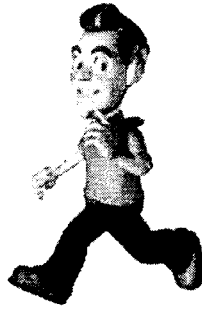


VR & AR Applications for Broadcasting



Sung-Choon Park
Technical Research Institute, KBS

September 2001

Technical Research Institute, KBS

VR & AR Applications
for Broadcasting

Contents

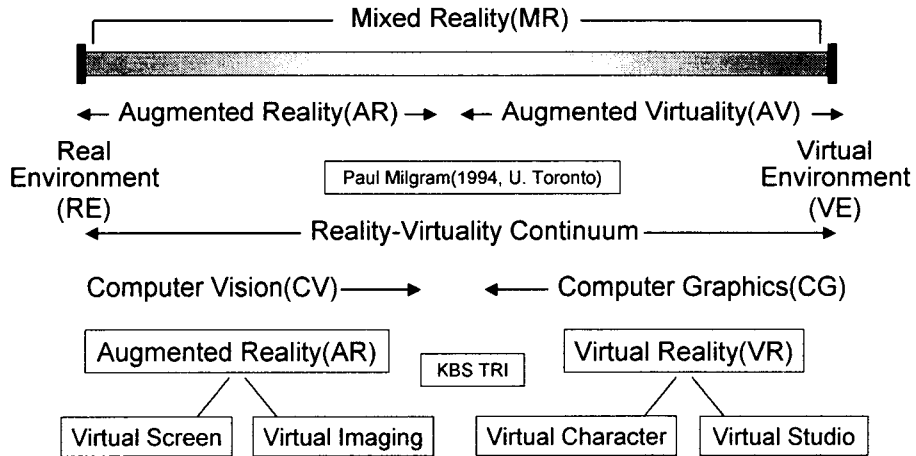
- Introduction
- Virtual Studio System
- Virtual Character System
 - Real-time Motion Capture based System
 - Motion Library based Character Animation Editing System
 - 3D Graphic Replay System for Soccer Game
- Virtual Screen System
 - 'K-vision' : Real-time Video Augmentation System
- Virtual Imaging System
 - Virtual Advertising
 - Camera Tracking based Virtual Imaging System
- Conclusion

September 2001

Technical Research Institute, KBS

1. Introduction

1.1 Background



1. Introduction

1.2 KBS R&D Projects

VR & AR Applications for Broadcasting

- Base technology : computer graphics & vision, VR & AR
- Composition between real images and virtual graphics
- New technology for digital contents creation



Virtual Studio



Virtual Character



3D News Replay



3D Soccer Replay



Virtual Screen



Virtual Imaging



MotionScope



Facial Mosaic

2.1 DreamSet

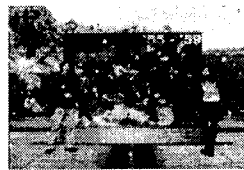
- Development of a virtual studio system 'DreamSet'
 - : 3D virtual graphic sets
 - : Camera tracking based real-time composition
 - : Virtual object animation and real-time data display
- Application
 - : Setting and operating virtual studio systems at TS-7, NS-1
 - : History Special, Music Tower, Election Program etc.

Application
Summary

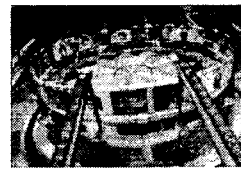
Creation
Process



History Special

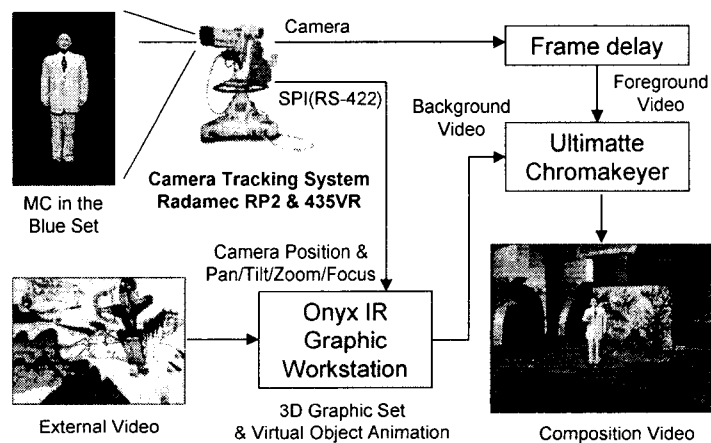


Music Tower



Election etc.

