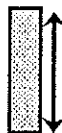


Annex 11 Plan of Operations (PO) and its Achievement

Project period: from June 1, 2002 to May 31, 2005

Activities	Details of Activities	Schedule (Calendar year, quarter)												Inputs	Outputs		
		2002				2003				2004						2005	
		(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)			(2)	
Strengthening institutional framework	Establishment of Project operation unit for implementation and administration	Allocation of personnel & budget, usage and maintenance of machinery and equipment properly												Japanese long-term experts C/P Facilities Local Cost	- Organization/functions of UCSC are strengthened.		
	Collection and dissemination of Project-related information	Planning of operation schedule for every year															
	Strengthening cooperation/coordination with other IT related institutions/organizations	Monitoring and evaluation															
	Further development of multimedia application technology																
Strengthening IT-related skills and technologies	Further development of computer network technology													Japanese short-term experts (several) Training in Japan Hardware for development Software for development	- C/Ps acquire necessary IT skills and technologies for the implementation of WBT.		
	Further development of information system management/administration technology																
	Further development of database system management/administration technology																
	Development of WBT system technology																
	Development of instructional design methodology																
Training on WBT	Preparation of training courses on WBT for WBT content developers/IT trainers													Hardware for training Software for training C/P Facilities Local Cost	- UCSC provides IT training courses on WBT - UCSC provides WBT courses		
	Training on WBT for content developers/IT trainers																
	Needs assessment and analysis																
	Design of WBT materials																
Implementation of WBT	Development of WBT modules																
	Implementation of WBT courses by UCSC																
	Evaluation of implemented WBT courses																
	4 of 8 WBT modules are developed as model cases																
Strengthening R&D capabilities in WBT	Planning of R&D													Research and development in three fields	- R&D capabilities relating to WBT are strengthened in UCSC.		
	Implementation of R&D																

Plan of Operation
Actual Operation



Annex 12 Technical Cooperation Plan (TCP) and its Achievement

Technology	Technology Modules	JFY2002												JFY2003												JFY2004												2005																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Multimedia	Multimedia Fundamentals								S13																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						

Technology	Technology Modules	JFY 2002												JFY 2003												JFY 2004												2005				
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5					
WBT System	WBT System Design and LMS																																									
	WBT Database Design using MySQL																																									
	WBT Module Design using PHP																																									
Instructional Design	Instructional Design for WBT																																									
	Presentation Technique																																									
R&D	R&D Management Methodology																																									
	Implementation of R&D 1 (Robust Speech Recognition)																																									
	Implementation of R&D 2 (3D Graphics)																																									
	Implementation of R&D 3 (Multimedia Database)																																									

Technical Cooperation Plan
Achievement

JFY 2002

A1 Academic Advisor 1
A2 Academic Advisor 2
A3 Academic Advisor 3

L1 Long-term Expert on Technical Coordinator

S1-1 Short-term Expert on Information System Design and Management
S1-2 Short-term Expert on Database System Management
S1-3 Short-term Expert on Multimedia Application Technology
S1-4 Short-term Expert on Computer Network Security
S1-5 Short-term Expert on Web Casing Technology
S1-6 Short-term Expert on Instructional Media Design
S1-7 Short-term Expert on WBT System Development
S1-8 Short-term Expert on DAISY Seminar/Workshop

C1-1 C/P Training on Digital Video Production at OIC
C1-2 C/P Training on Multimedia Production at OIC

JFY 2003

S2-1 Short-term Expert on Pedagogy
S2-2 Short-term Expert on Instructional Design
S2-3 Short-term Expert on R&D Management 1
S2-4 Short-term Expert on R&D Management 2
S2-5 Short-term Expert on R&D Management 3
S2-6 Short-term Expert on Instructor of ID Course

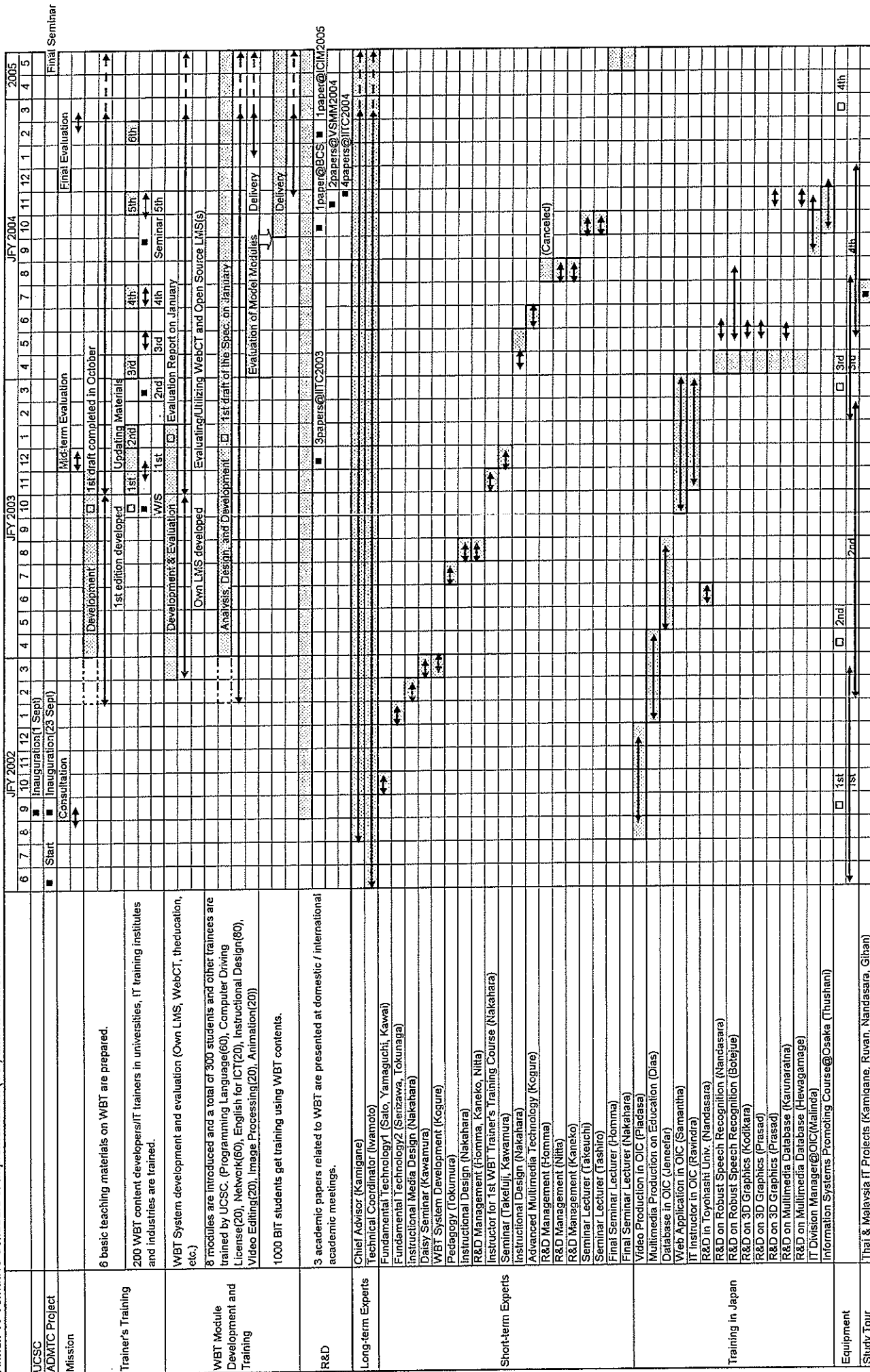
C2-1 C/P Training on R&D at TUT
C2-2 C/P Training on Database at OIC
C2-3 C/P Training on Web Application at OIC
C2-4 C/P Training on IT Instructor at OIC

