ISMAR2007
Final Program

THE SIXTH IEEE AND ACM INTERNATIONAL SYMPOSIUM ON MIXED AND AUGMENTED REALITY NOV. 13-16, NARA, JAPAN

Message from the General Chair

Welcome to ISMAR 2007 and welcome back to Japan! This year's ISMAR brings you to Nara, a historic city of Japan. ISMAR'07 is the premier international meeting in the fields of Mixed Reality (MR) and Augmented Reality (AR). It provides an opportunity for MR/AR researchers from academia and industry worldwide to meet in an informal atmosphere to exchange ideas, concepts, and recent results. As in previous years, ISMAR'07 will generate stimulating discussions among participants and will provide intensive exchange between academic and industrial researchers working in the different multidisciplinary research branches of MR and AR.

Nara is located close to Osaka and Kyoto and is one of the ancient capital cities of Japan. You may enjoy exploring historic Nara Park during the conference. Todaiji Temple's Great Budda and Kasuga Shrine are just within walking distance. Kyoto and Osaka are also located within 40 minutes by train and are very nice places to visit after or before ISMAR 2007.

The ISMAR organizing committees, including program and area chairs from all over the world, have worked hard to select a set of high quality papers, posters and demonstrations. The proceedings in front of you contain all of the long and short papers, as well as all of the posters, from the main conference. All of these were reviewed by at least four experts in the field and discussed and accepted by the international committee of area chairs. This year's event also includes workshops on "Tangible Space Initiative" and "Mixed Reality Entertainment and Art" as well as tutorials like "Tutorial 1: Designing and Developing Handheld Augmented Reality Systems" and "Rigid and Deformable Tracking using Markers or Scene Features."

ISMAR has invited Dr. Dieter Schmalstieg from Graz University of Technology to talk about "Upscaling and Downscaling Augmented Reality" and Dr. Seiki Inoue from NHK Science & Technical Research Laboratories to talk about "Mixed and Augmented Reality in Broadcasting." Also, a dinner talk will be given by Dr. Mark Billinghurst from HIT Lab New Zealand.

This year, we will also have a Noh performance to augment the main conference with traditional Japanese art. Noh is known to be a major form of classic Japanese musical drama that has been performed since the 14th century. It evolved from various popular, folk and aristocratic art forms, including Dengaku, Shirabyoshi, and Gagaku. Noh is a performance where audiences have to augment the performers by interpreting their symbolic movement. We hope you all enjoy the Noh performance.

In addition to the program committee and reviewers, we would like to thank the various organizing committees and the numerous individuals who have assisted in making ISMAR 2007 a great conference. We would especially like to thank the IEEE Computer Society, The Virtual Reality Society of Japan, all our co-sponsors, and non-profit foundations.

Have a great conference at ISMAR 2007!

Haruo Takemura, *Osaka University, Japan*
ISMAR 2007 General Chair

IS-1200 *VisTracker* 6DOF イメージトラッカー

革新的な慣性ジャイロセンサ開発企業である **InterSense** 社が、この度、開発した **Vision Tracker (IS-1200Vis)** は従来の 6DOF トラッキングシステム異なり、まったく新しい発想で、同社の慣性ジャイロセンサ技術をベースに企画開発されたトラッキングシステムです。超小型慣性センサとプロセッサを搭載した **InertiaCam カメラ**は自動的に基準マーカーを認識し、更に最先端データ処理アルゴリズムによりその位置と角度を算出します。自然光環境下で使用できる IS-1200VisTracker は少量、大量のマーカーに関係なく確実にトラッキング可能な画期的な 6DOF トラッカーです。IS-1200Vis は最大 3 万個のパターン (Fiducial) を認識しますので、従来とは比較にならない広範囲のトラッキングアリアを持っています。また ARDEMO、ISDEMO、InterSense の SDK、その他各種のソフトウェアがサポートしています。

特　徴

- ◆ ワイドエリア、ウェラブル 6DOF トラッキング＆ナビゲーションシステム
- ◆ VR、MR、AR、携帯コンピュータシステム用に特別設計されている
- ◆ 32000 ポイントまで用意されているユニークな基準マーカー
- ◆ EthernetUDP とインターフェース可能

アイ・トラッキングシステム

ディスプレィ付アイトラッカー

スタンドアロン型アイトラッカー

キャップ式アイトラッカー

Tobii アイ・トラッカーは完全非接触型アイ・トラッキングです。　煩わしい器具を装着したり、頭を固定する必要が全くないので、より自然な状態でのビジョンリサーチ/実験を行うことが出来ます。メガネやコンタクトも気にすることはありません。驚くほど簡単な設定とキャリブレーションで、高精度の注視点データを取得することが可能です。

特 徴

- ★ 非接触型ディスプレィ付とスタンドアロンタイプ
- ★ 数秒以内の簡単キャリブレーション
- ★ web 画面、静止画、動画等の様々な視覚刺激に対応
- ★ スキャンパス、注視点プロット他多様な分析ソフト
- ★ 新生児、高齢者、メガネ･コンタクト使用者に対応

モバイルアイは屋内・屋外で活発に動き回る被験者の視線追跡をするポータブルシステムです。アイカメラは非常に軽量で負担がきわめて少なく簡単に装着でます。記録装置は被験者の小さなポーチに入れて持ち運び自由です。

特 徴

- ★ 軽量アイカメラ 76ｇ
- ★ ポータブルシステム
- ★ 屋内屋外での使用が可能
- ★ 高い精度とシンプルな操作
- ★ GazeTracker による様々な解析

お問合せ先　株式会社**クレアクト･インターナショナル**
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SENSICS

大パノラマ 高臨場感
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米国Sensics社のヘッドマウントディスプレイ(HMD)、**piSight™**は、世界一没入感の高いHMDと言えます。

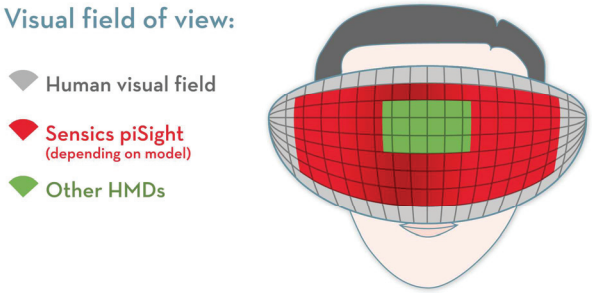
主な特徴:

- 対角線で82° から180° までの視野角の確保によるパノラミック3次元没入感
- モジュラー構造とアップグレード考慮設計による、広範な価格性能比
- 高解像度: 単眼あたり最大4200×2400 ピクセル(有効ピクセル数 2400×1720)
- 容易な操作: 1kg以下の重量、オープンフレーム設計による快適さとむれの防止

piSight™は特許取得の光学設計を用いる事により、マイクロディスプレイの画像を継目なく合わせ、驚くほど美しいパノラマ3D画像を体験出来るようにしました。 必要分のマイクロディスプレイを利用して、ほとんどの性能と価格要求に応える高解像度のHMDを数十種類の仕様より選択出来ます。

piSight™ 基本仕様

Field of view (depending on model)	82° to 180° diagonal 58 ° to 179 ° horizontal 29 ° to 84 ° vertical
Binocular overlap	48° to 90° diagonal
Resolution	20 pixels/degree 2.9 arcmin/pixel throughout entire visual field
Color	24 bit color 75% of NTSC gamut 100:1 contrast
Frame Rate	60 Hz
Eye relief	17mm
Interpupillary Distance	55 mm minimum 71 mm maximum
Headsupported weight	2 lbs (1 kg)
Tracking	Predictive 6 degrees of freedom
Typical tracking resolution	0.75mm position 0.05° angular
Typical tracking accuracy	3.0mm position 0.25° pitch roll 0.50° yaw