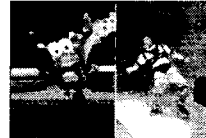
2.2 System Configuration



3.1 Introduction

- Development of a virtual character system

- : Motion capture based performance animation
- : Body and hand(finger) motion animation
- : Facial expression and lip motion animation
- : Combined with a virtual studio system



Creation Process

- Application

- : Setting and operating virtual character systems at TS-7, TS-14
- : TV Kindergarten, Election Program, Comedy Program etc.



PangPang

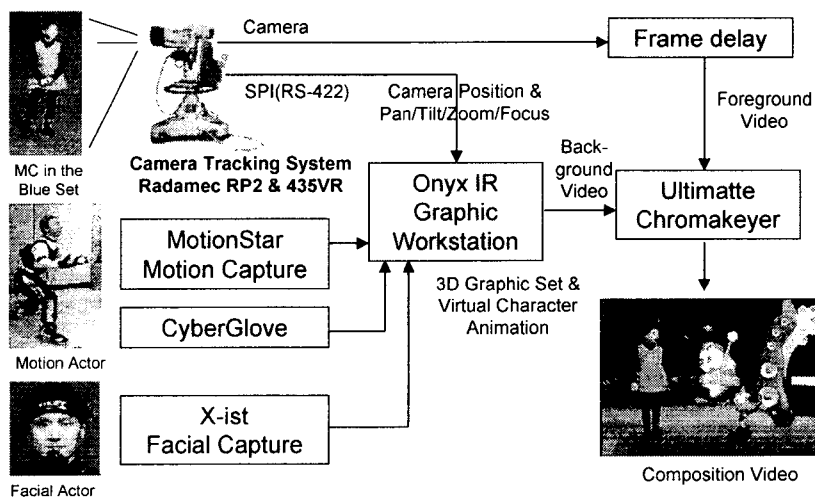


Aliang

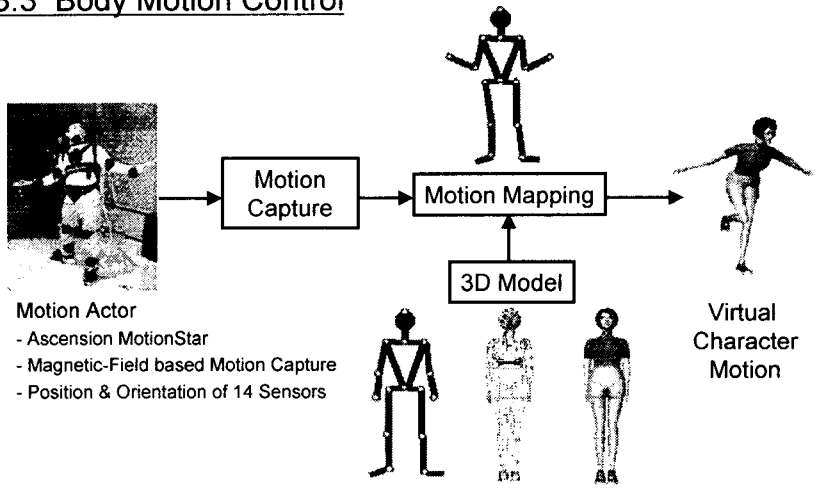


Wawoo

3.2 System Configuration

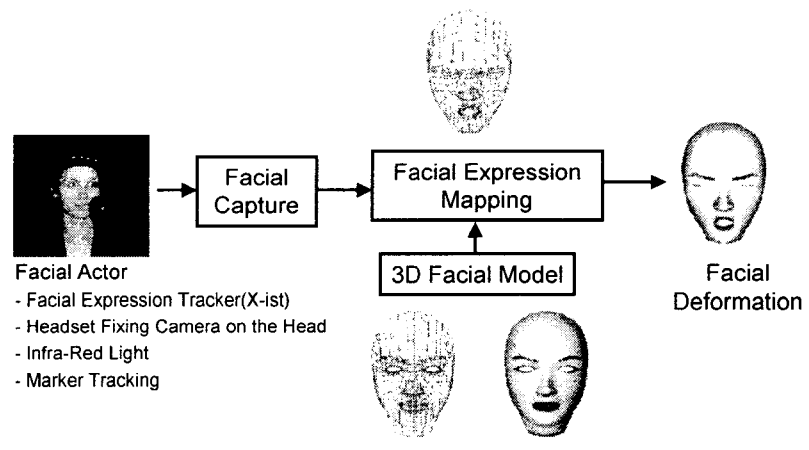


3.3 Body Motion Control



- Motion Actor**
- Ascension MotionStar
 - Magnetic-Field based Motion Capture
 - Position & Orientation of 14 Sensors

