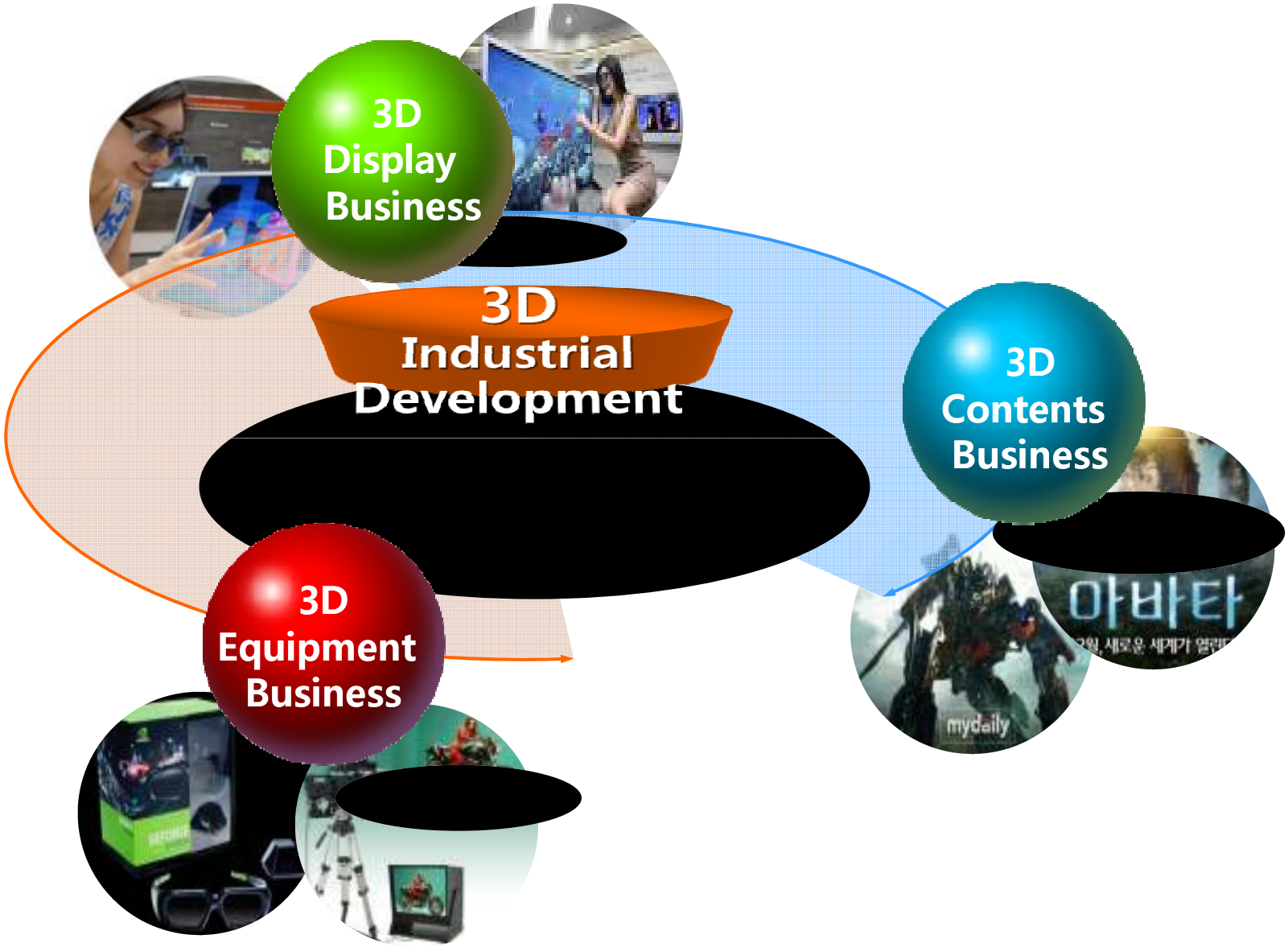
- 3D tomography, simulator
- 3D telemidicine
- Audio-visual education
- Science class