上図にてグレイの領域は、人間の目で認識できる視野角を示します。

赤い領域は、**piSight™**でカバーできる視野角を示します。

従来のHMDの様な1 つの表示素子を用いたHMDでは、グリーンで示す領域しかカバーする事が出来ません。

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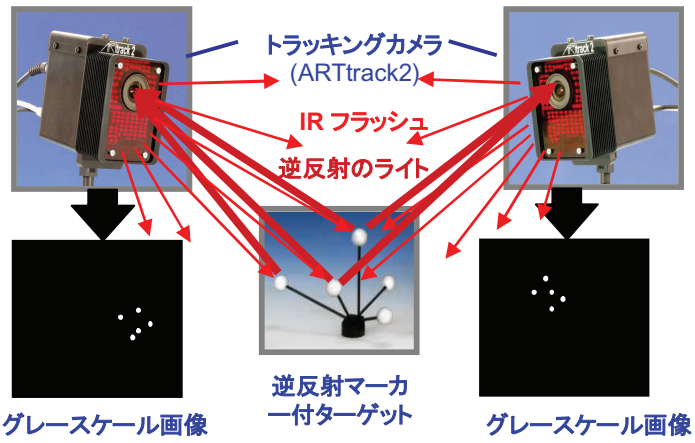

アプリケーション

没入感のあるバーチャルリアリティ (VR)

オーギュメンティッドリアリティ (AR)

没入ワークスペース etc…

お問合せは: 兼松エアロスペース株式会社 航空・防衛システム営業部 電子システム営業課
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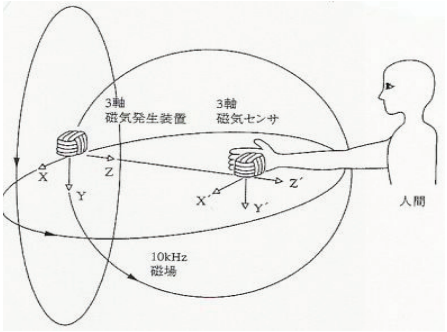
この磁気式センサーは、非接触で計測でき、光学式や音波式とは違い、物理的な障害物に物理的な障害物に影響されないデータをリアルタイムで提供致します。

高精度のモーションキャプチャーとしてVR,医療や各種シミュレーションのアプリケーションに最適です。



用途例　：

- **スポーツ科学や医療の研究分野における運動解析**
- **モーションキャプチャーを始めとしたVR＆CGへの応用**
- **手術支援システム等医療機器におけるセンサー**
- **HMD（ヘッドマウンテッドディスプレイ）システムのセンサー**
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- **測定範囲:　メーカー精度保証範囲　半径約76cmの半球内**
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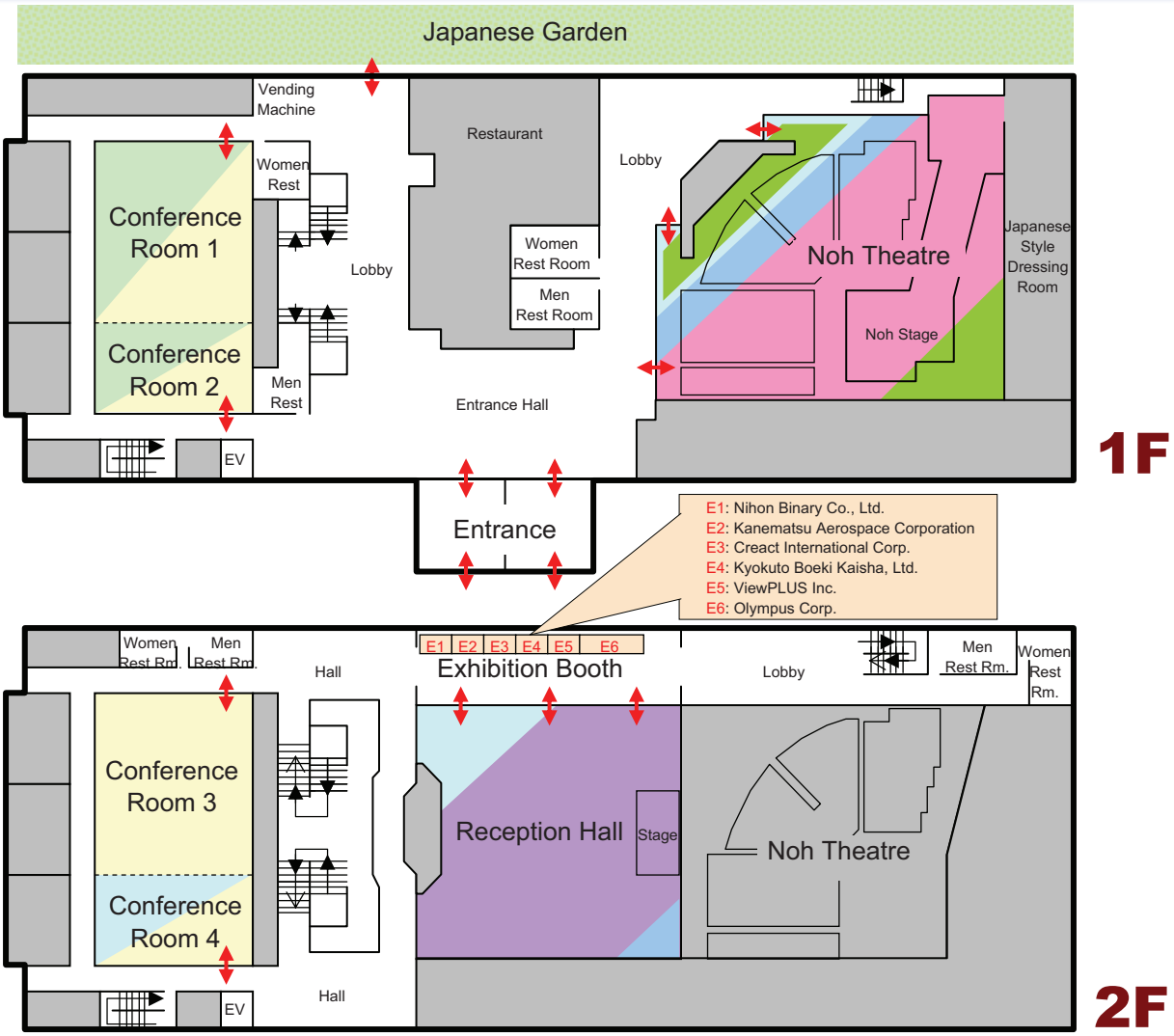
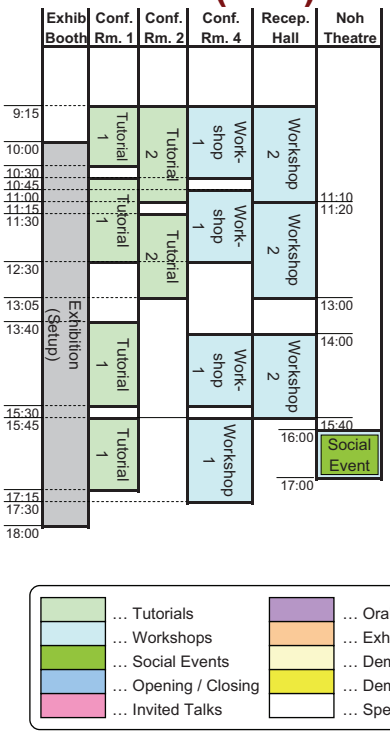
Floor map