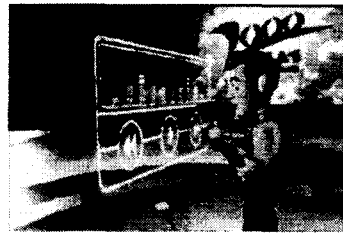
3.4 Facial Expression Control



- Facial Actor**
- Facial Expression Tracker(X-ist)
 - Headset Fixing Camera on the Head
 - Infra-Red Light
 - Marker Tracking

4.1 High Quality Virtual Character System

- Post-production System(Develop a Maya Plug-in Software)
- High Quality Rendering System
- Motion Library = Motion Database
- Interactive Motion Editing
- Lip Sync using Voice Pattern Recognition
- Emotional Shape Blending



4.2 Interactive Motion Editing(1)

- Motion Displacement
- Motion Stitching and Blending
- Motion Path Planning



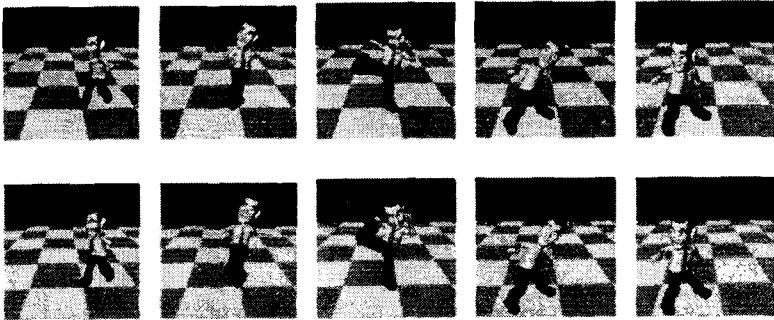
Motion Path



Motion Displacement

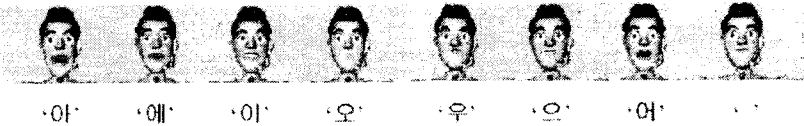
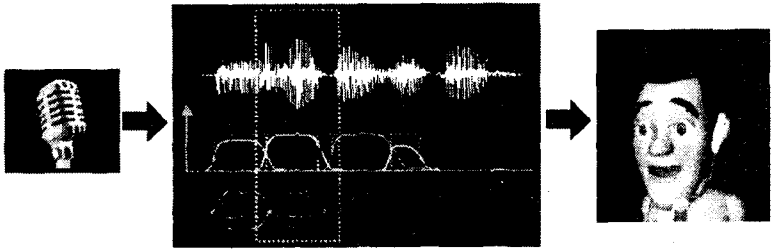
4.2 Interactive Motion Editing(2)