JFY 2004

S3-1 Short-term Expert on Instructional Design
S3-2 Short-term Expert on Advanced Multimedia Technology
S3-3 Short-term Expert on R&D Management 1
S3-4 Short-term Expert on R&D Management 2
S3-5 Short-term Expert on R&D Management 3

C3-1 C/P Training on R&D (Robust Speech Recognition) at TUT
C3-2 C/P Training on R&D (Robust Speech Recognition) at TUT
C3-3 C/P Training on R&D (3D Graphics) at TUT
C3-4 C/P Training on R&D (3D Graphics) at TUT
C3-5 C/P Training on R&D (3D Graphics) at TUT
C3-6 C/P Training on R&D (Multimedia Database) at TUT
C3-7 C/P Training on R&D (Multimedia Database) at TUT
C3-8 C/P Training on IT Division Manager at OIC
C3-9 C/P Training on Information Systems Promoting at OSIC

Annex 13 Tentative Schedule of Implementation (TSI) and its Achievement



Annex 14 C/P Technology Level Monitoring Sheet

Design and Use of Information System

by Mr. Yamaguchi Akihiko from 23 September to 22 October 2002

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	10	83
2	S.P. Sherin Mathara Arachchi	13	83
3	Malinda Siriwardana	0	70
4	S. Ravindra Madanayake	23	77
5	Thushani A Weerasinghe	0	93
	Average	9	81

Multimedia Application Technique

by Mr. Sato Hiroyuki from 23 September to 22 October 2002

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	32	64
2	S.P. Sherin Mathara Arachchi	17	62
3	Malinda Siriwardana	18	58
4	S. Ravindra Madanayake	23	61
5	Thushani A Weerasinghe	18	64
	Average	22	62

Database

by Mr. Kawai Hirotoshi from 23 September to 22 October 2002

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	8	60
2	S.P. Sherin Mathara Arachchi	15	87
3	Malinda Siriwardana	3	70
4	S. Ravindra Madanayake	3	63
5	Thushani A Weerasinghe	18	97
	Average	10	75

Network Fundamentals

by Mr. Iwamoto Masamichi from 22 October to 13 November 2002

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	19	76
2	S.P. Sherin Mathara Arachchi	2	25
3	Malinda Siriwardana	47	36
4	S. Ravindra Madanayake	8	84
5	Thushani A Weerasinghe	7	50
	Average	17	54

Network Security

by Mr. Serizawa Shigeru from 4 January to 3 February 2003

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	28	52
2	S.P. Sherin Mathara Arachchi	40	40
3	Malinda Siriwardana	28	42
4	S. Ravindra Madanayake	20	58
5	Thushani A Weerasinghe	25	88
6	Danika Nandana Piyadasa	23	52
	Average	27	55



Web Casting

by Mr. Tokunaga Toru from 4 January to 3 February 2003

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	10	85
2	S.P. Sherin Mathara Arachchi	25	85
3	Malinda Siriwardana	15	80
4	S. Ravindra Madanayake	20	80
5	Thushani A Weerasinghe	10	85
6	Danika Nandana Piyadasa	40	70
	Average	20	81

WBT System Development

by Mr. Kogure Yoichi from 16 March 2003 to 28 March 2003

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	69	80
2	S.P. Sherin Mathara Arachchi	47	72
3	Malinda Siriwardana	61	76
4	S. Ravindra Madanayake	62	96
5	Thushani A. Weerasinghe	57	
6	Danika Nandana Piyadasa	56	68
	Average	59	78

Pedagogy

by Mr. Tokumura Tomoaki from 5 July 2003 to 11 July 2003

	Participants	Pre-test(%)	Post-test(%)
	(Direct C/P)		
1	Malinda Siriwardana	36	87
2	Samantha Mathara Arachchi	20	83
3	Danika Piyadasa	14	90
4	Thushani Weerasinghe	36	90
5	Ravindra Madanayake	41	58
	(Staff of e-Learning Center)		
6	Sanath Hettiarachchi	5	78
7	Sajeewanie Jayawardhane	5	90
8	U. Buddhini Wackista-aratchie	11	90
9	Sivaluxman	25	80
10	K. M. G. B. Nishakumari	30	90
	Average	22	84

Advanced Multimedia Technology

by Mr. Kogure Yoichi from 14 June 2004 to 3 July 2004

	Participants	Pre-test(%)	Post-test(%)
1	Jeneefar Makbool	59	77
2	S.P. Sherin Mathara Arachchi	52	75
3	Malinda Siriwardana	56	62
4	S. Ravindra Madanayake	59	77
5	Thushani A. Weerasinghe	60	89
6	Danika Nandana Piyadasa	39	84
	Average	54	78

Annex 15 Seminars & Workshops

Date	Category	Title	Lecturer	Venue	Participants	No. of Participants
1 29 August 2002	Seminar	Overview of Research	Prof. Nitta Tsuneo	ICT	Lecturers of UCSC	20
2 4,5 March 2003	Workshop	DAISY Multimedia System	Mr. Kawamura Hiroshi	ADMT	Representatives of various blind associations	17
3 10 July 2003	Public Seminar	Instructional Design for Education and Training	Mr. Tokumura Tomoaki	ADMT	Lecturers of various universities	20
4 14 August 2003	Seminar	Trials of WBT in TUT	Prof. Nitta Tsuneo	ADMT	Lecturers of UCSC	20
5 21 August 2003	Public Seminar	Instructional Design for e-Learning	Ms. Nakahara Koko	ADMT	Lecturers of various universities	20
6 3 December 2003	Keynote at IITC2003	How to build a successful e-Government	Prof. Takefuji Yoshiyasu	BMICH	Participants of IITC2003	200+
7 3 December 2003	Keynote at IITC2003	DAISY for All	Mr. Kawamura Hiroshi	BMICH	Participants of IITC2003	200+
8 4-6 December 2003	Workshop at IITC2003	DAISY	Mr. Kawamura Hiroshi	ADMT	Representatives of blind associations, Blind students	40
9 5 December 2003	Workshop at IITC2003	How to build a successful e-Government	Prof. Takefuji Yoshiyasu	ADMT	Participants of IITC2003	15
10 5 December 2003	Public Lecture at IITC2003	Recent Innovation in ICT	Prof. Takefuji Yoshiyasu	UCSC	Participants of IITC2003	100+
11 16 December 2003	Public Seminar	WBT Trend	Mr. Motoshima Naoki	ADMT	Lecturers of UCSC	20
12 29 November 2004	Keynote at IITC2004	Collaboration for e-Learning in Asia	Dr. Tashiro Shuichi	BMICH	Participants of IITC2004	200+
13 29 November 2004	Keynote at IITC2004	SCM, Traceability and RFID in the Future	Mr. Takeuchi Kazumasa	BMICH	Participants of IITC2004	200+
14 17 May 2005	Final Seminar (Planned)		Prof. Homma Hiroomi	UCSC		
15 17 May 2005	Final Seminar (Planned)		Ms. Nakahara Koko	UCSC		
Total						1072+