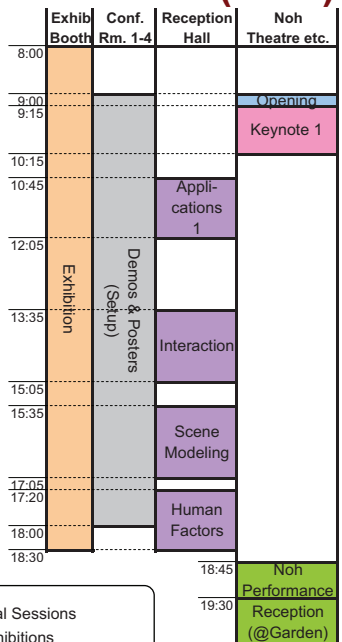


Timetable at a glance

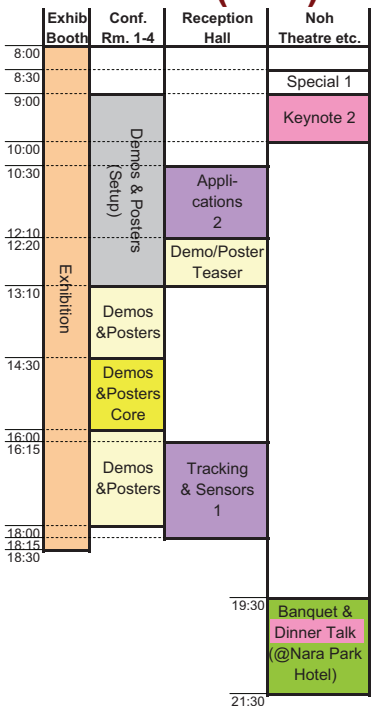
Nov. 13 (Tue)



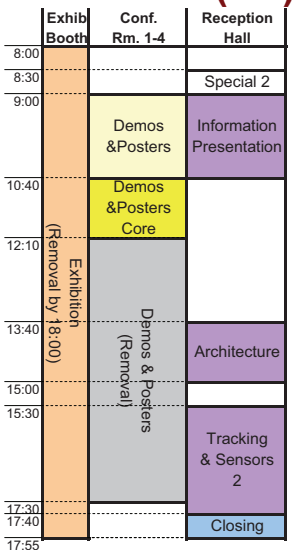
Nov. 14 (Wed)



Nov. 15 (Thu)



Nov. 16 (Fri)



… Tutorials
… Workshops
… Social Events
… Opening / Closing
… Invited Talks
… Oral Sessions
… Exhibitions
… Demos & Posters
… Demos & Posters Core
… Special Sessions

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Nonprofit Organizations

Japan Society for the Promotion of Science

Inoue Foundation for Science

The Support Center for Advanced Telecommunications Technology Research, Foundation

Workshops

Workshop 1(Full day):
Tangible Space Initiative

November 13 (Tue), 9:15-17:30, Conference Room 4

http://www.tangible-space.org/

The objective of this workshop is to facilitate intellectual exchange on current research activities towards building next-generation interaction spaces. Historically, human computer interaction (HCI) research in mixed and augmented reality and ubiquitous or pervasive computing have been largely carried out in separate research communities. As a result of recent advancements and increased maturity within the individual research areas, we consider it timely and fruitful to discuss combined approaches with a unifying perspective toward the next generation interaction space.

Under the umbrella concept of the "Tangible Space Initiative" (TSI), we have identified three components that form inter-operative but distinct areas in the area of tangible space: tangible interfaces (TI), responsive cyberspace (RCS), and tangible agents (TA). TI mainly provides the interface between the human and cyberspace. RCS is a virtual space that is responsive to user situation and intentions. A TA is a physical agent that is interacting with physical objects in the physical space on behalf of the cyberspace. TI has been a major focus of MR/AR research, RCS has been a main focus of research in ubiquitous computing, simulated environments and artificial intelligence, and TA has been a main focus of robotics and computer vision. The organizing committee seeks papers drawing on theory and methods in these diverse research communities and encourages workshop participants to identify research directions in their individual fields that can be profitably combined to form a new cooperative approach for the next-generation interaction space.

Organizers:
Tobias Höllerer (University of California / holl@cs.ucsb.edu),
Heedong Ko (Korea Institute of Science and Technology)

Workshop 2(Full day):
Mixed Reality Entertainment and Art

November 13 (Tue), 9:15-17:00, Rec. Hall & Noh Theatre

http://ismar07ea.wikidot.com/

Recently more and more people realize that entertainment is a key driver for development of technology. There has been a great deal of recent research put in the entertainment industry and it has grown dramatically as a topic of research interest. However, there is still a big gap to achieve physicality, mobility, tangible, social and physical interaction for people's entertainment. The main deficiencies of present entertainment systems is that they make people involved in the play passively and partially due to limited kinds of screen-based interactions and also a large lack of social physical interactions between humans and computer entertainment systems. It is proposed that social and physical interactions are new paradigms that outline the vision of the next generation of entertainment. We can provide these interactions through employment of technologies such as mixed reality to merge the human physical world with the virtual game world. Those new genres of mixed reality entertainment technology should provide much greater degrees of freedom than current entertainment systems.

Furthermore, the advances in mixed reality entertainment have also led to new forms of technology-enabled media art, culture and performance which have created new forms of entertainment that attract, immerse and absorb their participants. The phenomenal success of such a "culture" to initiate a mass audience in patterns and practices of its own consumption has supported the evolution of an enormously powerful mass entertainment, digital art and performance industry extending deeply into every aspect of our lives, leading further to major societal and business contacting changes.

In this workshop, we plan to explore and discuss the latest research and new paradigms of mixed reality for entertainment and art. We would welcome both academic and industry viewpoints and reports. The range of topics to be explored could include Mixed Reality applications for:

Location-based and Pervasive Gaming,
Mobile Entertainment,
Entertainment Robotics and Haptics
Digital, Artistic, and Commercial MR Games,
MR Edutainment,
Educational/Serious Games,
Interactive Games,
Multimodal Interfaces for Games,
e-Performance (e-Opera, e-Theatre, e-Concert, ...),
Virtual Exhibitions and Museum Installations
Social and Interactive Entertainment Computing Applications,
Innovative Applications of Technology in the Arts,
Novel Interfaces for MR Games,
Tabletop Games

Keynote Workshop Talk:
A special keynote workshop talk will be given by NEC Corporation researchers, including performance of Papero Robot. More details will be given closer to the event.