- Motion Amplifying & Attenuating

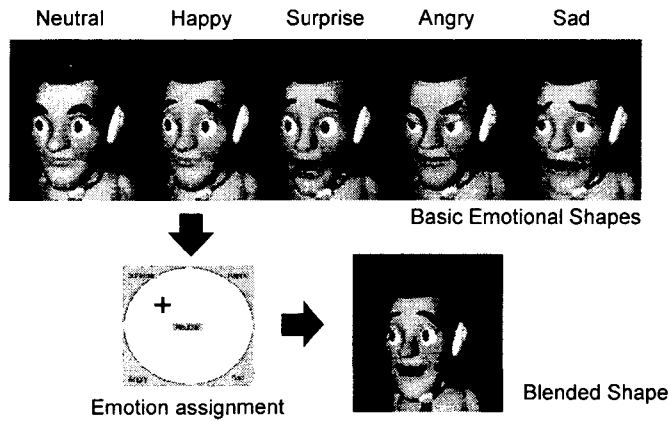


Motion Exaggeration

4.3 Voice Pattern Recognition



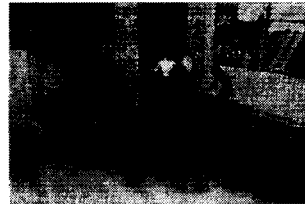
4.4 Emotional Shape Blending



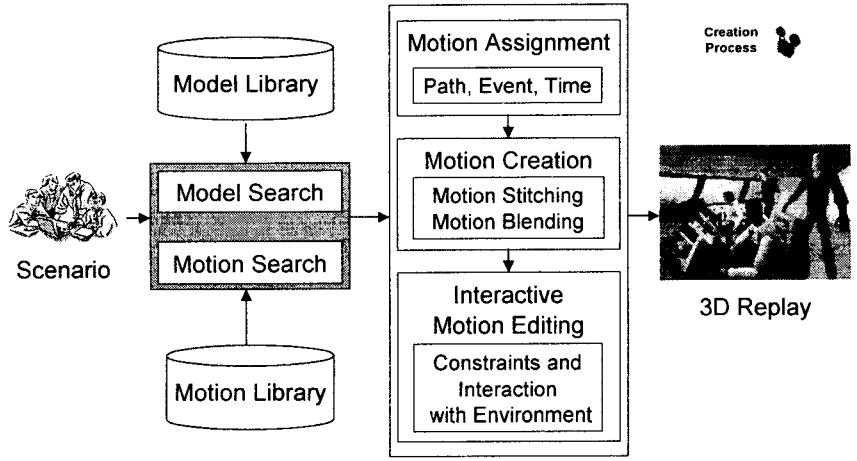
5.1 Overview

- Post-production System(Develop a Maya Plug-in Software)
- Model & Motion Library Based Character Animation System
- Multiple Virtual Character Control
- 3D News Replay System for Accidental Events
 - : Traffic Accident, Fire Accident etc.
- Make and Edit Animation Fast and Easily

3D News
Replay



5.2 Process

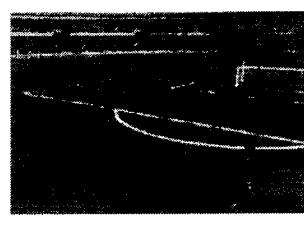


6.1 Overview

- Post-production System
- Image Processing to Detect Position and Motion of Players
- 3D Graphic Replay with Model and Motion Database
- Virtual Camera Movement for Versatile Angle Views
- Goal Replay, Commentary Analysis