Annex 16 Final Evaluation on Research and Development Program

1. Observation and Comments

A R&D program was added into this project to aim to develop new technologies on multimedia by teaching staffs, themselves in UCSC. Those technologies can be used for web developing technology. Ultimate goal of the R&D program is to innovate Sri Lanka own technology on the multimedia that is internationally unique and competitive, and lead the Sri Lanka IT technology to the international top level. The direct purpose is to develop a high level of technologies for web content development.

Three R&D research topics were selected from the more than ten research proposals done by teaching staffs. The selection was made on the basis of feasibility, realization, rationale, and budget. They are as follows:

- ① 3D Graphics and Virtual Reality
- ② Robust Speech Recognition
- ③ Multimedia Database System for WBT

Three R&D research groups set their clear research objectives and have started since April 2003. Then, necessary equipment was listed up in consultation with Japanese professors and ordered. However, actual initiation was made from August 2003 when three Japanese professors visited UCSC.

Final evaluation was done confirming the evaluation done by two Japanese professor, the research advisors; Prof. Kaneko and Prof. Nitta. Two professors received the final research achievement reports from their advising groups in December 2004. They evaluated the research achievement using the received reports and their observations at their last visit at UCSC, in August 2004 in term of accomplishment extent of soft goals. The evaluation by two professors is shown in Table 1.

For the final evaluation, three research groups were asked to give presentation on their research achievements and future plans, and show their developing system, and databases for the evidence. Re-evaluation results of research accomplishment by three research groups are shown in Table 2. In this table, re-evaluation results are overwritten on Table 1 to easily see the changes. General comments on their research achievements are as follows:

- If consider that the actual research and development period of each group is

around one and a half year, we can say that significant and good research achievements are obtained by especially two groups ① and ③.

- The soft goals set by three groups have almost been accomplished by the groups ① and ③.
- Key equipment for the group ② has been installed in January 2004. Therefore, the research progress of the group might be very much behind of the schedule. However, they caught up their research schedule as much as possible.
- In general, the R & D program has been smoothly performed and most of all the soft goals have been accomplished.
- The technologies developed by each group can be used for the web-based teaching or training (WBT).
- Not only the WBT, but also the other new application areas can be sought by the groups.

Impacts of the R&D program can be seen on many aspects. Those are as follows:

- In UCSC, three research laboratories have been established formally. Namely, those are not just the research groups founded by the project any more, but are laboratories as a unit of UCSC.
- Many undergraduate students want to join these laboratories and carry out researches.
- Young teaching staffs can be exposed to research chances.
- The groups can contact the outside organizations by intermediation of their research achievements to obtain the next research funds or supports.

The final reports submitted by three groups are shown on the following sections

Table 1 Final Evaluation on R & D program of Sri Lanka IT Human Resource Development

(By two Japanese advisors as of 28 December 2005)

Soft Goals set by the research group at the project mid-term evaluation		Adviser's evaluation about soft goals As of 28 December 2004	Causes or Obstacles considered by Adviser	Recommendation and future plans by Adviser
Soft goals	1. Virtual Reality and 3D Visualization (Advise Prof. Kaneko)	Please describe your evaluation on each item below Remarks: accomplished, almost accomplished, half-way to accomplishment, far way to accomplishment	Please write the causes or obstacles if you evaluate as half-way or far way to accomplishment	Please write the recommendation or future plans to sustain the research activities after the project termination
	The broad objective of this research is to enhance the research capabilities of the UCSC by developing new techniques, which are suitable for 3D modeling applications in Sri Lanka. New systems using the newly developed techniques and newly acquired equipment under the IICA project will be developed and several research papers in the International Journals and conferences will be published. After the IICA project period, the research group will continue to carry out research using their acquired research knowledge and equipment received under the IICA project		The main cause is the lack of manpower. For the Sigritya rock project only a D4 student was assigned without proper supervision, although a master level student was assigned initially.	The major unaccomplished tasks are the construction of the Sigritya rock and temporal change of the Sigritya ruin. Hope that these remaining unaccomplished tasks will be carried out. A reasonable base for carrying out CG and virtual reality applications has been developed. Financial assistance for the group to buy one or two PCs with powerful graphics capability is desirable. Hope that the works carried out by the group will be utilized in the Sigritya museum in the future. A financial support for purchasing PCs for implementing the results in the Sigritya museum is highly recommended.
	3D data acquisition of data of national heritage using GPS and digital cameras	3/4 done (except the Sigritya rock)	lack of manpower Initially assigned person left the group.	
	Creation of 3D virtual models	Halfway done (no concrete results yet)	Initially assigned person left the group	
	Adding navigation features using stereographic glasses and space mouse.	fully done (although this is not very important)		
	Creating temporal models for future predictions	not yet done	lack of manpower	
Soft goals	2. Robust Speech Recognition (Adviser Prof. Nitta)	Total evaluation of this activity Satisfactory(3/4 accomplished)		
	1. System Spec. & Setup	Mostly accomplished	Please write the causes or obstacles if you evaluate as half-way or far way to accomplishment	Please write the recommendation or future plans to sustain the research activities after the project termination
	2. Structured MIMDB	Half-way to accomplishment	expected to finish in March 2005	Developing speech recognition (SR) software needs many facilities. Two researchers visited my laboratory and studied fundamental knowledge, algorithms, and how to use basic tools.
	3. Design/Development Software & Tool Development	Half-way to accomplishment	expected to finish in March 2005	But, it seems the training at my laboratory is not enough to accomplish a prototype system. So, we are preparing further opportunity of studying and developing SR systems at doctor course, because the SR software of Sinhalese will be very important for Sri Lanka people.
	4. Publications			
	Total evaluation of this activity	Half-way to accomplishment		