Home display

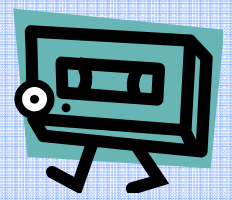
- Multi-media display
- Home entertainment
- Videophone
- Imaginary shopping

I-4 3D Industrial Classification



I-5 3D Technical Factor Flow

Contents	Production	Distribution Format	Deployment	Decoding	Visualization
Stereo Acquisition	**L/R 3D Edition**	**Encoding**	**Media Service**	**Receiver Equipment**	**3D-Ready Displays**
- Capture 3D by Rig camera system - CG Stereo Render - Live & CGI - 3D Converting	- Emulation - 3D Image Processing - 3D Surveillance - Storage - Compensator - 3D Calibration	- MPEG2, AVC/MVC implementations - Bandwidth optimization - 3D display Format - ISO/ITU/IEC/JST /MPEG	-BROADCAST . Terrestrial Satellite . Cable . DMB . IPTV - PC& AV &Mobile . Down load . BLU-RAY . DVD	- SET TOP BOX - PC - BLU-RAY - MOBILE	- Frame Sequential - Line Interleaved - Checker Board - Dual Input Projector(s) - Anaglyph
	HDSDIx2 3GSDIx2	DPX TIFF	TS	TS	HDMI



HD- SDI : Serial Digital Interface (Broadcasting Format), DPX :Digital Picture Exchange, TIFF: Tagged Image File Format , TS: Transport Stream

I-6 3D Market Revitalization

Completion of 3D Hardware

- Complete of 3D Tech and Commercialization
- Available various size of hardware
- Starting the competition from South Africa World Cup Season in 2010

Increase of 3D consumer interests

- Increase of 3D response thru the development of quality and movie tech
- Easy pay of 3D contents premium
- Interests in various game, movie, sports, documentary

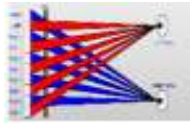
Increase of 3D contents application

- Consider the Profit of 3D contents (All right reserved, Premium price etc)
- 24H 3D broadcasting in Korean Sky life
- Premier league footfall match thru 3D in England SKY Broadcasting
- USA ESPN: Broadcasting in 2010 World Cup by 3D