Organizers and Workshop Co-General Chairs:
Adrian David Cheok, National University of Singapore
Michael Haller, Upper Austria University of Applied Sciences

Workshop Co-Chairs:
Mark Billinghurst, HIT Lab NZ, University of Canterbury, New Zealand
Masahiko Inami, The University of Electro-Communications, Japan
Carsten Magerkurth, SAP Research CEC, Switzerland
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Keiji Yamada, C&C innovation Laboratories, NEC Corporation, Japan

Publicity Chair:
Dongpyo Hong, GIST, Korea

Organizing Chair:
Newton Fernando, Mixed Reality Lab, National University of Singapore

Tutorials

Tutorial 1(Full day):
Designing and Developing Handheld Augmented Reality Systems

November 13 (Tue), 9:15-17:15, Conference Room 1

http://studierstube.icg.tu-graz.ac.at/handheld_ar/ismar2007/

Mobile devices with small displays and cameras have become a pervasive part of our everyday life. They are now powerful enough to run Augmented Reality applications, allowing people to see virtual information overlaid on the real world. This is significant because for the first time AR developers can deploy their applications on hundreds of millions of cell phones and handheld devices used by people every day. However, the design and implementation of user interfaces and interactive applications for mobile devices differ significantly from the development of similar programs for desktop PCs or notebooks because of the remarkable physical differences of the devices, differences in the software and in the context of use. Despite this, in 2007 there will be over 600 million mobile phones sold

with a camera, significant processing power and screens. Mobile devices have the potential to be the largest platform for consumer level Augmented Reality.

The aim of this full day tutorial is to teach the design and programming of AR applications for small mobile platforms. Particular attention will be paid to human-computer-interface (HCI) and design issues for applications and games using these platforms. The details and best practices on designing and developing applications using currently available hardware and software will be presented.

This tutorial is planned as a full day tutorial split in two parts:

HCI and design issues related to handheld devices focusing on AR applications.

Details on how to implement the interface concepts presented in part one.

Attendees who are only interested in either HCI or technology development, can attend for a half day.

The tutorial should be of interest to those who want to a quick start on the development of AR applications for mobile devices and the HCI aspects that should be considered. The intended audience is academic and industrial researchers. No background knowledge on mobile device development is required, but a basic knowledge in real-time computer graphics and C++ development us useful.

Participants will learn:
- Differences between desktop, backpack and handheld AR
- Design guidelines on HCI techniques for handheld AR
- Information on programming Windows Mobile and Symbian devices
- Standards for handheld devices (OpenGL ES, Collada)

This tutorial has been taught at the VR2007 conference in March 2007. In the feedback forms ratings ranged from above average to excellent. All attendees recommended the tutorial to be repeated at future VR conferences.

Organizer:
Daniel Wagner (Institute for Computer Graphics and Vision, Graz University of Technology /
daniel@icg.tu-graz.ac.at)

Lecturers:
Istvan Barakonyi (Imagination Computer Services GesmbH),
Mark Billinghurst (University of Canterbury),
Blair MacIntyre (College of Computing, Georgia Institute of Technology)

Tutorial 2(Half day): Rigid and Deformable Tracking using Markers or Scene Features

November 13 (Tue), 9:15-13:05, Conference Room 2
http://campar.in.tum.de/ISMAR07TT/WebHome

In this tutorial, we aim to give a survey of the most recent developments on visual tracking in Augmented Reality applications. First, latest marker-based approaches will be recalled and discussed. Then, we will focus on marker-less concepts for tracking using features and/or image alignments. Once the newest methods have been introduced, we will see how computer vision and machine learning techniques can be combined in order to improve the quality and the efficiency of the detection and the tracking. Finally, after having considered the camera environment as rigid, performing virtual augmentation on deformable objects in the scene will be described.

Organizers:
Selim Benhimane (Technische Universitat Munchen / benhiman@in.tum.de),
Vincent Lepetit (EPFL),
Adrien Bartoli (LASMEA)

Lecturers:
Mark Fiala (IIT, National Research Council)
Nassir Navab (Technische Universitat Munchen)

Keynote Talks

Keynote 1: Upscaling and Downscaling Augmented Reality

Dieter Schmalstieg, Graz University of Technology
November 14 (Wed), 9:15-10:15, Noh Theatre

Despite great advances in core technology, Augmented Reality (AR) still has to cover some ground in order to prove its value as a mainstream technology. Partly this can be attributed to difficulties originating in scale problems. For example, the amount of data for covering wide physical areas with AR content is too big to be handled manually. Mobile AR equipment is often too heavy and too expensive for casual users. This talk will focus on technology and experiences to address some of these issues. Handheld AR running on small devices, in particular smartphones, promises to provide more scalable AR - more lightweight, more discreet, more affordable and more collaborative. Authoring and modeling tools address the problem of scalable content creation. The talk will also present application examples which make use of these new possibilities.

Dieter Schmalstieg is full professor of Virtual Reality and Computer Graphics at Graz University of Technology, Austria, where he directs the "Studierstube" research project on augmented reality. His current research interests are augmented reality, virtual reality, distributed graphics, 3D user interfaces, and ubiquitous computing. He received Dipl.-Ing. (1993), Dr. techn. (1997) and Habilitation (2001) degrees from Vienna University of Technology. He is author and co-author of over 100 reviewed scientific publications, member of the editorial advisory board member of computers & graphics, member of the steering committee of the IEEE International Symposium on Mixed and Augmented Reality, chair of the EUROGRAPHICS working group on Virtual Environments, and advisor of the K-Plus Competence Center for Virtual Reality and Visualization in Vienna. In 2002, he received the START career award presented by the Austrian Science Fund.

Keynote 2: Mixed and Augmented Reality in Broadcasting

Seiki Inoue, NHK Science & Technical Research Laboratories
November 15 (Thu), 9:00-10:00, Noh Theatre

This talk will introduce examples of video synthesis in broadcasting from the viewpoint of mixed and augmented reality. In broadcasting programs, virtual studio in which camera shot video and CG are synthesized according to the camerawork of the camera is widely used. The talk will introduce the history of development and research about virtual studio, for example, Synthevision using HDTV video as wider background, co-starring of CG and real actors, image-based virtual sets, immersive virtual studio and recent application to live sport program. The talk also introduces the special camera, AxiVision which can get depth video for three dimensional synthesis, the robot camera which can be easily used for virtual studio, and Invisible Panel which can support performers in virtual studio. The talk includes the possibility of TVML (TV program Making Language) for virtual studio, which can easily generate CG character animation and speech

synthesis in real time.

Seiki Inoue is a senior research engineer in NHK Science & Tech. Research Labs. He is a leader of the group of Visual Expression & Technology where they research virtual studio, intelligent robot camera and text-to-video technology (TVML: TV program Making Language). He got B.S. degree in electrical engineering, M.S. and Ph.D. degrees in electronics engineering all from Univ. of Tokyo in 1978, 1980 and 1992, respectively. He joined NHK in 1980 and moved to Science & Tech. Research Labs. in 1983. From 1995 to 1998, he worked for ATR Media Integration & Communications Research Labs. From 2002 to 2005, he worked at NHK Broadcast Engineering Department. His research interests include image and video processing, CG and visual expression.

Dinner Talk

Where's the Reality in Augmented Reality?

Mark Billinghurst, HITLabNZ, New Zealand

November 15 (Thu), During Banquet, Nara Park Hotel

Dr Billinghurst has a wealth of knowledge and expertise in human computer interface technology, particularly in the area of Augmented Reality (the overlay of three-dimensional images on the real world).

