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shaping tomorrow with you

Video Retrieval

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Who am I ?

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- My research areas : Image processing
  - Document image processing
    - Japanese OCR (Optical character recognition)
    - Text extraction from natural scene images
  - Video analysis ← today's topics
  - Gesture user interface

Text extraction

Gesture user interface

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Outline

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0. Introduction
1. Caption extraction and recognition
2. Digest video generation
3. Visual user interface
4. Summary

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0. Introduction

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- Importance of video retrieval

  “By 2013, more than 25 percent of the content that workers see in a day will be dominated by pictures, video or audio” (Gartner 2008)

Current status :

- Many video portals : YouTube, Google videos, Veoh..
- Many legacy videos : TV programs, Surveillance videos, E-learning videos, ..
- Wide spread of smart phones

⇨ Video retrieval is needed in various scenes

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Applications in a wide variety of businesses

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Broadcast

Editing

Broadcast

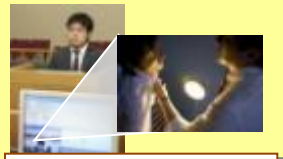
Manufacturing

Maintenance manual

Weld verification

Security

Accident inspection



Interrogation video

Healthcare

Surgery video

Informed consent

Video analysis/ retrieval

Delivery

Share

Production

Surveillance

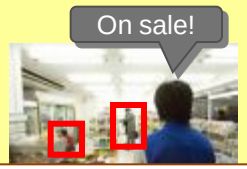
Agriculture

Growth observation

Damage control

Retail distribution

Shoplifting



Announcement effect

Education

Educational videos

Museum signage

Public service

Proceedings video

Illegal dumping

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Video Retrieval System

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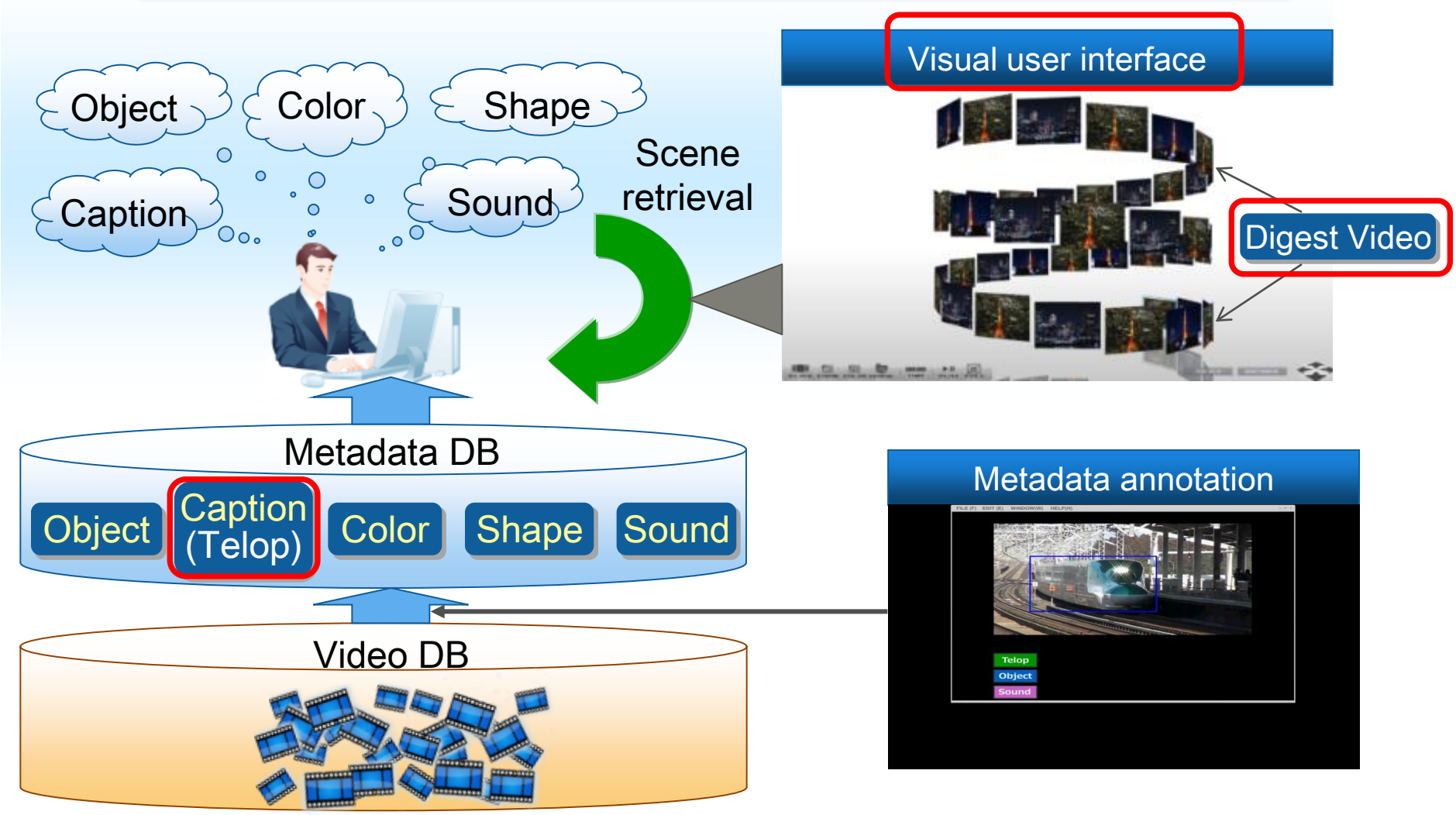
Scene retrieval from various aspects (metadata) such as object, caption, color, shape, and sound