		Please describe your evaluation on each item below. Please write the causes or obstacles if you evaluate as half-way or far way to accomplishment	Please write the recommendation or future plans to sustain the research activities after the project termination
3. Multimedia Database System for WBVT (Adviser Prof. Nitta)		Remarks: accomplished, almost accomplished, half-way to accomplishment, far way to accomplishment	
Soft goals	1. System Setup : A research lab is set-up with the required hardware. The necessary software is installed and configured.	Accomplished	
	2. Study the available meta data standards : It is essential to use meta-data to describe the content of multi-media objects. Generally, the meta-data set required to describe the semantics of data objects depends on the application. Since our goal is to explore how Multi-media	Accomplished,	
	3. Develop a meta-model to store meta-data and Multimedia Objects : Once the required meta data set is identified, it is necessary to store both meta-data and multi-media objects in a databases. Currently relational data bases and XML databases have been used for this purposes and each of these methods has its own advantages and disadvantages. We need to evaluate these two approaches in order to determine which approach is more suitable for our research and what modifications and extensions are required for these approaches.	Accomplished	
	4. MMDB Design : The outcome of this stage would be an architecture of a data management system based on the data model identified in section 3 , to store and manage meta-data and multi-media objects in a multimedia Database. During this stage it is essential to identify the functionality required both at the user side and the server side.	Accomplished	They studied a meta data standard SCORM, but I think its functionality is not so high. So I hope they will try to implement stronger meta-data description language into their next system after discussing requirements.
	5. Software Development (Server Side) : Develop software for server side requirements.	Almost accomplished	
	6. Software Development (Client Side) : Develop software for client side requirements	Almost accomplished	
	7. Prototype System : Build a prototype system by combining and integrating all software components developed up to this stage.	Half-way to accomplishment	expected to finish in March 2005
		Total evaluation of this activity	Almost accomplished

Table 2 Final Evaluation on R & D program of Sri Lanka IT Human Resource Development
(evaluated by Homma 3 and 4 March 2005, shown in bold, italic and underlined letters)

Soft Goals set by the research group at the project mid-term evaluation	Adviser's evaluation about soft goals As of 28 December 2004	Causes or Obstacles considered by Adviser	Recommendation and future plans by Adviser
1. Virtual Reality and 3D Visualization (Advise Prof. Kanelo)	<p>Please describe your evaluation on each item below Remarks: accomplished, almost accomplished, half-way to accomplishment, far way to accomplishment</p> <p>The broad objective of this research is to enhance the research capabilities of the UCSC by developing new techniques, which are suitable for 3D modeling applications in Sri Lanka. New systems using the newly developed techniques and newly acquired equipment under the JICA project will be developed and several research papers in the International Journals and conferences will be published. After the JICA project period, the research group will continue to carry out research using their acquired research knowledge and equipment received under the JICA project</p> <p>3D data acquisition of data of national heritage using GPS and digital cameras</p> <p>Creation of 3D virtual models</p> <p>Adding navigation features using stereographic glasses and space mouse.</p> <p>Creating temporal models for future predictions</p>	<p>Please write the causes or obstacles if you evaluate as half-way or far way to accomplishment</p> <p>The main cause is the lack of manpower. For the Sigiya rock project only a B4 student was assigned without proper supervision, although a master level student was assigned initially.</p> <p>lack of manpower Initially assigned person left the group.</p> <p>lack of manpower</p>	<p>Please write the recommendation or future plans to sustain the research activities after the project termination</p> <p>The major unaccomplished tasks are the construction of the Sigiya rock and temporal change of the Sigiya ruin. Hope that these remaining unaccomplished tasks will be carried out. A reasonable base for carrying out CG and virtual reality applications has been developed. Financial assistance for the group to buy one or two PCs with powerful graphics capability is desirable. Hope that the works carried out by the group will be utilized in the Sigiya museum in the future. A financial support for purchasing PCs for implementing the results in the Sigiya museum is highly recommended.</p> <p><u><i>NFS, 1,000 US\$ UNESCO is most possible research funding organization. Expansion of 3D image to be expanded to Medical field.</i></u></p>
2. Robust Speech Recognition (Adviser Prof. Nitta)	<p>Please describe your evaluation on each item below Remarks: accomplished, almost accomplished, half-way to accomplishment, far way to accomplishment</p> <p>Mostly accomplished (<u>accomplished</u>)</p> <p>Half-way to accomplishment (<u>accomplished</u>)</p> <p>Half-way to accomplishment (<u>almost accomplished</u>)</p> <p>Far way to accomplishment (<u>Half-way to accomplishment</u>)</p> <p><u>One paper will be submitted on Indian or Japanese Journals Paper title will be "Building of acoustic model for Sinhala language using improved GREDY selection"</u></p> <p>Total evaluation of this activity</p>	<p>Please write the causes or obstacles if you evaluate as half-way or far way to accomplishment</p> <p>Developing speech recognition (SR) software needs many facilities. Two researchers visited my laboratory and studied fundamental knowledge, algorithms, and how to use basic tools. But, it seems the training at my laboratory is not enough to accomplish a prototype system. So, we are preparing further opportunity of studying and developing SR systems at doctor course, because the SR software of Sinhalese will be very important for Sri Lanka people. <u>Nov, 260</u></p> <p><u><i>Sinhala words have been stored in the acoustic models and word dictionary. Now, system is being developed.</i></u></p>	<p>Please write the recommendation or future plans to sustain the research activities after the project termination</p> <p>Developing speech recognition (SR) software needs many facilities. Two researchers visited my laboratory and studied fundamental knowledge, algorithms, and how to use basic tools. But, it seems the training at my laboratory is not enough to accomplish a prototype system. So, we are preparing further opportunity of studying and developing SR systems at doctor course, because the SR software of Sinhalese will be very important for Sri Lanka people. <u>Nov, 260</u></p> <p><u><i>Sinhala words have been stored in the acoustic models and word dictionary. Now, system is being developed.</i></u></p>

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3. Multimedia Database System for WBT (Adviser Prof. Nikta)		Please describe your evaluation on each item below Remarks: accomplished almost accomplished, half-way to accomplishment, far way to accomplishment	Please write the causes or obstacles if you evaluate as half-way or far way plans to sustain the research activities after the project termination		
1. System Setup : A research lab is set-up with the required hardware. The necessary software is installed and configured.	Accomplished				
2. Study the available meta data standards : It is essential to use meta-data to describe the content of multi-media objects. Generally, the meta-data set required to describe the semantics of data objects depends on the application. Since our goal is to explore how Multi-media databases could be used for Web-based Training, it is essential to study meta-data sets used by similar projects and the advantages and disadvantages of using these sets. The main aim of this study to identify the core meta-data set required for our research.	Accomplished,				
3. Develop a meta-model to store meta-data and Multimedia Objects : Once the required meta data set is identified, it is necessary to store both meta-data and multi-media objects in a databases. Currently relational data bases and XML databases have been used for this purposes and each of these methods has its own advantages and disadvantages. We need to evaluate these two approaches in order to determine which approach is more suitable for our research and what modifications and extensions are required for these approaches.	Accomplished				They studied a meta data standard SCORM, but I think its functionality is not so high. So I hope they will try to implement stronger meta-data description language into their next system after discussing requirements <u>Dr. Gihan mentioned no conflicts in group research works. Students can consult any staffs who are available. Group members flexibly responded to the student requests beyond their assignments. Seminar was regularly held to exchange information.</u>
4. MMDB Design : The outcome of this stage would be an architecture of a data management system based on the data model identified in section 3. , to store and manage meta-data and multi-media objects in a multimedia Database. During this stage it is essential to identify the functionality required both at the user side and the server side.	Accomplished				
5. Software Development (Server Side) : Develop software for server side requirements.	Almost accomplished				
6. Software Development (Client Side) : Develop software for client side requirements	Almost accomplished				
7. Prototype System : Build a prototype system by combining and integrating all software components developed up to this stage.	Half-way to accomplishment			expected to finish in March 2005	
	Total evaluation of this activity	Almost accomplished			

2. 3D Graphics and Virtual Reality

2.1 Project Team

Research Advisor: Prof T. Kaneko

Research Leader: Dr. N.D.Kodikara

Researchers: Dr. Pujitha Gunaratna, Dr. Prasad Wimalaratne, C.M.B. Attanayake, M.L.M. Karunanayake, Prabath Gunawardana, Ransi de Silva, Rukman Senanayake

2.2 Research Areas

Virtual Heritage, Visualization Systems, Image Processing

2.3 Current Status of Major Activities

1. Virtual model/tour of Sigiriya Rock

Lion leg/Entrance/Frescoes Area and several other areas have been modeled.