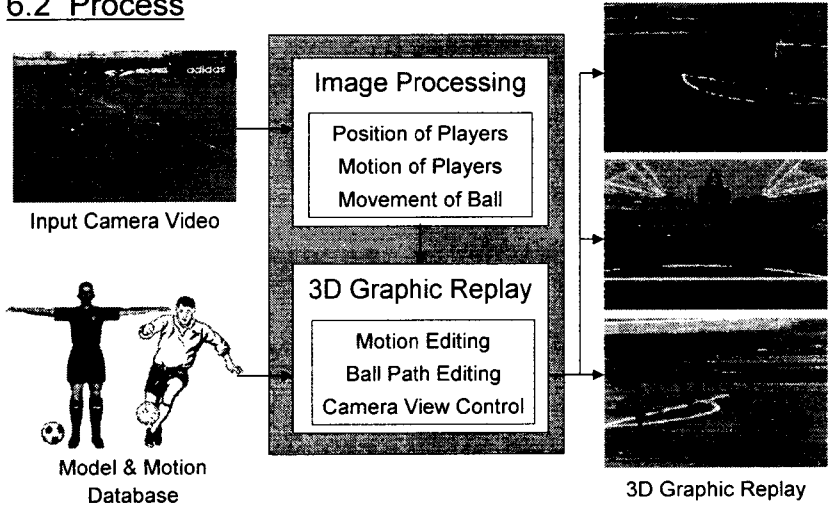


Camera Video



3D Graphic Replay

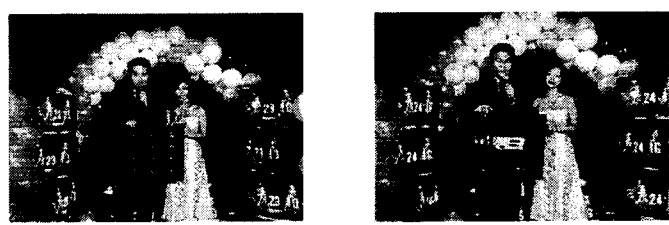
6.2 Process



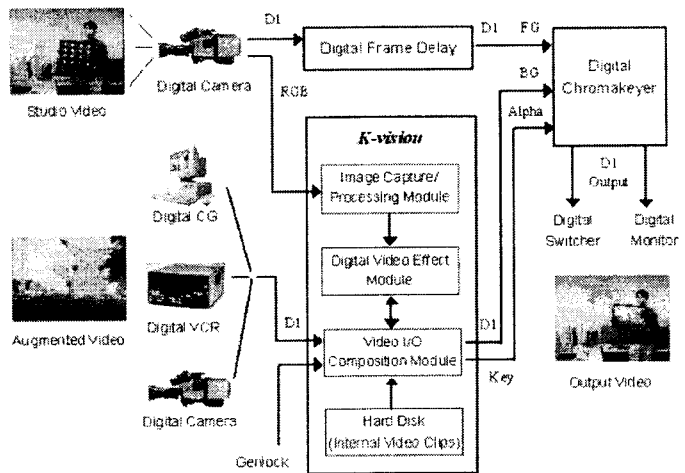
7.1 Introduction



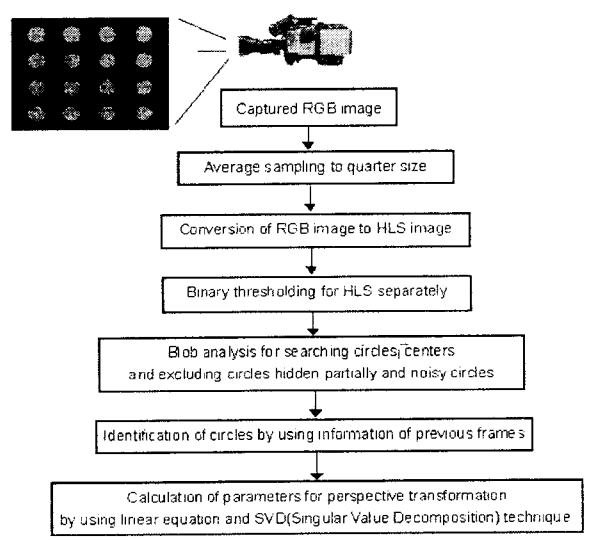
- Virtual screen system is a new AR(Augmented Reality) application for broadcasting area.
- Virtual screen system is a real-time video augmentation system by tracking a chroma-patterned moving panel.
- We have developed a virtual screen system, which name is 'K-vision'.



7.2 System Configuration



7.3 Tracking Algorithm



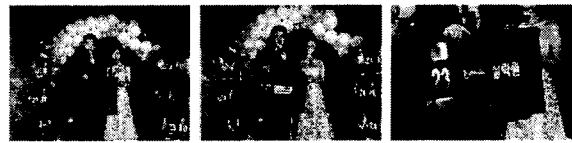
7.4 Applications

K-vision
Application

- Election



- Entertainment



- Documentary



8.1 Introduction

- Natural Composition Virtual Graphics into Real Environment Video
- Virtual Imaging enhances live video with informative and entertaining tied-to-the-field commentary graphics, animation and video overlays, which seamlessly integrate on the sports field regardless of the camera's movements
- It is also used for virtual advertising in many countries
- Virtual Imaging Technology
 - : Camera Tracking based Virtual Imaging System
 - : Image Processing based Virtual Imaging System
- Virtual Imaging in KBS
 - : Orad's CyberSport System
 - : TRI is developing proprietary system

AR Applications Broadcasting **8. Virtual Imaging** Virtual Advertising

8.2 Virtual Advertising(1) Virtual Advertising

November 2001 *Technical Research Institute, KBS*

AR Applications Broadcasting **8. Virtual Imaging** Virtual Advertising

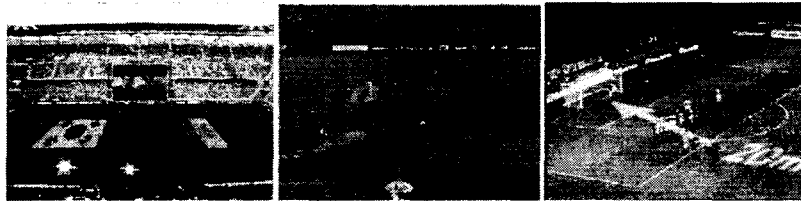
8.2 Virtual Advertising(2)