In 2002, the former HIT Lab US Research Associate completed his PhD in Electrical Engineering, at the University of Washington, under the supervision of Professor Thomas Furness III. As part of the research for his thesis titled Shared Space: Exploration in Collaborative Augmented Reality, Dr Billinghurst invented the Magic Book - an animated children's book that comes to life when viewed through the lightweight head-mounted display (HMD).

Not surprisingly, Dr Billinghurst has achieved several accolades in recent years for his contribution to Human Interface Technology research. He was awarded a Discover Magazine Award in 2001, for Entertainment for creating the Magic Book technology. He was selected as one of eight leading New Zealand innovators and entrepreneurs to be showcased at the Carter Holt Harvey New Zealand Innovation Pavilion at the America's Cup Village from November 2002 until March 2003. In 2004 he was nominated for a prestigious World Technology Network (WTN) World Technology Award in the education category and in 2005 he was appointed to the New Zealand Government's Growth and Innovation Advisory Board.

Originally educated in New Zealand, Dr Billinghurst is a two-time graduate of Waikato University where he completed a BCMS (Bachelor of Computing and Mathematical Science)(first class honours) in 1990 and a Master of Philosophy (Applied Mathematics & Physics) in 1992.

Noh Performance

Nohgaku Workshop “Introduction to Noh, Japanese Traditional Musical Drama Performance”

November 14 (Wed), 18:45-19:30, Noh Theatre

Contents

- Introduction to Nohgaku
- Introduction of musical instruments used for Nogaku
- Noh performace “Tsunemasa”

Performers (Shite Kata)

- Takahiko Fukano, a member of Nohgaku Kyoukai
- Tadaki Hashimoto, a member of Nohgaku Kyoukai
- Shigeki Miyamoto, a member of Nohgaku Kyoukai
- Yoshiko Washio

Musicians

- Fue (A Japanese transverse flute) Yasuyoshi Morita, Morita school of fuekata (Morita-ryu)
  Important intangible cultural property holder
  a member of Japan Nohgakukai and Nohgaku Kyoukai
- Kotsuzumi (A hourglass-shaped Japanese drum) Mitsuhisa Hayashi, Ko school of kotsuzumikata (Koryu)
  Important intangible cultural property holder
  a member of Japan Nohgakukai and Nohgaku Kyoukai
- Ohtsuzumi (A large hourglass-shaped Japanese drum) Yuhji Taniguchi, Ishii school of Ohtsuzumikata (Ishii-ryu)
  a member of Nohgaku Kyoukai

Tsunemasa (excerpt from http://www.aizu-noh.aizu.or.jp/18kaisetsu.html with modification)

This story is called Shuramono. Shuramono is one of the hell into which the samurai falls after death, and is the world of suffering to which killing one another continues there through all eternity. The place is Ninna-ji Palace in autumn.

Heike family's Tairano Tsunemasa is an expert of the Japanese lute and is a young nobleman. He was loved by a prince Shukakuhossinoh and given a Japanese lute "Seizan". He deposited Seizan to Ninna-ji temple, and went to the western front with the family because he did not want to lose the rare utensil "Seizan" by the fight. However, he was killed in the battle at Ichinotani on the way.

Kagenkou (a funeral with the stringed instrument) for the soul of Tsunemasa is held in Ninna-ji temple by direction of the prince Shukakuhossinoh.

Kagenkou continued to midnight, and Tsunemasa of the appearance of a young samurai appears while the shadow is faint. He talks that he returned to the human world for the obsession. Only his voice hears into the faint shadow. He brings up and picks the lute "Seizan" and speaks that he spent satisfied and joyful in this world. He answers that he is Tunemasa when Gyoukei of the Waki post calls him. He keeps playing the lute while imagining, recollecting various scenes, and spends the time of bliss. Suddenly the anger and regret about having been killed by the fight welled up in him. He dances Cakeri before long. Soon he is caught up into an unmeasured fight against Ashura and Taishakuten's army and fights violently in the hell named Shuradou. He finds himself changed into an ugly appearance and is ashamed of it. And soon he is diverted to the dark and disappears when daybreak will begin to become near before long.

Program

November 14 (Wed)

9:00-9:15 Opening Remarks

9:15-10:15 Keynote Talk 1

Session chair: Tom Drummond

Upscaling and Downscaling Augmented Reality
Dieter Schmalstieg

10:45-12:05 Session 1: Applications 1

Session chair: Ron Azuma

10:45 Laser Pointer Tracking in Projector-Augmented Architectural Environments

Daniel Kurz, Ferry Haentsch, Max Grosse, Alexander Schiewe, and Oliver Bimber

11:15 Urban Sketcher: Mixed Reality on Site for Urban Planning and Architecture
Markus Sareika and Dieter Schmalstieg

11:35 Augmented Reality-based factory planning - an application tailored to industrial needs
Katharina Pentenrieder, Christian Bade, Fabian Doil, and Peter Meier

13:35-15:05 Session 2: Interaction

Session chair: Bruce Thomas

13:35 Face-to-Face Tabletop Remote Collaboration in Mixed Reality
Shinya Minatani, Itaru Kitahara, Yoshinari Kameda, and Yuichi Ohta

13:55 Visual Hints for Tangible Gestures in Augmented Reality
Sean White, Levi Lister, and Steven Feiner

14:15 A 3D Flexible and Tangible Magic Lens in Augmented Reality
Julian Looser, Raphael Grasset, and Mark Billinghurst

14:35 AR-Jig: A Handheld Tangible User Interface for Modification of 3D Digital Form via 2D Physical Curve
Mahoro Anabuki and Hiroshi Ishii

15:35-17:05 Session 3: Scene Modeling

Session chair: Hideo Saito

15:35 Semi-automatic Annotations in Unknown Environments
Gerhard Reitmayr, Ethan Eade, and Tom Drummond

15:55 Automatic Reconstruction of Wide-Area Fiducial Marker Models
Manfred Klopschitz and Dieter Schmalstieg

16:15 Automatic contour model creation out of polygonal CAD models for markerless Augmented Reality
Juri Platonov and Marion Langer

16:35 Semi-Automatic Generation of Appearance-based Edge Models from Image Sequences
Jeremiah Neubert, John Pretlove, and Tom Drummond

17:20-18:30 Session 4: Human Factors

Session chair: Mark A. Livingston

17:20 Visual Longitudinal and Lateral Driving Assistance in the Head-Up Display of Cars
Marcus Toennis, Christian Lange, and Gudrun Klinker

17:40 Evaluating Display Types for AR Selection and Annotation
Jason Wither, Stephen DiVerdi, and Tobias Höllerer

18:00 An Evaluation of Graphical Context as a Means for Ameliorating the Effects of Registration Error
Cindy Robertson and Blair MacIntyre

18:45-19:30 Noh Performance (Japanese Traditional Dance)

Facilitator: Haruo Takemura

19:30-20:30 Reception

November 15 (Thu)

9:00-10:00 Keynote Talk 2

Session chair: Haruo Takemura

Mixed and Augmented Reality in Broadcasting
Seiki Inoue

10:30-12:10 Session 5: Applications 2

Session chair: Steve Feiner

10:30 An Industrial Augmented Reality Solution For Discrepancy Check
Pierre Georgel, Pierre Schroeder, Selim Benhimane, Stefan Hinterstoisser, Mirko Appel, and Nassir Navab