2. 3D graphics modeling of archaeological artifacts and reconstruction of damaged artifacts

Currently, the focus of the above has been mainly changed to creation of the cultural heritage database using the laser scanner. Reconstruction of damaged artifacts is in progress.

2.4 Publications

1. Visual 3D graphics modeling of Sigiriya is continuing. The Frescoes area, Lions Leg area and entrance have been modeled. The modeling of the main structure of Sigiriya using photographs is currently in progress. Some results have been obtained. *"Recovering Depth Information from Digital Photographs: Two view not-calibrated Projective Reconstruction"*, - BSc dissertation by Ransi de Silva
2. A paper titled: *"From 2D to 3D: A case study from Sri Lankan Virtual Heritage"*, P. Wimalaratne, N. Kodikara, T. Kaneko and P. Gunawardana has been published at 10th International Conference on Virtual Systems and Multimedia (VSMM 2004), Gifu, Japan. pp40-51, Pub IOS Press, ISBN 1-58603-481-2
3. Image Coding Using the Self Similarity of Wavelet High Frequency Components, S. Selvarajah and N.D. Kodikara, 5th International IT Conference (IITC 2003). ISBN 955-8974-00-5
4. Edge Enhancement of Digital Images Using Edge Profile Analysis, D. Jayasooriya and N.D. Kodikara, 6th International IT Conference (IITC 2004), ISBN 955-8974-01-3
5. A paper titled *"Asymmetry in Facial Expressions : 3D Analysis using Laser Rangefinder Systems"* has been presented for 5th International IT Conference (IITC 2003). The results of this paper is based on some of the images taken using the 3D scanner received from the JICA project. P Gunaratne, N.D. Kodikara, Y Sato, ISBN 955-8974-00-5
- 5' (By product): A paper titled: *"Off Line Sinhala Handwriting Recognition with an Application to Postal City Name Recognition"* - M. L. M. Karunanayake, N. D. Kodikara, G. D. S. P. Wimalaratne, has been

ym 21

2.5 Undergraduate and Masters Projects

Undergraduate Research Projects Supervised by the Staff

1. The 3D models of some archeological artifacts have been obtained. The techniques to reconstruct the damaged parts of the models are under study.
2. A low cost Semi-immersive Virtual Environment. (using stereo glasses, 3D mouse etc).
3. 3D graphics modeling of archeological artifacts and techniques to reconstruct damaged artifacts.
4. Identification of optimum cutting patterns of gem stones using 3D graphics techniques
5. A 3D framework to represent 3D worlds (language Lab).
6. Analysis of handwriting to interpret personal characteristics
7. A low cost fingerprint analysis and recognition system
8. A virtual physics laboratory
9. Length distribution analysis of coir fiber samples using image processing techniques
10. Image compression techniques using wavelet and Harr transformations
11. Analysis of facial expressions of images obtained from webcams.
12. Visual tool for teaching mathematics (currently underway)

2.6 Study Visits

Study Visit to Toyohashi University of Technology, May 2004

The following summarizes the activities carried out by Dr N.D. Kodikara and Dr. P. Wimalaratne during the visit

- ☐ Initial discussion with Prof T. Kaneko and presentation of the progress of JICA sponsored R & D Computer Graphics projects at UCSC. The presentation included a virtual model/tour of 'Sigiriya Rock' which has been developed for the 3D Visualization Project.
- ☐ Obtained technical reports of TUT containing publications on computer graphics for further study.
- ☐ Visited the Multimedia Centre at TUT. Facilities available for Virtual Reality research, video conferencing and video editing was demonstrated to us.
- ☐ Presentations and demonstrations by the TUT MSc students on their research work.
- ☐ Presentation and demonstration by TUT PhD students on their research work followed by a discussion with us.
- ☐ Demonstration of the 3D laser scanner and Polhemus tracking device.
- ☐ Further study on the 3D reconstruction of 'Sigiriya Rock' from still images.

- ☐ Review discussions with Prof T. Kaneko to support the future developments on the project.
- ☐ Identification of a mathematical model for 3D reconstruction of ‘Sigiriya Rock’ through the discussions with Prof T. Kaneko.

Study Visit to Tokyo University by Dr. Prasad Wimalaratne, November 2004

Ikeuchi Laboratory, Institute of Industrial Science, University of Tokyo, Komaba 4-6-1, Meguro-ku

- ☐ Obtained technical reports and research papers of Ikeuchi Laboratory containing publications on computer graphics for further study.
- ☐ Demonstration of the facilities available for Computer Graphics related research,
- ☐ Presentation and demonstration by PhD researchers on their research work followed by a discussion with us.
- ☐ Demonstration of the different types of 3D range scanners
- ☐ Range Scanning of geometric objects
- ☐ Simultaneous geometric alignment, multiple view geometry merging and texture alignment using software,
- ☐ As a part of the visit, the research paper titled “From 2D to 3D: A Case Study from Sri Lankan Virtual Heritage”, will be presented on the 17th November 2004 at VSMM .

2.8 Future Work


The research work is planned to continue in the same areas of research areas while new areas will be added to the group research interests in Computer Graphics.