Revitalization of 3D Market

Increase of 3D contents production
H/W company co-operate with contents

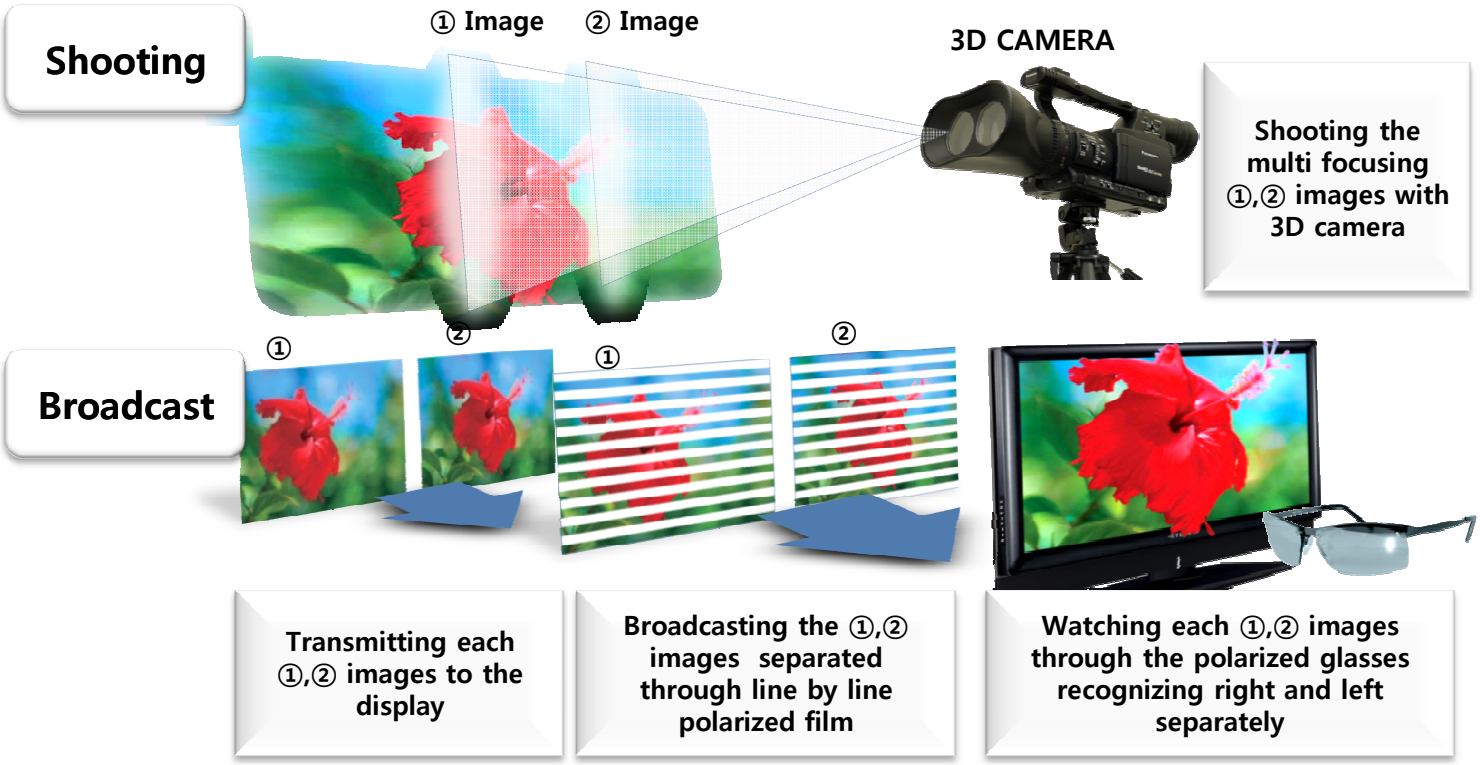
I-7 3D methods comparison

3D METHOD			FEATURES	COMPANY
3D Glasses Type	Polarized Glasses Type		▪ Separating Left and Right Eye Views is implemented by using 3D glasses and Polarized film on the panel ▪ Excellent quality for viewing angle (right/left-Free, up/down 20°) ▪ Reduction of horizontal resolution (1/2) because of line by line display format ▪ Excellent quality for Stereo Cross-talk program ▪ The cost of the polarizing system is higher ▪ It's possible for many people to watch 3D Broadcasting in popular place.	◆ Hyundai IT ◆ Zalman ◆ JVC ◆ LGE
	Shutter Glasses Type		▪ When the L/R views are alternated on the display, it's shuttering glasses by synchronized signal to reach L/R views on the L/R eye accurately. ▪ Free viewing angle in the display but synchronization requirement ▪ Big decreasing brightness and inconvenience as wearing shutter glasses ▪ Full resolution expression due to frame by frame display format ▪ Weakness for Cross-talk issue according as LCD response time ▪ Expensive electronic shutter glasses which must be recharged ▪ Advantage for risk taking 3D display, almost same as 2D	◆ Samsung ◆ Sony ◆ Panasonic ◆ LGE
3D Non-Glasses Type	Lenticular Lens Type		▪ Using refraction of light through lenticular lens ▪ Reduction of horizontal resolution (1/2) ▪ Difficulty of large display/ High production cost	◆ LGE ◆ Samsung ◆ Alioscopy
	Parallax Barrier Type		▪ Separation of right and left image by horizontal line barrier ▪ For the small size display only ▪ Reduction of horizontal resolution (1/2) ▪ High contents production cost	◆ Samsung Cellular phone