10:50 Visualization of Spatial Sensor Data in the Context of Automotive Environment Perception Systems
Marcus Toennis, Rudi Lindl, Leonhard Walchshaeusl, and Gudrun Klinker

11:20 Laparoscopic Virtual Mirror for Understanding Vessel Structure: Evaluation Study by Twelve Surgeons
Christoph Bichlmeier, Sandro Michael Heining, Mohammad Rustaee, and Nassir Navab

11:40 Contextual Anatomic Mimesis: Hybrid In-Situ Visualization Method for Improving Multi-Sensory Depth Perception in Medical Augmented Reality
Christoph Bichlmeier, Felix Wimmer, Sandro Michael Heining, and Nassir Navab

12:20-13:10 Demo & Poster Teaser

Session chair: Masahiko Inami

14:30-16:00 Demos & Posters Core Time

16:15-18:15 Session 6: Tracking & Sensors 1

Session chair: Vincent Lepetit

16:15 Feature Tracking for Mobile Augmented Reality Using Video Coder Motion Vectors
Gabriel Takacs, Vijay Chandrasekhar, Bernd Girod, and Radek Grzeszczuk

16:35 Real-Time Object Tracking for Augmented Reality Combining Graph Cuts and Optical Flow
Jonathan Mooser, Suya You, and Ulrich Neumann

17:05 Ninja on a Plane: Automatic Discovery of Physical Planes for Augmented Reality Using Visual SLAM
Denis Chekhlov, Andrew Gee, Andrew Calway, and Walterio Mayol-Cuevas

17:25 A Method for Predicting Marker Tracking Error
Russell Freeman, Simon Julier, and Anthony Steed

17:45 Initialisation for Visual Tracking in Urban Environments
Gerhard Reitmayr and Tom Drummond

19:30-21:30 Banquet with Dinner Talk

Facilitator: Hirokazu Kato

Where's the Reality in Augmented Reality?
Mark Billinghurst

November 16 (Fri)

9:00-10:40 Session 7: Information Presentation

Session chair: Kiyoshi Kiyokawa

9:00 Hear-Through and Mic-Through Augmented Reality: Using Bone Conduction to Display Spatialized Audio
Robert Lindeman, Haruo Noma, and Paulo Gonçalves de Barros

9:20 Human-Centered Development of an AR Handheld Display
Raphael Grasset, Andreas Duenser, and Mark Billinghurst

9:40 Dynamic Adaptation of Projected Imperceptible Codes
Anselm Grundhoefer, Manja Seeger, Ferry Haentsch, and Oliver Bimber

10:10 Interactive Focus and Context Visualization for Augmented Reality
Denis Kalkofen, Erick Mendez, and Dieter Schmalstieg

10:40-12:10 Demos & Posters Core Time

13:40-15:00 Session 8: Architecture

Session Chair: Dieter Schmalstieg

13:40 A Two-by-Two Mixed Reality System That Merges Real and Virtual Worlds in Both Audio and Visual Senses
Kyota Higa, Takanobu Nishiura, Asako Kimura, Fumihisa Shibata, and Hideyuki Tamura

14:00 A Wide Field-of-view Head Mounted Projective Display using Hyperbolic Half-silvered Mirrors
Kiyoshi Kiyokawa

14:20 A System Architecture for Ubiquitous Tracking

Environments
Manuel Huber, Daniel Pustka, Peter Keitler, Florian Echtler, and Gudrun Klinker

14:40 Measurement of absolute latency for video see through augmented reality
Tobias Sielhorst, Wu Sa, Ali Khamene, Frank Sauer, and Nassir Navab

15:30-17:40 Session 9: Tracking & Sensors 2

Session Chair: Nassir Navab

15:30 Precise Geometric Registration by Blur Estimation for Vision-based Augmented Reality
Bunyo Okumura, Masayuki Kanbara, and Naokazu Yokoya

15:50 Parallel Tracking and Mapping for Small AR Workspaces
Georg Klein and David Murray

16:20 Deformable Surface Augmentation in Spite of Self-Occlusions
Vincent Gay-Bellile, Adrien Bartoli, and Patrick Sayd

16:40 A Fast Initialization Method for Edge-based Registration Using an Inclination Constraint
Daisuke Kotake, Kiyohide Satoh, Shinji Uchiyama, and Hiroyuki Yamamoto

17:10 Retexturing in the Presence of Complex Illumination and Occlusions
Julien Pilet, Vincent Lepetit, and Pascal Fua

17:40-17:55 Closing Remarks

Posters

Teaser: November 15 (Thu), 12:20-13:10
Core Time 1: November 15 (Thu), 14:30-16:00
Core Time 2: November 16 (Fri), 10:40-12:10

P01 Initializing Markerless Tracking Using a Simple Hand Gesture
Taehee Lee and Tobias Höllerer

P02 Visually Elegant and Robust Semi-Fiducials for Geometric Registration in Mixed Reality
Ryuhei Tenmoku, Yusuke Yoshida, Fumihisa Shibata, Asako Kimura, and Hideyuki Tamura

P03 Webtag: A World Wide Internet Based AR System
Mark Fiala

P04 Mosaicing a Wide Geometric Field of View for Effective Interaction in Augmented Reality
Seokhee Jeon and Gerard J. Kim

P05 Adaptive Augmented Reality Using Context Markup and Style Maps
Erick Mendez and Dieter Schmalstieg

P06 A High-level Event System for Augmented Reality
Jean-Luc Lugrin, Remi Chaignon, and Marc Cavazza

P07 Accelerating Template-Based Matching on the GPU for AR Applications
Yannick Allusse, Raphael Grasset and Mark Billinghurst

P08 ARMO: Augmented Reality based Reconfigurable MOck-up
Yoon-suk Jin, Yang-wook Kim, and Jun Park

P09 Overlay what Humanoid Robot Perceives and Thinks to the Real-world by Mixed Reality System
Kazuhiko Kobayashi, Koichi Nishiwaki, Shinji Uchiyama, Hiroyuki Yamamoto, Satoshi Kagami, and Takeo Kanade

P10 Vesp'R – Transforming Handheld Augmented Reality
Ernst Kruijff and Eduardo Veas

P11 Reliving Museum Visiting Experiences on-and-off the Spot
Takashi Okuma, Masakatsu Kourogi, Nobuchika Sakata, and Takeshi Kurata

P12 Identifying differences between CAD and physical mock-ups using AR
Sabine Webel, Mario Becker, Didier Stricker, and Harald Wuest

P13 A Framework for Tangible User Interfaces within Projector-based Mixed Reality
Yuan Yuan, Xubo Yang, and Shuangjiu Xiao

P14 Visualizing Occluded Physical Objects in Unfamiliar Outdoor Augmented Reality Environments
Benjamin Avery, Wayne Piekarski, and Bruce Thomas

P15 Efficient Extraction of Robust Image Features on Mobile Devices
Wei-Chao Chen, Yingen Xiong, Jiang Gao, Natasha Gelfand, and Radek Grzeszczuk

Demos

Teaser: November 15 (Thu), 12:20-13:10
Core Time 1: November 15 (Thu), 14:30-16:00
Core Time 2: November 16 (Fri), 10:40-12:10

D01 Parallel Tracking and Mapping for Small AR Workspaces
Georg Klein, David Murray