The contribution from JICA is sought for the following items to enhance the capabilities of the researchers and strengthen the research work,

1. As a low cost stereo visualization system is built with the locally available low cost material, purchase of screen cloth from Da-lite will help to develop a better visualization environment.
2. A portable Battery for Range Scanner will be needed to capture objects in cultural sites where no electricity supply.
3. Foreign travel for Conference Paper Presentations
4. Local travel expenses for capturing heritage Objects in cultural sites in Sri Lanka
5. CCD camera for new research projects computer vision/image processing
6. Subscription to electronic journals in computer graphics
7. purchase of text books

The manuscript used for final evaluation is shown as follows:


Slide 1



Visual Computing Research Group

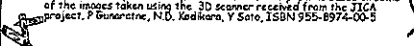
Dr. Nihal Kodikara,

University of Colombo School of Computing
35, Reid Avenue, Colombo 7, Sri Lanka



Publications


1. A paper titled: "From 2D to 3D: A case study from Sri Lankan Virtual Heritage", P. Wimalaratne, N. Kodikara, T. Kaneko and P. Gunawardana has been published at 10th International Conference on Virtual Systems and Multimedia (VSM 2004), Gifu, Japan pp40-51, Pub IOS Press, ISBN 1-56603-481-2
2. A paper titled: "Off Line Sinhala Handwriting Recognition with an Application to Postal City Name Recognition" - N. L. M. Karunayake, N. D. Kodikara, G. D. S. P. Wimalaratne, has been published at the 6th International IT Conference (IITC 2004), ISBN 955-8974-01-3
3. Image Coding Using the Self Similarity of Wavelet High Frequency Components, S. Satharajah and N.D. Kodikara, 5th International IT Conference (IITC 2003), ISBN 955-8974-00-5
4. Edge Enhancement of Digital Images Using Edge Profile Analysis, D. Jayasekera and N.D. Kodikara, 6th International IT Conference (IITC 2004), ISBN 955-8974-01-3
5. A paper titled "Asymmetry in Facial Expressions: 3D Analysis using Laser Rangefinder Systems" has been presented for 5th International IT Conference (IITC 2003). The results of this paper is based on some of the images taken using the 3D scanner received from the JICA project, P. Gunaratne, N.D. Kodikara, Y. Sato, ISBN 955-8974-00-5



Slide 2


Project Team

- Research Advisor: Prof T. Kaneko
- Research Leader : Dr. N.D.Kodikara
- Researchers : Dr. Pujitha Gunaratna, Dr. Prasad Wimalaratne ,C.M.B. Attanayake, M.L.M. Karunanayake ,Prabath Gunawardana, Ransi de Silva, Rukman Senanayake



Research Awards


a Bronze Medal was awarded to the Low cost semi immersive visualisation system project at the British Computer Society National Best Quality Software Awards 2004



Slide 3


Research Areas

- Virtual Heritage, Visualization Systems, Image Processing



Undergraduate and Masters Projects

- Undergraduate Research Projects Supervised by the Staff of the Visual Computing Group.
- The 3D models of some archaeological artifacts have been obtained. The techniques to reconstruct the damaged parts of the models are under study.
- A low cost Semi-immersive Virtual Environment. (using stereo glasses, 3D mouse etc).
- 3D graphics modeling of archaeological artifacts and techniques to reconstruct damaged artifacts.
- Identification of optimum cutting patterns of gem stones using 3D graphics techniques
- A 3D framework to represent 3D worlds (Language Lab).
- Analysis of handwriting to interpret personal characteristics
- A low cost fingerprint analysis and recognition system
- A virtual physics laboratory
- Length distribution analysis of coir fiber samples using image processing techniques
- Image compression techniques using wavelet and Hertz transformations
- Analysis of facial expressions of images obtained from webcams.
- Visual tool for teaching mathematics (currently underway)



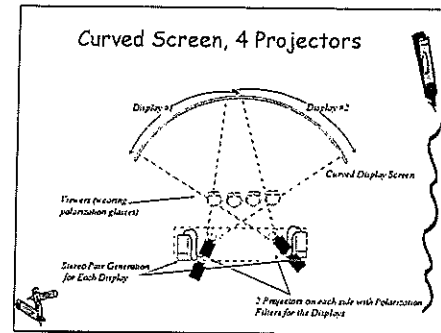
31

Slide 7

Project 1: Sigiriya Project

- 3D reconstruction of large scale non-uniform structures using 2D still photographs and GPS coordinates.
- a framework for low cost semi-immersive visualisation.
- 5th AD cultural heritage site from Sri Lanka is used as a case study to develop an application to promote Sri Lankan tourism industry.

- aims to reconstruct a large non-uniform natural structure using still 2D photographs and GPS coordinates
- combines the structure with virtual models of the objects along the foot path the peak of the rock in the cultural heritage site
- provide a virtual walkthrough within a semi-immersive 3D virtual environment.

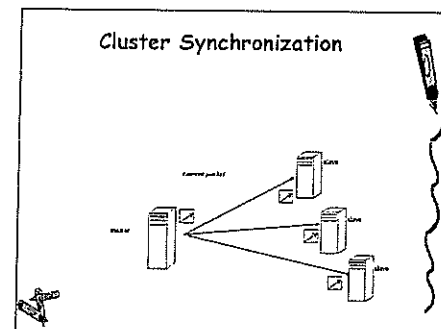


Slide 8

Rationale

Generating 3D models of non-uniform structure?

- acquire the model using range device such as laser range scanners to project a light beam onto the object and acquire 3D information.
- for a large non uniform structure such as the case study (approximately 100x600 meter rock in a mountaneous terrain) selected in this study, it would not be feasible to use a laser range scanner to acquire the geometric information.
- Cost factor!

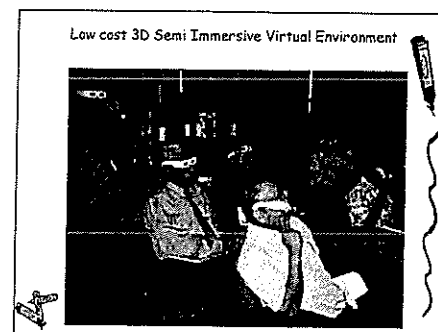


Slide 9

Low cost 3D Semi Immersive Virtual Environment

- Projection Screen Material
 - Non depolarization (Polarized light falling on the screen must be reflected back to the viewer with the same polarization angle. (Eg 'Silver Matte' and 'Disney Black' from Da-Lite)
 - Viewing Angle (some materials with shiny texture, have a tendency to reflect the light falling upon it unevenly to different viewing angles)
 - Gain (measurement of reflectivity of any given screen material)

Type of Projectors




Slide 13

Low cost 3D Semi Immersive Virtual Environment

- Capability of Stereoscopic Rendering
- Multi-display support using a single workstation
- Synchronized rendering using a cluster of workstations
- Edge Blending for overlapping Surfaces
- Prototype implementation using OpenScenegraph API and C++

Paintings on the Rock Cave



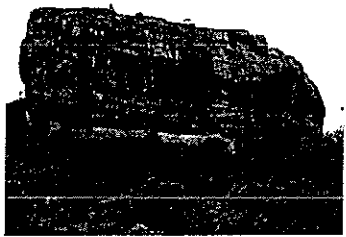
Virtual and Real scenes from 5th AD cultural heritage site

(a) image of the virtual cave (b) still photo of real cave

Slide 14

'Sigiriya Rock' - 5th AD Kingdom

(Approximately 100x600 meters)




Other Projects

- Digital Archiving of Cultural Heritage
 - A database of digital objects has been established

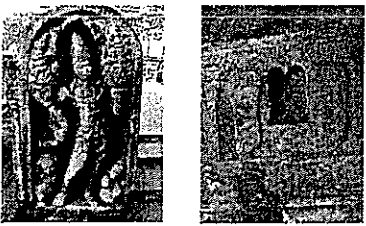
Slide 15

'Lion's Leg entrance' along the path to the top of rock



(a) image of the virtual 'Lion's leg' entrance (b) still photograph of the real 'Lion's leg' entrance