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1. Caption extraction and recognition

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- What is a caption ?
  - ➔ Character strings which appears in a frame

Video Database

:

ビストロ | Search

Retrieved result

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Our target

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- Various types of captions used in Japanese TV program

	Uniform character color	Multiple character color
Uniform Background		
Complicated background		

Method A, B

Method C

Target of our method

Exception1 : movable caption
(ex. End credits of movies)

Exception2 : Gradation

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Outline of caption extraction / recognition

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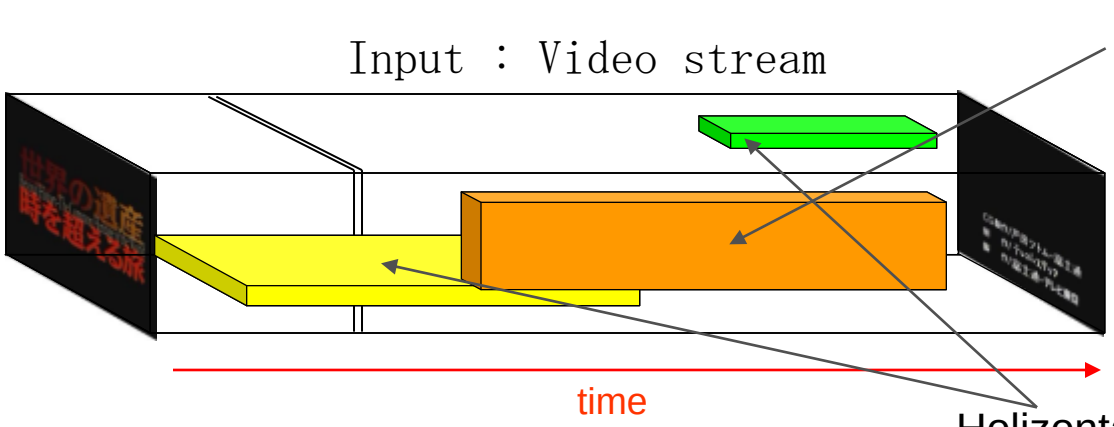
Caption extraction

Extract caption region candidates from static part of the video



Caption recognition

Recognize characters inside caption region

→「レトロ車両」

(utilized as video index)