I-8 Comfortable polarizing 3D method

POLARIZED FILM 3D TYPE

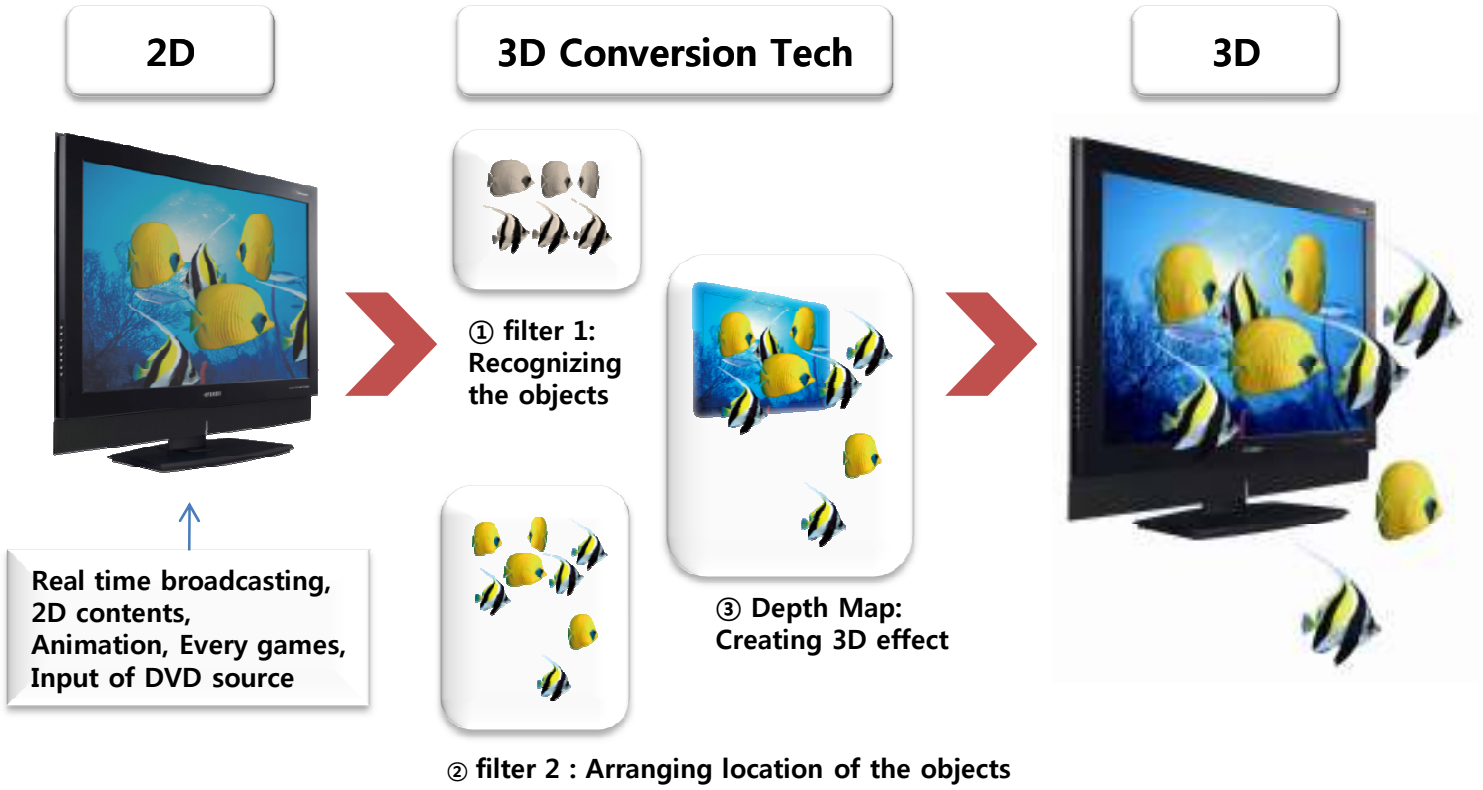
- Clean 3D realization without any wave patterns and overlapping images
- Polarization of the best high-definition 3D stereoscopic images delivered
- 3D realization without flickering and dizziness
- The sleek and lightweight, easy adoption of polarized glasses