Maker	System	Feature
Orad	IMadGINE	Camera Sensor, Advertising
	CyberSport	Camera Sensor, Sports Information
Symah Vision	EPSIS Boards	Camera Sensor, Advertising
	EPSIS Graphics	Camera Sensor, Sports Information
	EPSIS Fast	Image Processing, Advertising & Sports Info
	EPSIS Clic	Video Link Advertising, PC, Link Internet Site
PVI	L-VIS	Image Processing & Camera Sensor, Advertising & Sports Information
	iPoint	Video Link Advertising & Info, PC/STB
Scidel	EIS	Image Processing, Advertising
	AGE	Image Processing, Sports Information

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8.3 CyberSport SystemCyberSport
Application 

- Camera Tracking based Real-time Virtual Imaging System
- System Configuration
 - : Camera Tracking System, DVP-200, O2
- Features
 - : 2D/3D Graphic Insertion, Video Jumbotron
 - : Team Logo & Score, 9.15m Circle, Distance to the Goal



2001

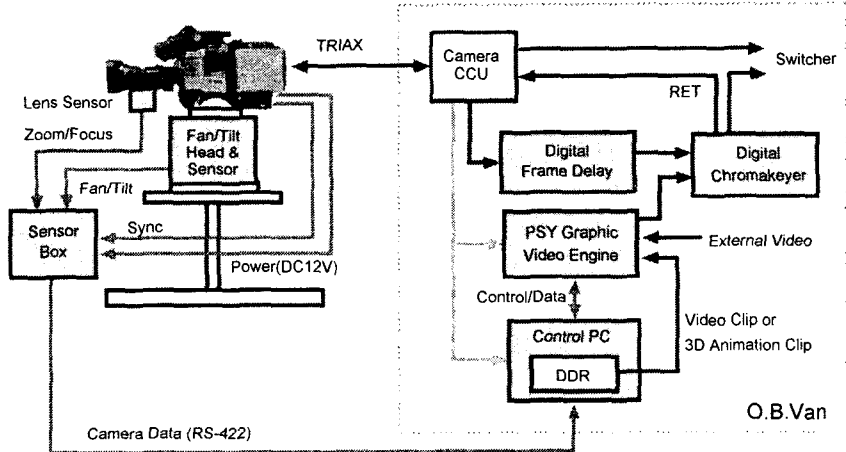
*Technical Research Institute, KBS***8.4 KBS Virtual Imaging System**Prototype
Demonstration 

- R&D Period : July 2000 – June 2002
- Camera Tracking based Real-time Virtual Imaging System
- System Configuration
 - : Camera Tracking System, Graphic Engine, PC, Chromakeyer etc.
- Features
 - : 2D/3D Graphic Insertion, Video Insertion, DDR(Digital Disk Recorder)
 - : Sports Functions added in the Near Future.
- Technology
 - : Camera Tracking & Calibration
 - : Registration 3D Graphics into the Real World
 - : Real-time 3D Graphics Control
 - : Composition considering Occlusion Processing

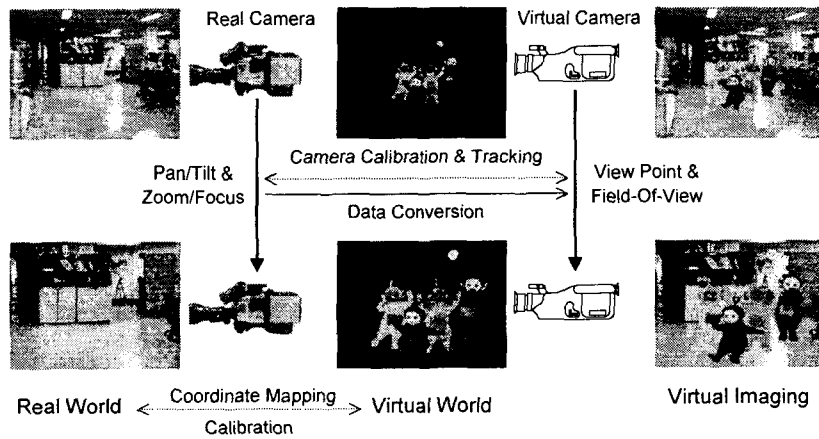
2001

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8.5 Prototype System Configuration