D02 Semi-automatic Annotations in Unknown Environments
Gerhard Reitmayr, Ethan Eade, Tom Drummond

D03 Markerless AR Display System for Supporting Pool Games
Hideaki Uchiyama, Hideo Saito

D04 A Wide Field-of-view Head Mounted Projective Display Using Hyperbolic Half-silvered Mirrors
Kiyoshi Kiyokawa

D05 wIzQubesTM - a Tangible Mixed Reality Storytelling Application
ZhiYing ZHOU, Adrian David Cheok

D06 AR-Sudoku
Gudrun Klinker

D07 Ubiquitous Tracking for Quickly Solving Multi-Sensor Calibration and Tracking Problems
Daniel Pustka, Manuel Huber, Peter Keitler, Florian Echtler and Gudrun Klinker

D08 A Fast Initialization Method for Edge-based Registration Using an Inclination Constraint
Daisuke Kotake, Kiyohide Satoh, Shinji Uchiyama, and Hiroyuki Yamamoto

D09 2x2 Audio-Visual Mixed Reality and RealSound Interaction
Kyota Higa, Mai Otsuki, Yoshio Ishiguro, Asako Kimura, Fumihisa Shibata, and Hideyuki Tamura

D10 Experimental Theatre Staging Using Augmented Reality, Computer Vision, Inertial Sensors, Interactive Installation and Digital Media
Daniel Jernigan

D11 Visually Elegant and Robust Semi-Fiducials for Geometric Registration in Mixed Reality
Ryuhei Tenmoku, Shinsuke Kaigawa, Fumihisa Shibata, Asako Kimura, Hideyuki Tamura

D12 PALMbit-Shadow: Accessing by Virtual Shadow
Goshiro Yamamoto, Shunsuke Nanbu, Huichuan Xu and Kosuke Sato

D13 Urban Sketcher
Markus Sareika, Dieter Schmalstieg

D14 Automatic Reconstruction of Fiducial Marker Models
Manfred Klopschitz, Dieter Schmalstieg

D15 Seamless Real-Time Augmented Reality
Mario Becker, Sabine Webel, Gabriele Bleser, Didier Stricker and Sebastian Wagner, Tobias Franke

D16 A-commerce: A new way for product presentation in the

digital factory
Katharina Pentenrieder

D17 Advances in Handheld AR - A Software and Hardware Combo
Erick Mendez, Ernst Kruijff, Dieter Schmalstieg

D18 A Demonstration of Realtime Simultaneous Localisation and Mapping (SLAM) for AR
Andrew Gee, Denis Chekhlov, Andrew Calway and Walterio Mayol

D19 Dynamic Adaptation of Projected Imperceptible Codes
Anselm Grundhfer, Manja Seeger, Ferry Hntsch, and Oliver Bimber

D20 Interactive Scene Compositing for Augmented Reality
Denis Kalkofen, Dieter Schmalstieg

D21 Document-Based Augmented Reality
Jonathan J. Hull, Berna Erol, Jamey Graham, Qifa Ke, Hidenobu Kishi, Jorge Moraleda, and Daniel G. Van Olst

D22 Tracking with Multiple Global Hypotheses for Augmented Reality
Kenichi Hayashi, Hirokazu Kato, Shogo Nishida

D23 Outdoors Augmented Reality on Cell Phone
Gabriel Takacs, Vijay Chandrasekhar, Thanos Bismpigiannis, Natasha Gelfand, Yingen Xiong, Wei-Chao Chen, Radek Grzeszczuk, Kari Pulli

D24 Applications for Mobile Phone Augmented Reality
Daniel Wagner, Istvan Barakonyi, Dieter Schmalstieg, Matthias Stifter

D25 LUMAR: A Hybrid Spatial Display System for 2D and 3D Handheld Augmented Reality
Alex Olwal, Anders Henrysson

D26 Hands-on Augmented Reality
Taehee Lee, Tobias Höllerer

D27 An Indoor/Outdoor Personal Positioning System for Pedestrian Navigation
Masakatsu Kourogi, Takashi Okuma, Takeshi Kurata

Special Demo Session "Mixed Reality Pre-Visualization for Filmmaking" (MR-PreViz Research Project in Japan)

D28 On-Site 3D Video Generation for PreViz in a Mobile 3D Video Studio
Takeshi Takai, Hidetoshi Nakayama, Shohei Nobuhara, Hiromasa Yoshimoto, Takashi Matsuyama

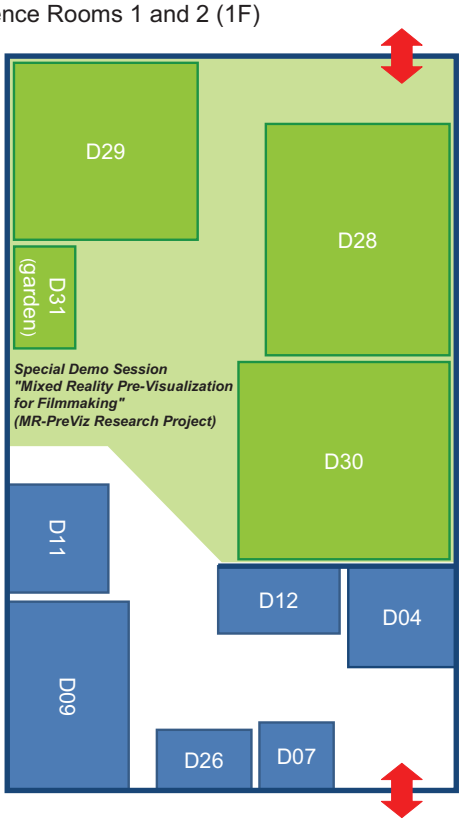
D29 MR-PreViz Image Capturing and Compositing System for Filmmaking
Ryosuke Ichikari, Keisuke Kawano, Ryuhei Tenmoku, Fumihisa Shibata, and Hideyuki Tamura

D30 MR Action Rehearsal System of Sword Fighting
Takanori Hashimoto, Junichi Fujimoto, Ryuhei Tenmoku, Fumihisa Shibata, Hideyuki Tamura

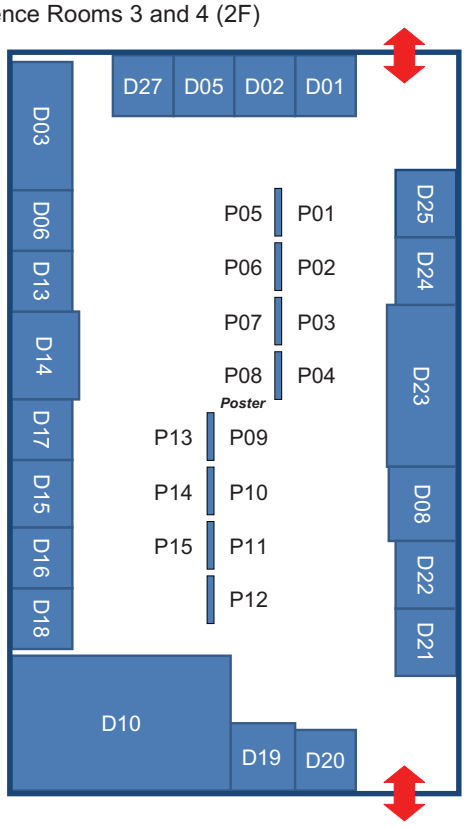
D31 Geometric Registration Using Feature Landmark Database
Takafumi TAKETOMI, Bunyo OKUMURA, Sei IKEDA, Tomokazu SATO, Masayuki KANBARA, Naokazu YOKOYA