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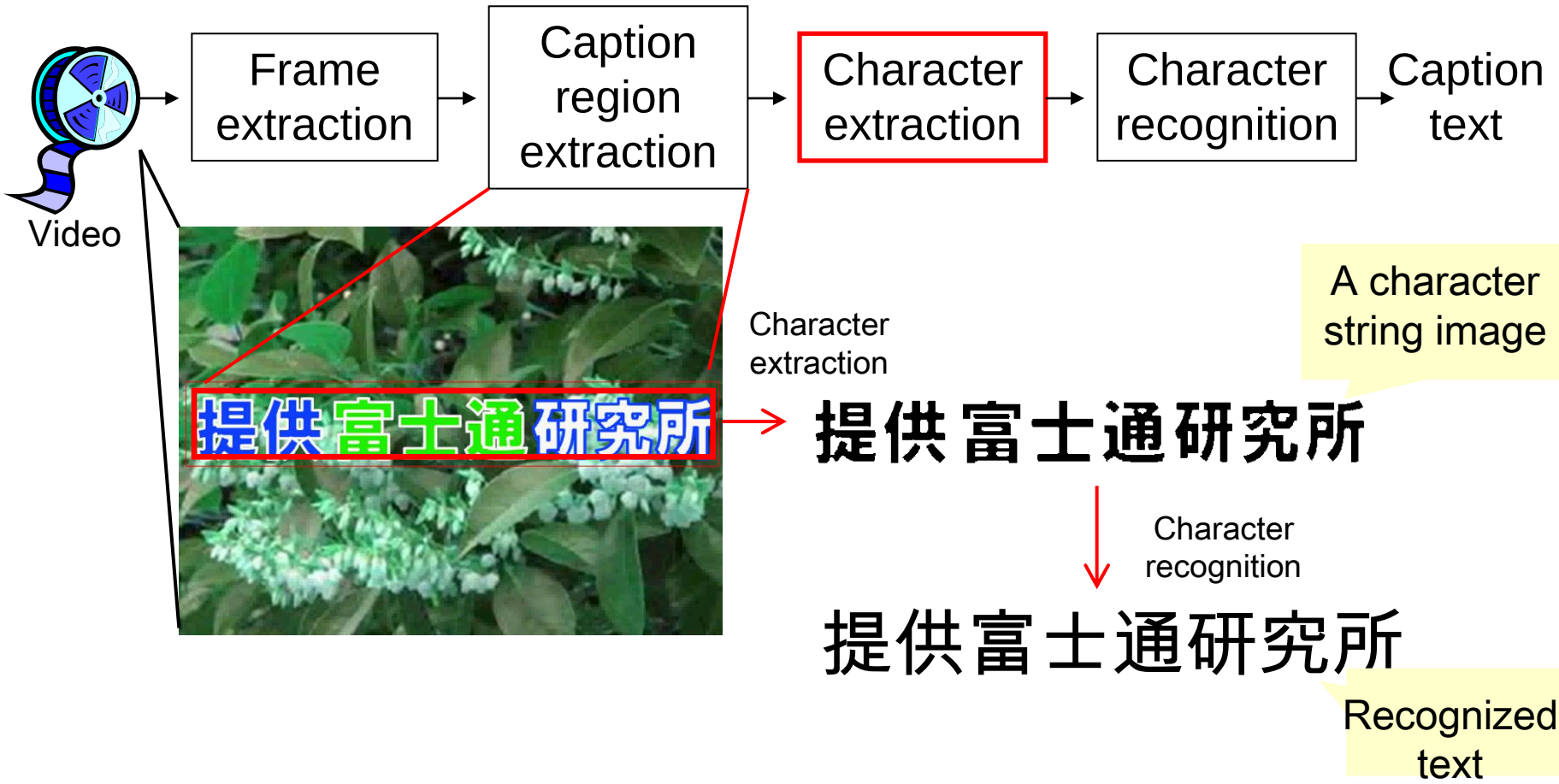
Whole flow



It is important to extract character string from complicated background

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Problems of conventional method

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(1)A method which utilizes uniform character color

- Effective for single colored caption
- Not effective for multi-colored caption

(2)A method which utilizes uniform background color

- Not effective in complicated background

Character extraction with multiple-color from complicated background is not easy

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Problems of conventional method (2)

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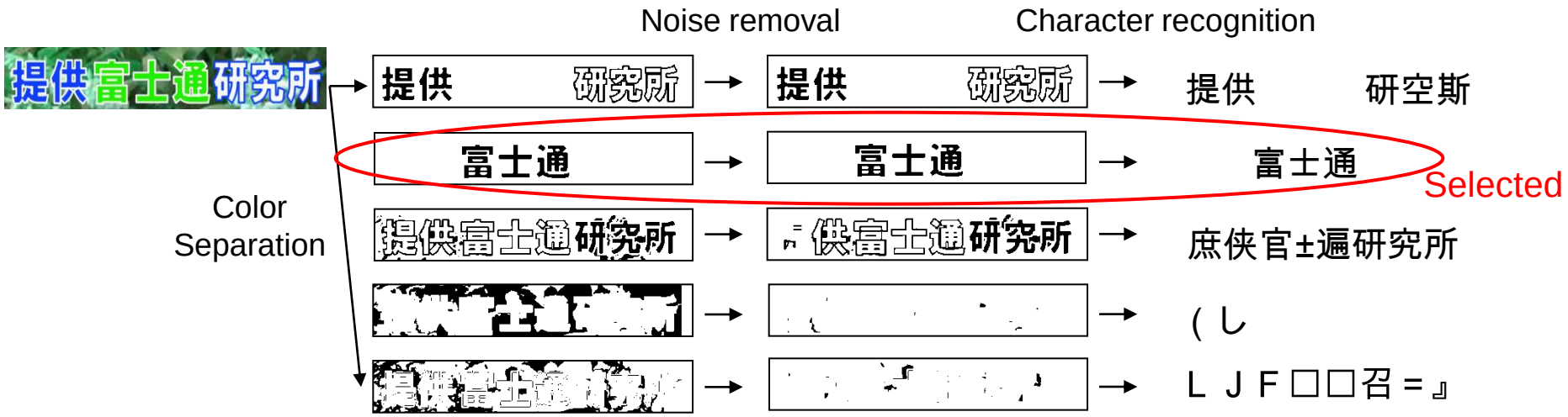
(3) A method which utilizes color separation and select single color plane



A recognition result of single color plane include only part of correct texts.