I-9 Real time 3D conversion technique

3D CONVERSION Tech

- Converting every 2D images to 3D images by using HYUNDAI IT conversion tech
- Natural 3D effect applied by Ultra Smoothing tech
- True to nature 3D realization by using Depth Mapping tech
- Easy 3D realization by inputting various sources



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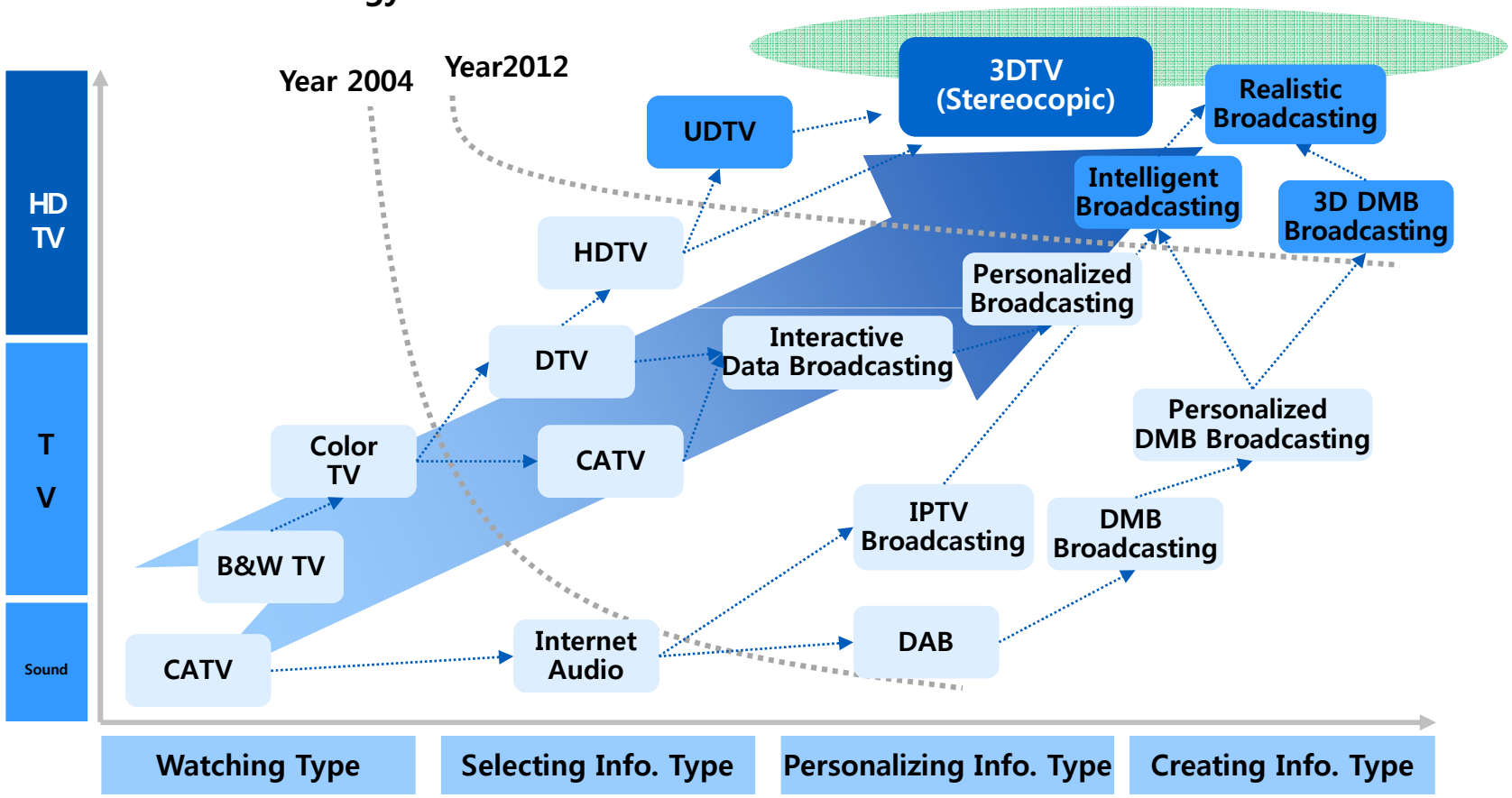
Ⅱ 3D Business Trend