Demos & Posters Layout

Conference Rooms 1 and 2 (1F)



Conference Rooms 3 and 4 (2F)



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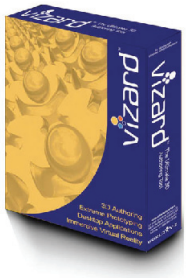

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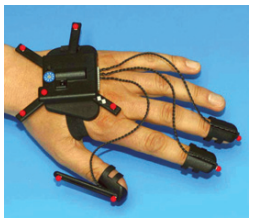

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NEW

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【主な特徴】

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NEW

IEEE-1394b 3眼ステレオビジョン Bumblebee XB3

Bumblebee XB3は、新しい３眼のIEEE-1394bステレオビジョンです。従来品と比べ、メガピクセルカメラ採用（１.３MP）により、解像度が向上し、24cmロングベースラインにより、中-遠距離方向の奥行き精度向上が期待できます。また、ショートベースライン(12cm,向かって左-中央カメラ)とロングベースライン(24cm,向かって左-右カメラ)の2つのベースライン設定を切替えて使用ができ、用途に応じた柔軟な撮影ができます。

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【主な特徴】

- ●世界初!! 外部ケーブルによるPCI Expressダイレクト接続カメラ
- ● 実効帯域, 200MByte/Sec以上
- ● VGA解像度の撮像素子を12mm間隔で5 x 5に25個配置!!
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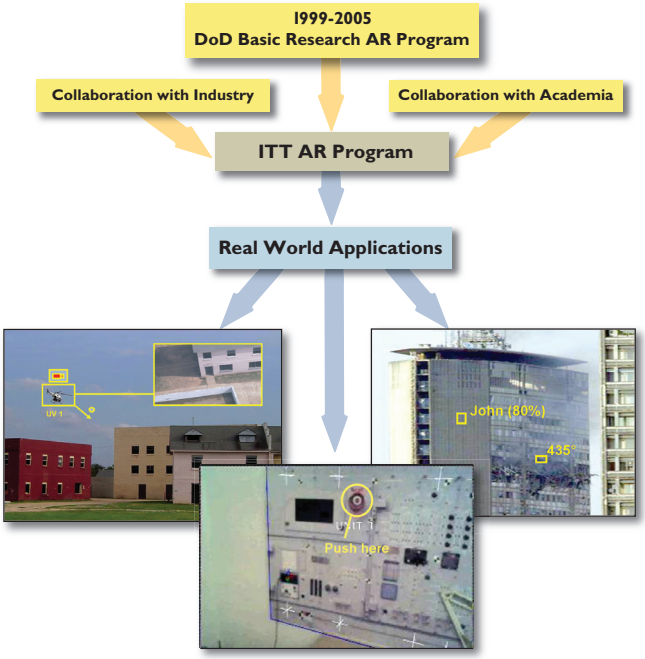
ITT AR Program

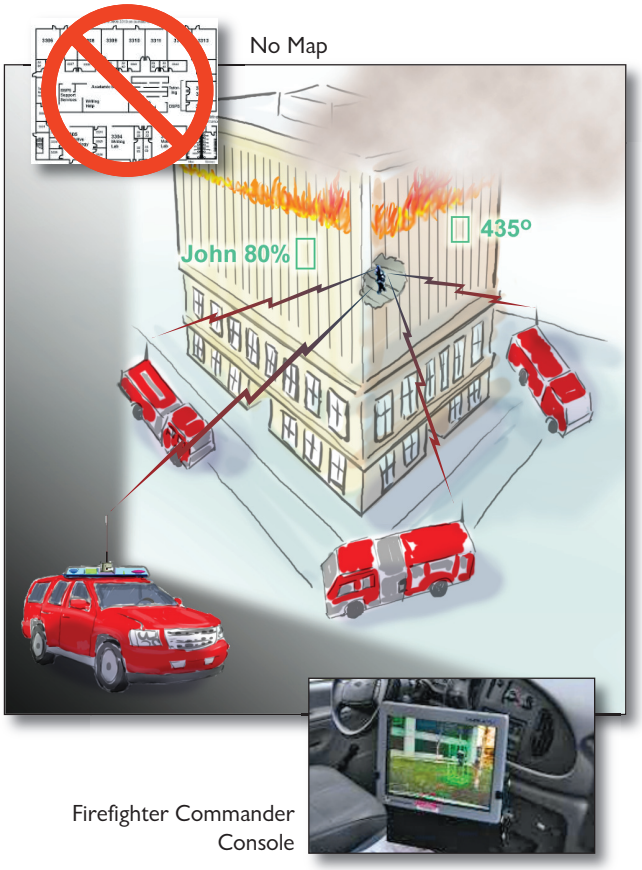


ITT Advanced Engineering & Sciences (AES)

is a division of ITT Defense and Electronic Services, a global engineering and manufacturing corporation. ITT AES provides leading-edge technology services and products to government, industrial, and commercial customers. AES employs over 1590 people in 27 locations across the United States and has a rich history as a leader in the fields of Homeland Defense, Information Technology, and Telecommunications Systems.

ITT AES has an extensive experience in developing and demonstrating Augmented Reality for soldiers and first-responders. From 1999 to 2005, ITT AES supported a large DOD program aimed at solving some of the basic research issues related to the use of mobile AR systems by the military in urban environments. Currently, ITT AES ensures technology transfer of this development by working with defense and first-responders costumers to provide them with AR products for real world applications.

ITT AES is a large integrator and as such is continuously leveraging past and current developments, either internally or from other parties, with the goal to provide products to market faster. For example, ITT establish partnership with display and tracking manufacturers to accelerate the development of these key peripherals. ITT also collaborates with academic institutions helping to integrate successful research in future products.



Firefighter Commander Console

Situation Awareness for Fire Emergency (SAFE)

Many firefighters die each year in the line of duty. The causes of these fatalities often result from firefighters becoming asphyxiated, lost, or trapped in the burning structures they're battling to save. On average, a firefighter sending a distress call has ***less than 10 minutes*** of oxygen remaining, while the average response time to rescue the distressed firefighter is ***over 20 minutes***. Improving the situational awareness of firefighters is a vital step toward reducing the number of firefighter fatalities. To solve this problem, ITT developed a vehicle-mounted AR system able to show the location of firefighters operating inside a building directly on top of a live video of the building captured by a camera mounted on the vehicle. The main features of this system are:

- Data about sensor and firefighters are directly mapped with the location of these entities
- Enhanced situation awareness – No mental integration
- No need for 2D or 3D map, live video always available
- Inertial Motion Unit (IMU) combined with RF mesh network triangulation provides 3 meter accuracy indoor

ITT

Engineered for life

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「夢を創り、実現する力」それがオリンパスに脈打って流れるDNAです。1919年の創立以来、日本で最初に顕微鏡を量産し、世界で初めて胃カメラの実用化に成功したのも、デジタルカメラの世界をグローバルにリードするのもオリンパス。独自のオプトデジタルテクノロジーを核に映像・医療・ライフサイエンス・産業の各分野で、オリンパスならではの価値創造に挑んでいきます。

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