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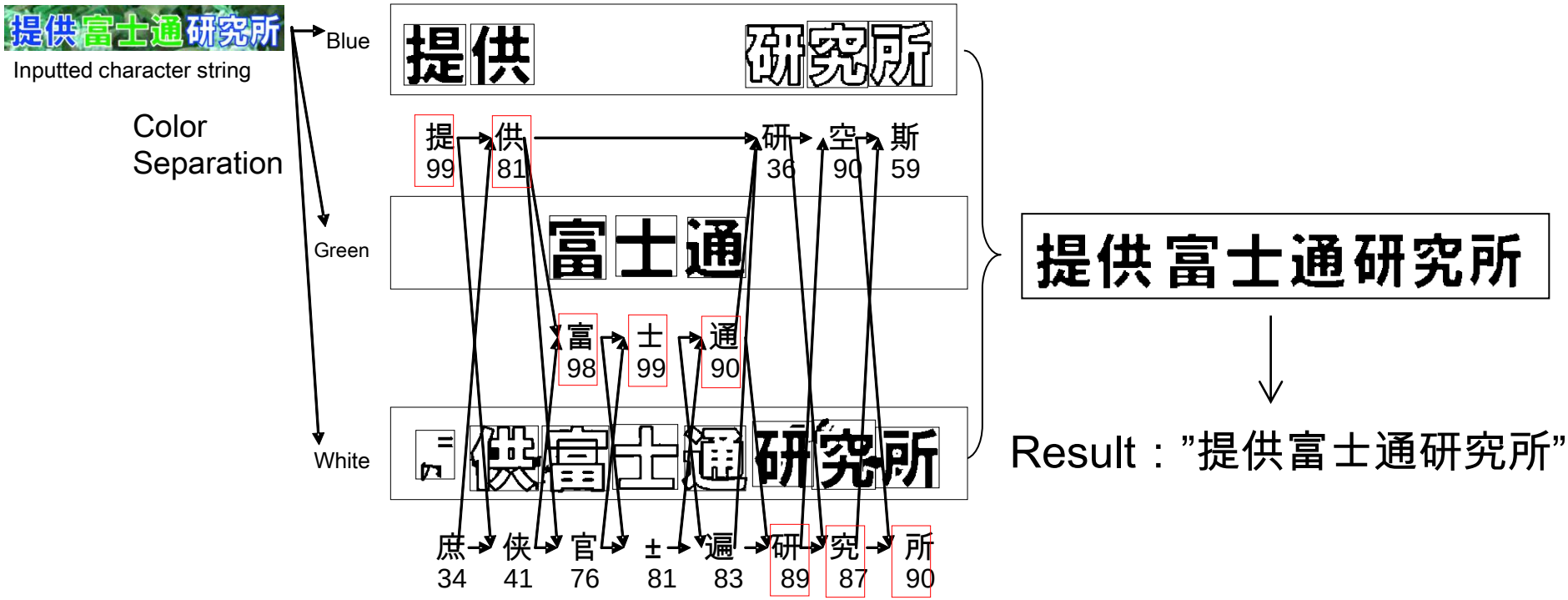
Multi-colored caption recognition (proposed)

- Decompose an input color image and extract character region candidate
- Recognition reliability and continuity of rectangles and colors are evaluated by Dynamic programming



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Recognition result

Result： “気になる費用は”

Result： “問題ここはどこ”

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2. Digest Video Generation

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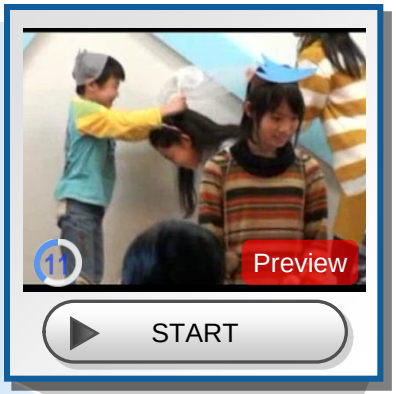
Automatic generation of digest videos from TV program, movie, surveillance / homemade videos etc.