Cultural Heritage



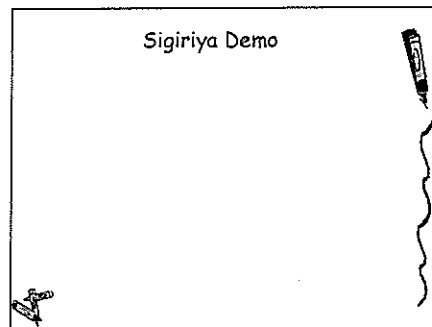
Slide 19



Funding Sought

- As a low cost stereo visualization system is built with the locally available low cost material, purchase of screen cloth from De-lite will help to develop a better visualization environment.
- A portable Battery for Laser Range Scanner will be needed to capture objects in cultural sites where electricity supply is not available.
- ATA Memory card for the Laser Scanner to avoid the need for a PC with a SCSI card. A lap top with a SCSI will be an expensive option, hence add on memory card for a existing scanner will be a better option. Else carrying a monitor and a PC to cultural sites is difficult and it is also not suitable to move a servers around.
- Foreign travel for Conference Paper Presentations
- Local travel expenses for capturing heritage Objects in cultural sites in Sri Lanka
- CCD camera for new research projects computer vision/image processing
- Subscription to electronic journals in computer graphics purchase of text books

Slide 20



Acknowledgements

- Sincere Thanks go to JICA for generous support extended towards research activities at UCSC.

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Current Status

- Large Scale Stereo Visualisation System – Completed
- Desktop Stereo Visualisation System - Completed
- Modelling of Sigiriya walk through – completed
- 2D to 3D reconstruction – In Progress
- Digital Archiving of Cultural Heritage- Completed, (Software System completed, need to travel to more sites and capture more objects)

3. Robust Speech Recognition

3.1. Research group members

Research Coordinator: Prof. Dr. Tsuneo Nitta, Dept. of Knowledge-based Information Engineering, Toyohashi University of Technology

Research Head: Mr. S. T. Nandasara, Advanced Digital Media Technology Center

Members: Dr. Ruwan Weerasinghe

Mr. Niyumal Boteju, Instructor

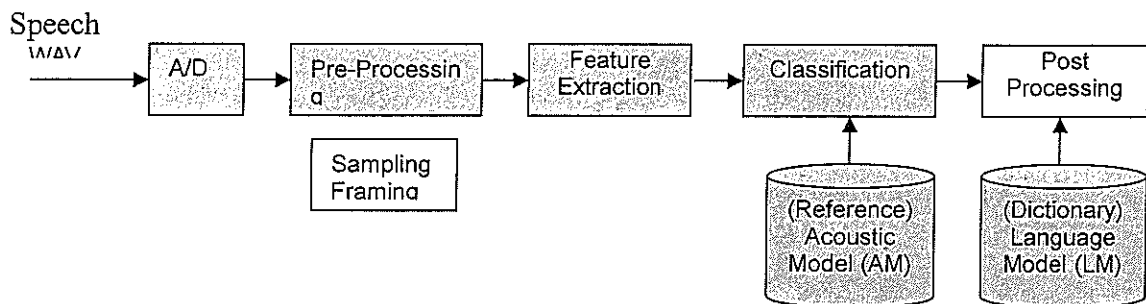
Department of Media & Communication

3.2. Research overview

Speech recognition is the process by which a computer (or other type of machine) identifies spoken words. Basically, it means talking to your computer, AND having it correctly recognizes what you intend. To achieve robust ASR, there are many issues including robust acoustic model (AM), language model (LM), confidence scoring strategy, etc.

The goal of this project is to develop all aspects of speech recognition in the domain of spontaneous, human-human conversational speech (as opposed to planned, read, or human-machine dialog). This includes robust feature extraction, acoustic modeling, language modeling and confidence scoring for English speech using English Language Corpus.

Furthermore, Development of Sinhala Text Corpus and building of Acoustic Model and Language Model for Sinhala language related research will be carried out.



3.3. Objectives

At the initial stage of the project, it will be focusing on a number of fundamental research problems that have to be solved in order to attain the ultimate goal of robust speech recognition.

1. Extracting candidate word-sequences from spontaneously spoken utterance which contains hesitations, self-repairs, etc.
2. Scoring confidence of each candidate using context of dialogue, information given by dialogue manager of a system.
3. Experience gain from above would used to develop sub set of Sinhala Language Corpus, Acoustic Model and Sinhala Language Model for Sinhala Speech Recognition.

3.4. Activities

Testing of Feature extraction, modeling, re-sampling and re-scoring for existing

English Database

After Training and practical sessions receive form TUT during May and June, 2004, group was able to establish the research environment at UCSC. This includes setting up of Machinery and tools for the experiment for future research. (See Figure I)