Ⅱ-1 3D Broadcasting Trend

3D Broadcasting Roadmap

❖ Service & Technology Trend



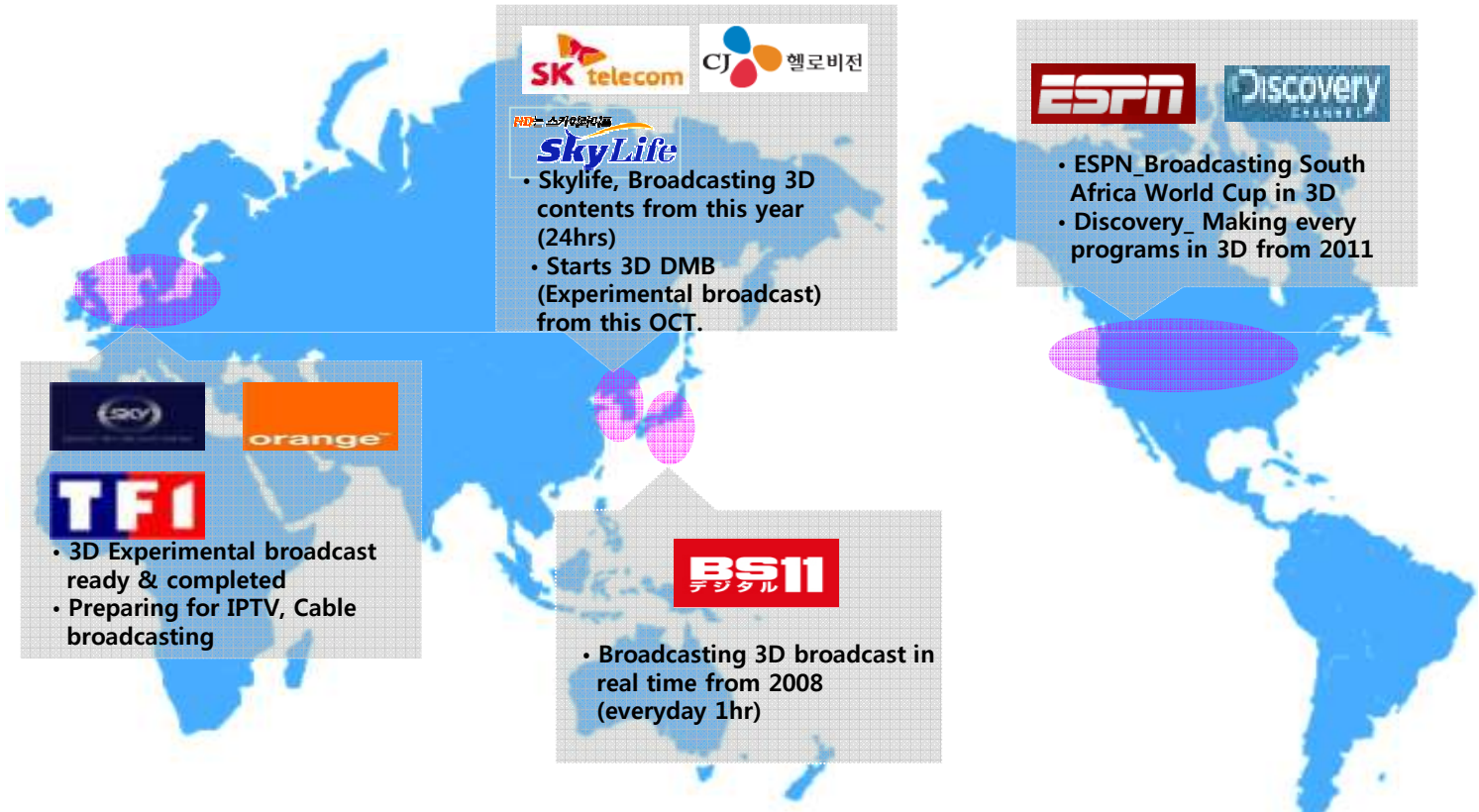
Ⅱ-1 3D Broadcasting Business Trend

3D Factor Technology Road Map

		2010 ~ 2012	2013 ~ 2015	2016 ~ 2018
Transmission		**MPEG-2 / H.264**	**H.264 / SVC / HVC**	**SVC, Future Codec**
	SoC	High compressed Encoder	Scalable Video Encoder	Scalable Video& Future Codec High Speed
		Hardwired SoC Design	SoC Optimization	Convergence SoC Design
3D Video Creation & Processing		**2D to 3D RT Conversion**	**3D Video Processing**	**Multi view & Volumetric Processing**
	R&D Tech	3DFull HD Global standardization	3D UHD Global standardization	
		High Quality 2D/3D RT Conversion	Interactive 3D GUI Tech.	Multi View & Auto stereoscopic Tech
		High Quality 3D Image Tech.	3D Depth Rendering Tech.	3D Emotional Tech.
Performance		**1,280 x 720 /1,920 x 1,080 60 fps**	**1,920 x 1,080 / 3,840 x 2,160 60 / 120 fps**	**3,840 x 2,160 / 7,680 x 4,320 120 fps**
		HD/Full HD 3D Signal Processing	Full HD/UHD 3D Signal Processing	4K/8K 3D Signal Processing
		Full HD 3DTV	UHD 3DTV	8K UHD TV / 4DTV
Network		**3D IPTV**	**Home Network 3DTV**	**Realistic Media TV**
		Giga IP Processing	Interactive & Individual Broadcasting	Intelligence Broadcasting
		High-speed Data transmission	Wireless Data Transmission	Realistic Technology Platform

Ⅱ-1 3D Broadcasting Business Trend

The World 3D Broadcasting Status