Application

Sports program

Homemade videos

Digest Video Generation



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Scene analysis for digest video generation

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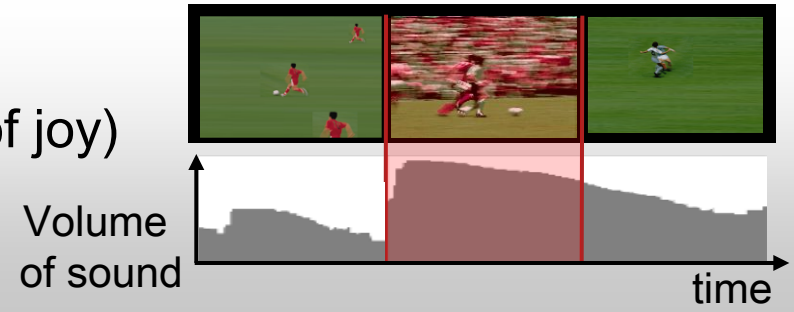
- Specific scenes in a video are detected by analyzing video/sound

Examples of scene analysis

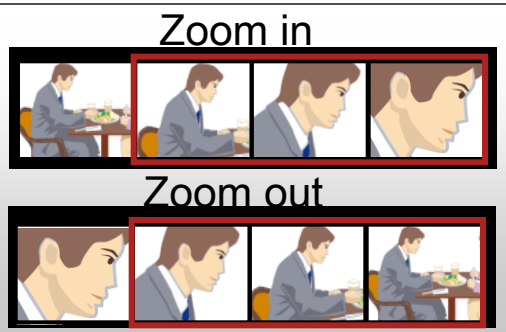
Highlight detection

Analyze the highlight of sound(a shout of joy) of sports program and detect a score scene



Camera motion estimation

Analyze camera motion such as zoom-in, zoom-out and hand-shake in video and then detect the motion change scene



Speech/Sound detection

Analyze sound features and detect a conversation scene or music scene

Detect only song scene from music show

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How to utilize sound feature

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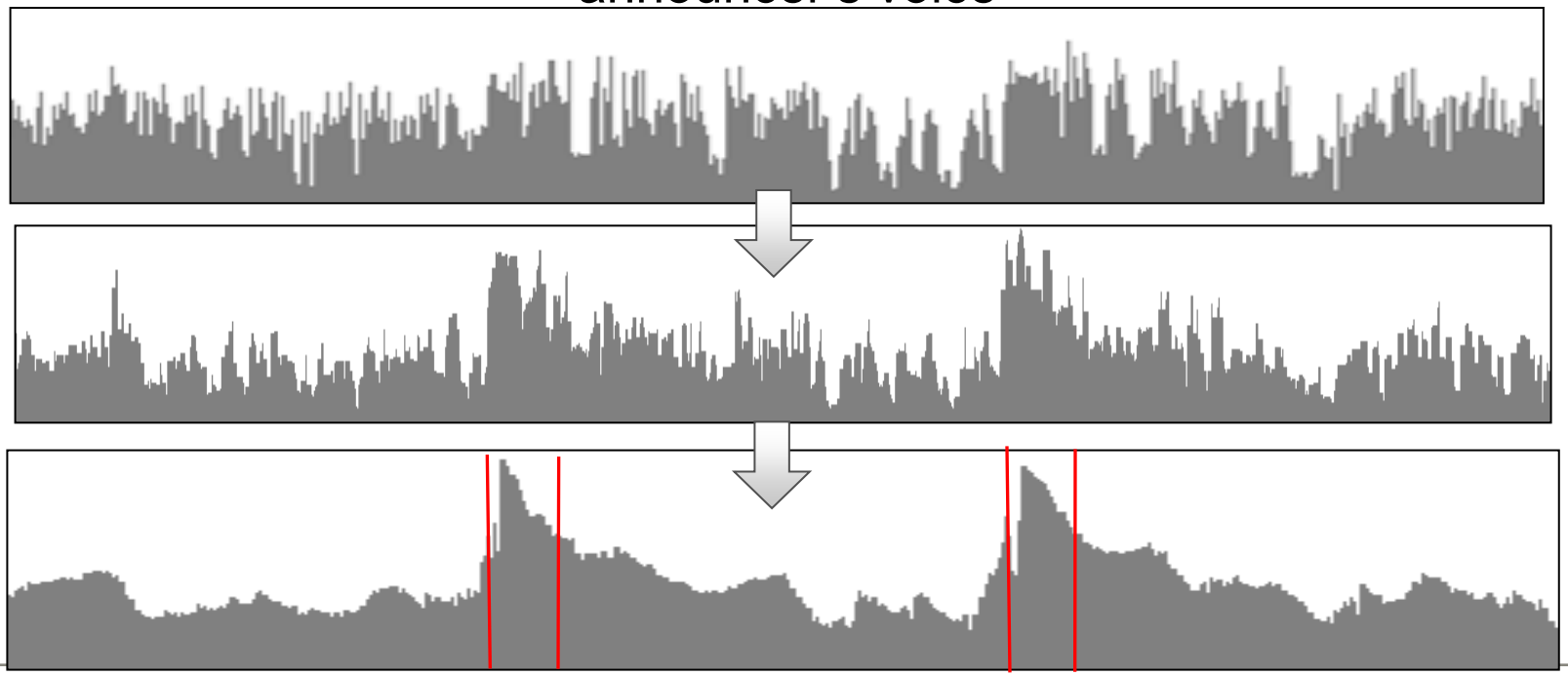
Original video