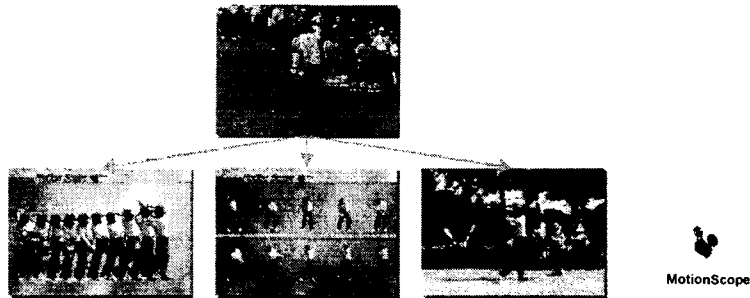
8.6 Registration 3D Graphics into the Real World



9. MotionScope

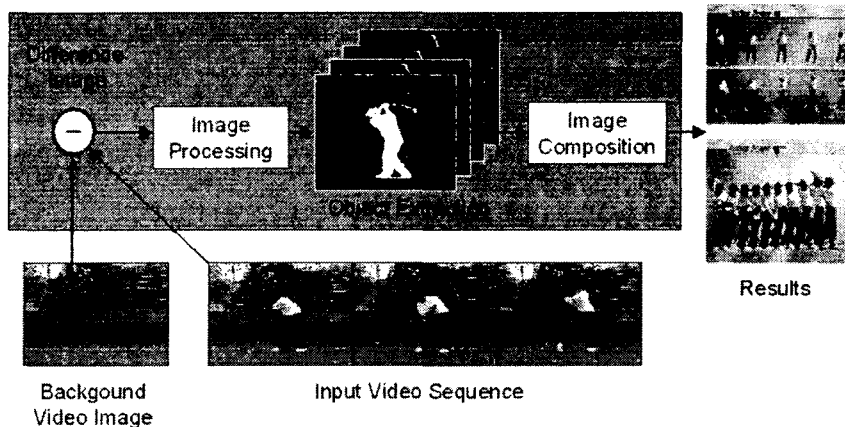
9.1 Overview

- Special Effect : Display Fast Motion of Player onto a Single Image
- Purpose : Analysis of Player's Form and Motion Path
- System Configuration : PC with Video I/O Board
- Applications : Golf, Baseball, Gymnastics



9. MotionScope

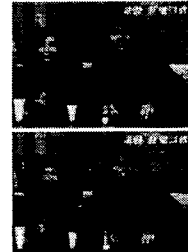
9.2 Process



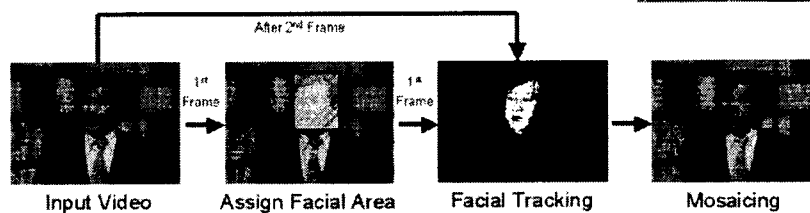
10.1 Overview

- Automatic Mosaic Processing to the Facial Area
- Protection to infringe upon a Person's Privacy
- Using Facial Color Information
- Plugged into NLE Software(Odyssey)

Facial Mosaic



10.2 Process



- KBS have been researching and developing VR & AR applications
 - : Base Technology
 - 3D Computer Graphics, Image Processing
 - Camera Calibration, 3D Registration, Image Composition
 - : Developed Systems
 - Virtual Studio, Virtual Character, Virtual Screen, MotionScope etc.
 - : Developing Systems
 - Virtual Imaging, 3D News Replay, 3D Soccer Replay
- Many programs use our system for special effects.
- Future Works
 - : System & software enhancement
 - Virtual Imaging, 3D News Replay, 3D Soccer Replay
 - : Apply these systems to TV programs in the next year
 - : Research on new technology for digital contents creation