Ⅱ-1 3D Broadcasting Business Trend

The world's first 3D broadcasting

- Retention of the experience in the world's first 3D broadcasting with Japanese BS11 broadcasting station
- The world's first commercialization of the LCD TV receiving real time 3D broadcast(2008.04)
- In process of collaborating with the companies related to 3D broadcasting in every country as a leader of 3D broadcast tech standardization

- **The world's first 3D broadcasting (Japan, BS11 on the air)**
  - **December 1, 2007 ~ : '3D Revolution' Test broadcast**
  - **March 31, 2008 ~ : Regular broadcasting (1 hour or more/ a day)**

- **Animation**
- **Documentary**
- **Sports**

Ⅱ-1 3D Broadcasting Business Trend

Announcement Opening 3DTV Era in Korea

Ⅱ-1 3D Broadcasting Business Trend

3D Broadcasting Promotion Comprehensive Plans in Korea

The relevant authorities	Ministry of Knowledge Economy	KOREA Communications Commission	Ministry of Culture, Sports and Tourism
Invest	10 billion won	5 billion won	20 billion won
Biz. Title	3D industrial convergence development Strategy	3D TV trial broadcast promotion team	3D production image Biz.
Biz. Content	Proceeding Korea-made Broadcasting	Starting 3D trial broadcast in October	3D Converting Tech.
Participating company	Association Of Realistic Media Industry, ETRI, Hyundai IT, CJ Powercast, etc	KBS, ETRI, Korea Cable television & Telecommunications Association, Samsung Electronics, LGE, Hyundai IT, etc	