Ideal detection

Features

Volume of sound + Removal of announcer's voice + Sudden sound change

Extracted value



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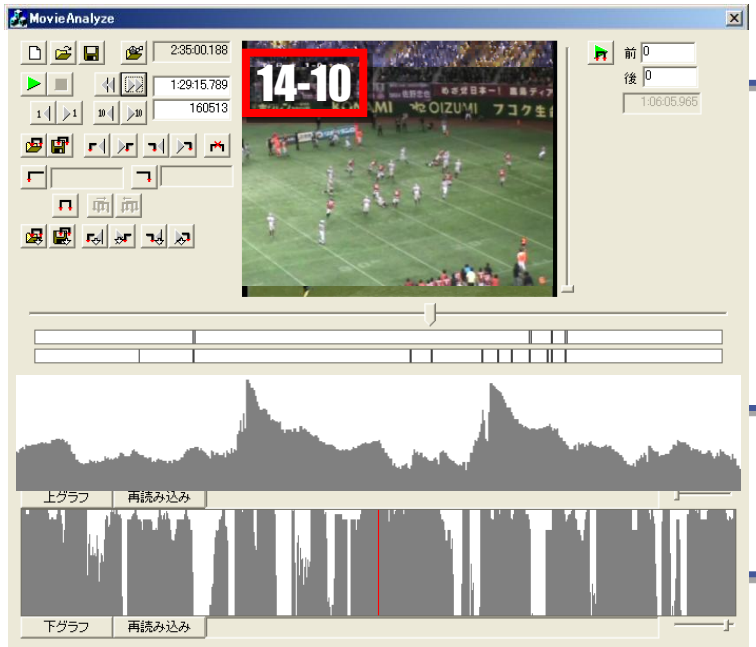
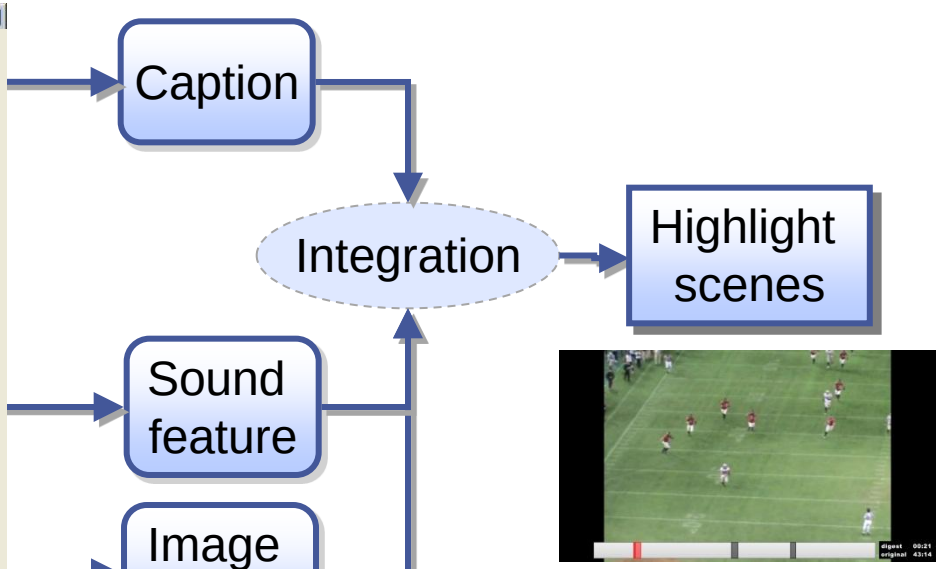
Example1: Sports video retrieval

- Extracting various kinds of scenes for digest video creation
  - Caption features for score, sound features for a shout of joy , image features for ground color are integrated.





Highlight scene extraction

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Example2: Illegal dumping scene retrieval

- What is “Illegal dumping” ?
  → Someone illegally dumps waste.
- Illegal dumping is a social issue.
- Officials in local governments check surveillance videos to retrieve illegal dumping scenes.

Image feature (Frame difference for human detection)

Image feature (Frame difference for waste detection

Integration

Highlight scenes

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3. Visual User Interface

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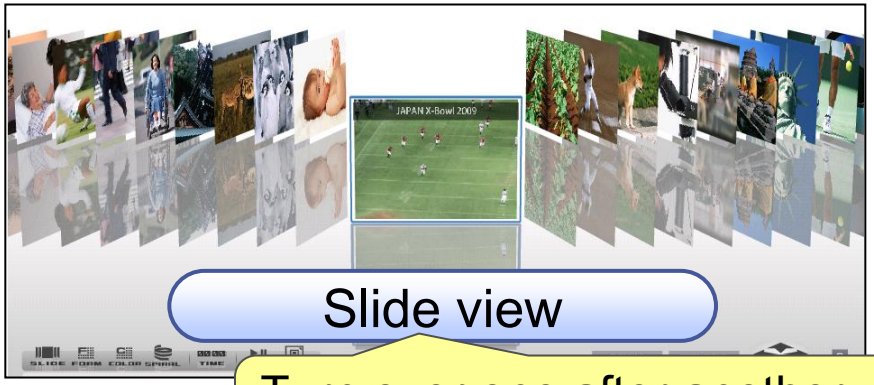
- Easier video search with various GUIs