Prepare the foundation for standardizing technologies

Full HD Quality & Backward Compatibility

Dominate World 3D TV system in Advance

Ⅱ-2 Korean/Foreign 3D Display Business Trend

Movie & 3D Contents

Foreign

- DreamWorks: Producing every animation in 3D from this year
- Disney: Planning to make 22 3D Movies by 2011
- PIXAR: Opening 3D Movie <Rapunzell> in early 2010

Korean

- Big I Entertainment: Government-run Task, Producing Project contents
- Vision 3 International: Making 5~6 3D Blockbuster movies
- CJ PowerCast: Opening 3D movie from June

3D CINEMA (IMAX, Dreamworks, Disney, 20th FOX, Paramount, Universal Pictures)

Ⅱ-2 Korean/Foreign 3D Contents Trend

3D Game

Foreign

- Available 3D game in this summer
- Demonstration the popular 3D game
- Opening 3D game
  <Attack of Movie 3D>

Korean

- Production the 3D game player for boarding
- Reliance on the import of materials and contents

EA Sports 3D Games

NVIDIA 3D PC Games Solution

Ⅱ-3 Korean/Foreign 3D Display Business Trend

Korean Company

- SAMSUNG : Proposed 3D combination solution to 3D TV with shutter glass type and 3D Blu-ray, 3D AV products (CES 2010)
- LG : Demonstrated the variety of Line-up for 55" 3D LED/LCD TV, 72" 3D LCD TV, etc. (CES 2010)
- Hyundai IT : Marketing for real-time 3D broadcasting LCD TV with polarized type in Japan (Apr. 2008), Sales the variety of 3D TV, 3D monitor
- ZALMAN Tech : Manufacturing/Sales for 3D monitor with polarized glass type
- KDC IT : Manufacturing/Sales for 3D equipments in theater, 3D terminal, etc.
- i-Station : Breakthrough of the 10 millions of 3D stereo glasses (Nov. 2009)

Ⅱ-3 Korean/Foreign 3D Display Business Trend

Foreign Company

- **Sony** : Demonstration of 3D LED TV and Player with shutter glass type (CES 2010)
- **Panasonic** : Demonstration of Full HD 3D LCD, PDP(CES 2010)
- **Real D** : Benefited from 3D equipments for theater
- **JVC** : Sales for the polarized 3D product (24”~56”) with brand ‘Victor’
- **Viewsonic** : Sales for the 3D monitor with shutter glass type
- **Planar** : Manufacturing/Sales for the costly 3D monitor for professionals



Ⅱ-3 Korean/Foreign 3D Display Business Trend

Partnerships status in 3D display market

HYUNDAI HYUNDAI IT CORP.

BS11 デジタル

DDD

SAMSUNG

DreamWorks Animation SKG

technicolor

real D The New 3D

LG전자

HD는 스카이라이프 SkyLife

TLi Technology Leaders & Innovators

SONY

Discovery Channel

ESPN

real D The New 3D

IMAX

Panasonic

DIRECTV SATELLITE TELEVISION

real D The New 3D

NATIONAL GEOGRAPHIC

Partnership with company for contents and 3D material,
in an attempt to get leadership of 3D display market

Ⅱ-3 Korean/Foreign 3D Display Business Trend

Korean TV company VS Foreign TV company

	Korean TV company	Foreign TV company
Value Chain for 3D	Possession of TV Set, but excluding 3D business	The benefits for broadcasting equipments, movie, game,etc.
Sales point	In short terms of technical development, available to sales LED, LCD, PDP	Targeting the one point for LCD or PDP
Marketing strategy	Hardware Marketing (LED, design, etc.)	Partnership and investment for revitalization of 3D contents
Main company	SAMSUNG, LG, Hyundai IT	SONY, Panasonic, JVC

Thank you

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