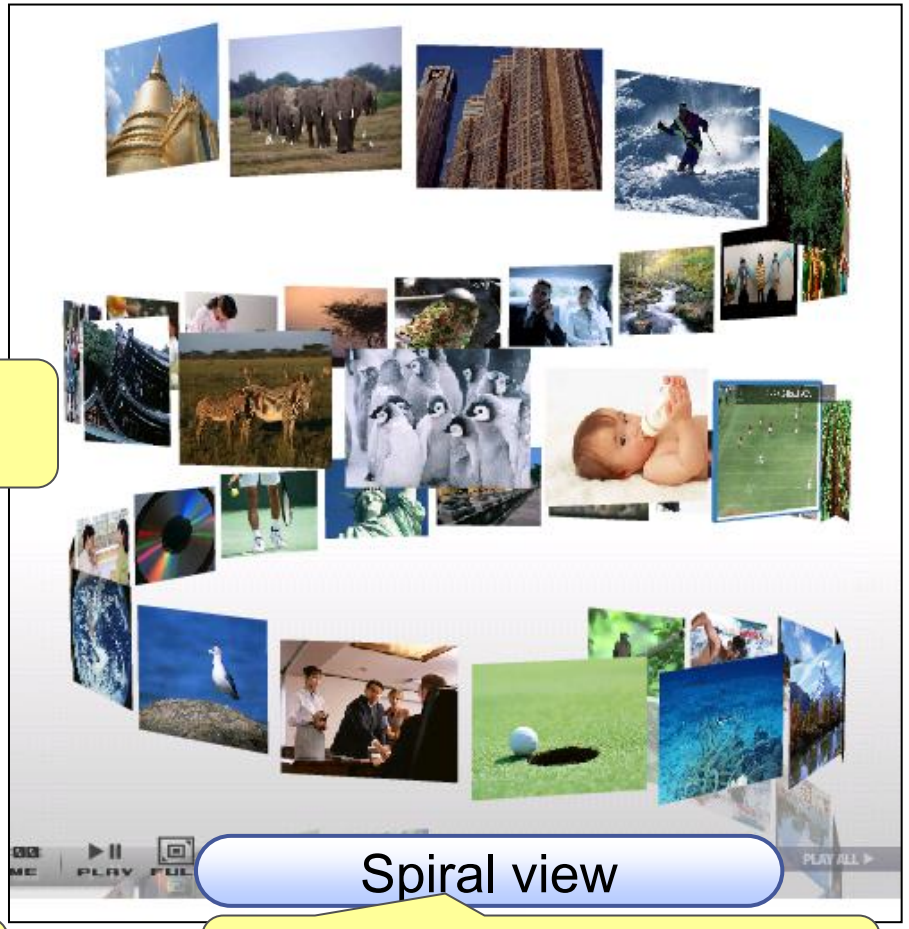


Slide view

Turn over one after another like the shuffle of cards

Color/shape based view

Arrange similar color or shape images closely



Spiral view

Simultaneous reproduction of images on a thumbnail

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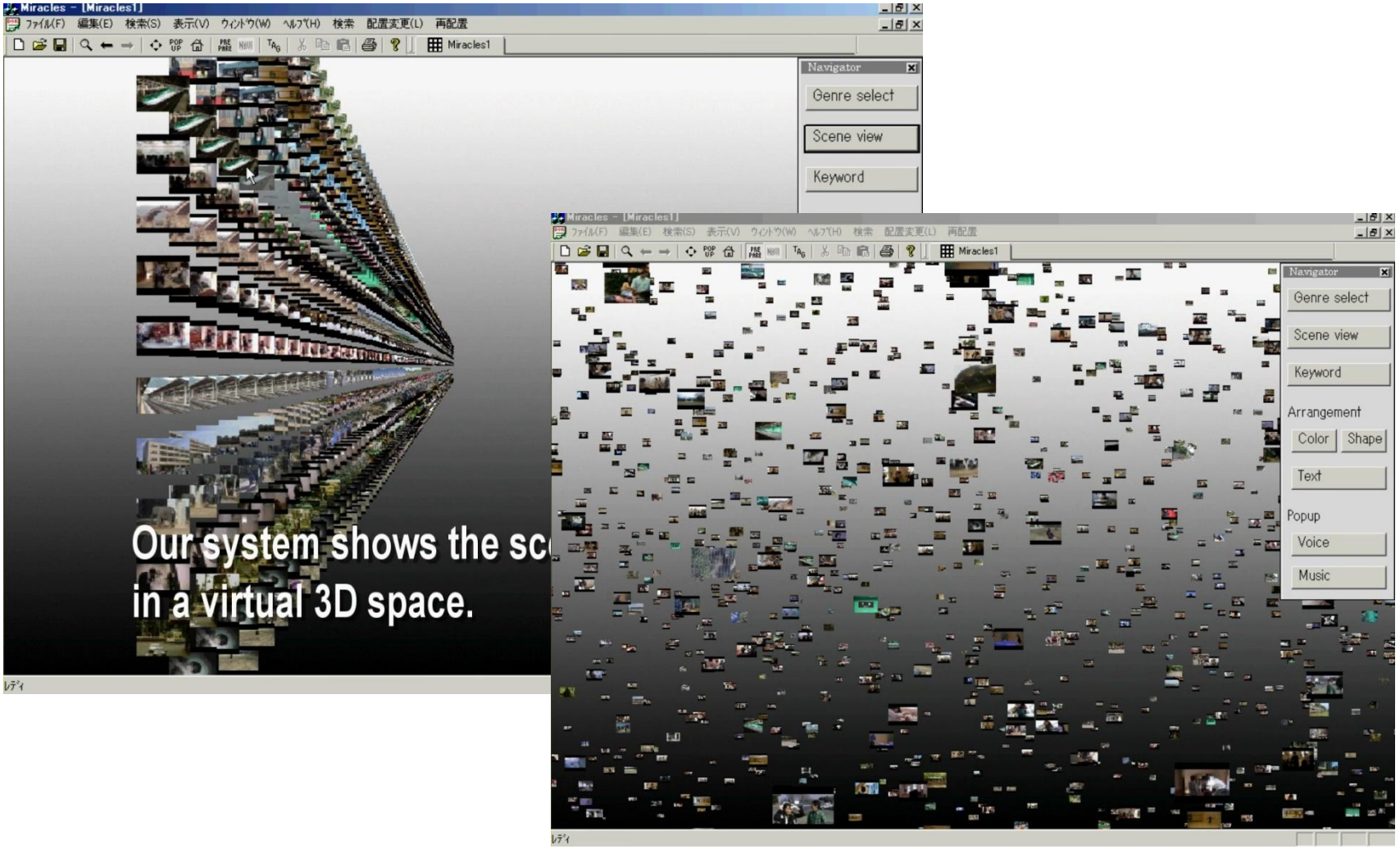
Demo of visual user interface

- Reduce retrieval cost by combination of keyword search and visual user interface



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4. Summary

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- Several video retrieval technologies were introduced.
  - Caption extraction and recognition
  - Digest video generation
  - Visual user interface
- In next 5-10 years
  - Various types of metadata such as peoples name, object name (ex. Landmarks) can be added with progress of object recognition
  - Web information are dynamically linked with contents of video
    ex. Peoples face->Facebook,
    Landmark -> Wikipedia
    Restaurant -> Reputation site..

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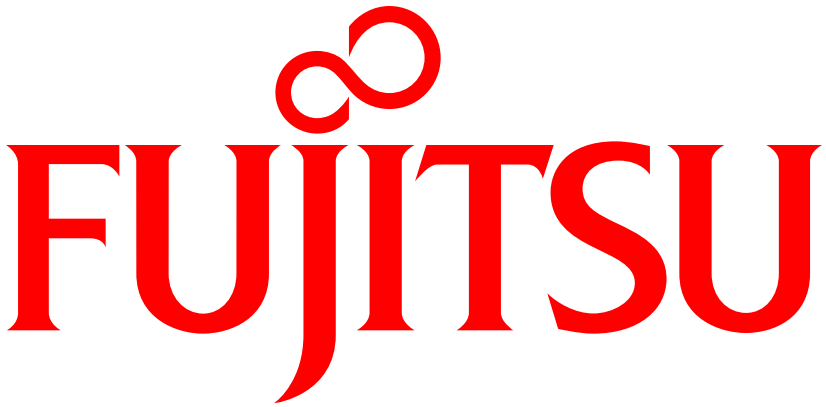

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