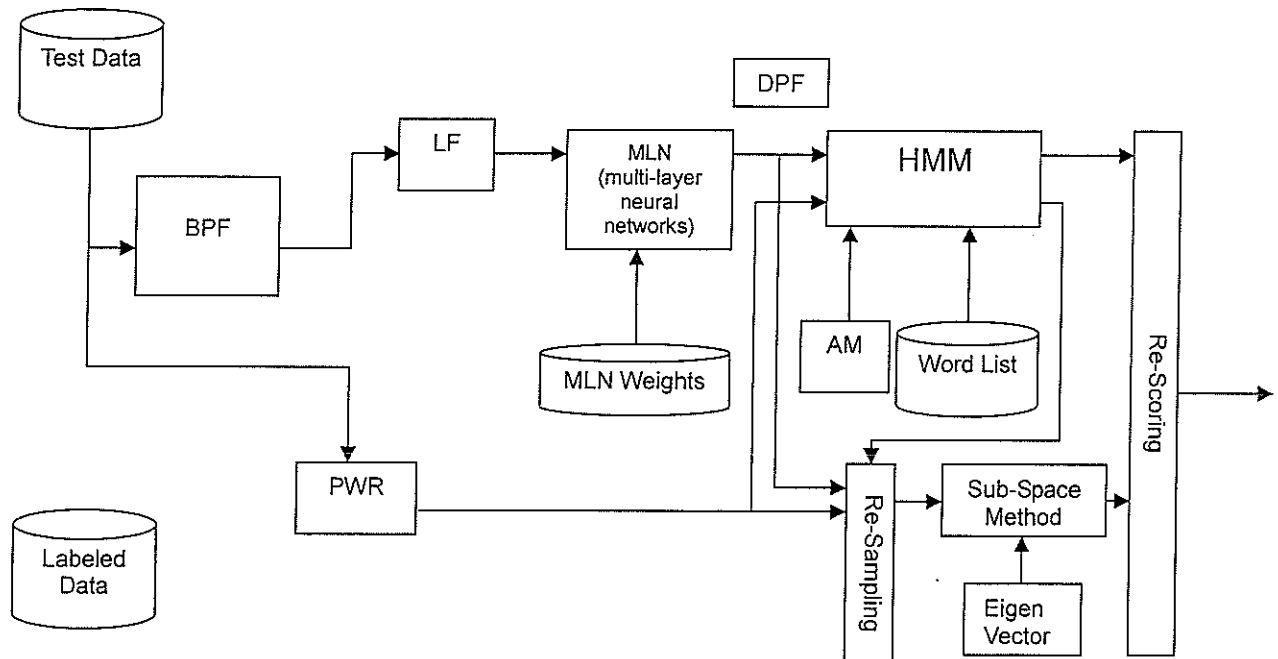


Figure I

- BPF – Band Pass Filter (24)*
- PWR - Power*
- LF – Local Features (25)*
- DPF – Distinctive Phonetic Feature*
- MLN – Multi-Layer Neural Networks*
- HMM – Hidden Markov Model*
- AC – Acoustic Model*
- DCT – Discrete Cosine Transformation*
- DFT – Discrete Fourier Transform*
- FFT – Fast Fourier Transform*
- MFCC – Mel Frequency Cepstral Co-efficient (38)*
- SM – Subspace Method*
- Guassiam Mixture*

Due to lack of experience and knowledge of this subject area took little more time to get the infrastructure ready for the research on Robust Speech recognition.

They have been overcome with the members of the group and are started real experiment with Japanese and English Database available with TUT lab, and thereafter group was involving using UCSC own TIMIT and other databases for the research. UNIX based and Windows XP based Operating Systems were used to test the tools develop by TUT Lab.

The experimental processes for Robust Speech Recognition establish at UCSC, will be modified and enhanced according to the needs arise with Sinhala Language speech processing as well

Sinhala Corpus Building and Acoustic Model and Word List Creation

During the second visit of Prof. T. Nitta, group was able to focus on more Sinhala Language development, which is more relevant and challenging research areas for future.

According the schedule, following activities were accepted by the advisor of the Speech Recognition group Prof. T. Nitta.

- Building a text corpus of 10,000 words
- Writing the conversion program
- Investigation of Sinhala Phonetics
- Creating word/phrase and phonetic code list for Sinhala
- Phonetic Code Design
- Selection of words (Entropy calculation and Phonetic segment unit)
- Preparing phonetic segment balanced list (word/phrases)
- Publish a paper on related work.

Prior to the phase of data gathering the group referred to some useful information from different Universities through Internet. We found some information like a project to build a corpus on Indigenous Minority Languages of the British Isles and Irelands which was done by the Lancaster University – United Kingdom.

During the phase of collection of data, part of some necessary data was gathered from the Sri Lankan Government Printing Press and other News Paper Publishing organizations. Having a focused Sinhala Text Materials, it was decided to build a balanced corpus representing different genres. So that the following classification of genres found suitable to be reflected in the corpora once built. Classification of genres as follows: News, Legal, Health, Fiction, Letters/Diaries, Leisure, Commerce, Government, Scientific/Academic, Historical, Children, and Manuals. (See Figure II)



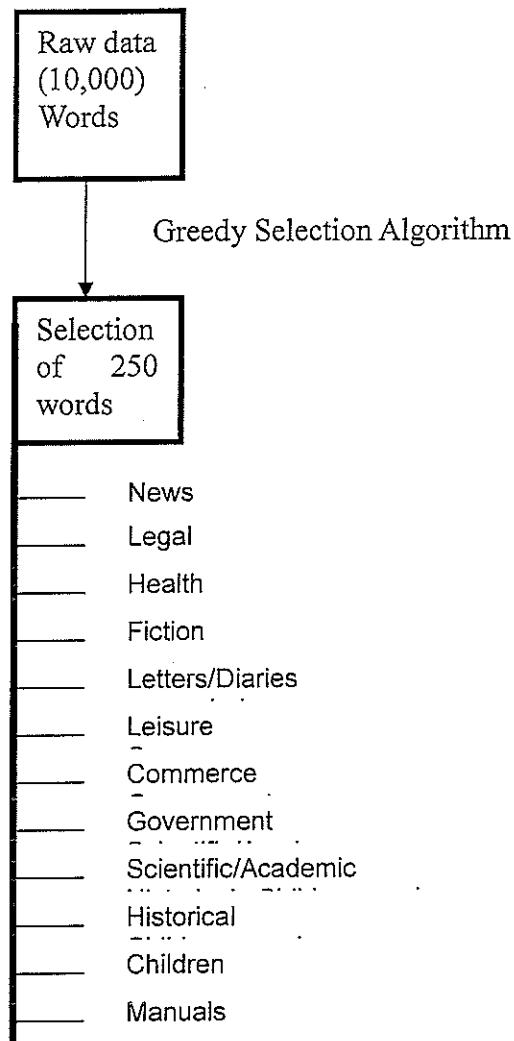


Figure II

Around 10,000 words to be gathered from different genres and out of them only 250 words to be used in building Acoustic model and word list. These words will be attaining using male and female voices.

Classifying words for the above genres is to be done with the consultation of experts in the languages. Prof. JB Disanayaka from the University of Colombo and other linguistic expert from University of Kelaniya have regularly contacted fro the above process.

Research Paper

When selecting words we looked at the simplest selection algorithm called greedy selection algorithm. This paper will discuss the research finding published in journal paper by *Baris Bozkurt, Ozlem Ozturk, Thierry Dutoit, "Text design for TTS speech corpus building using a modified greedy selection", Proc. of Eurospeech, p. 277 – 280, Geneva, 2003* and *G. Jan Wilms, "Using Corpus-Based Techniques to customize a Lexicon for a New Domain", Department of Mathematics and Computer Science – Union University, Jackson, USA.*

Ym w

The method of greedy selection algorithm will be tested with selected Sinhala words and if further research is needed for Sinhala will be discussed in the research paper. The research paper will be finalized in March, 2004

Collaborative work with Language Research Lab

Robust Speech Group activities were further extended and exchange with the Language Research Lab established by the UCSC and headed by the Dr Ruwan Weerasinghe, who is one of the member of Robust Speech Group. This Language Research Lab was established with help of IDRC in January 2004. Activities of the above lab are building of Ten Million Sinhala Text Corpus, development of Text to Speech and OCR for Sinhala.

Course Modules for Under Graduate Syllabi

Due to the lack of knowledge of some subject areas like "Digital Signal Processing", it is hard to introduce research or experimental task for the under graduate student of UCSC. Therefore, with the experience gain from this research, UCSC will be introducing the new subject module mainly "Digital Signal Processing" and other related modules for the under graduate curricular in near future.

The presentation manuscript used for the final evaluation is as follows:



Slide 1

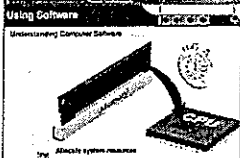
R&D Training on Robust Speech Recognition

3rd March, 2005
2.00 pm

R&D on Robust Speech Recognition

Purpose of the Research: (What ?)

- Recognition of Commands by voice in e-learning environment
 - I.e. Next, Previous, Back, Content Page, Go to Page, Play, Stop, Pause,



Distinctive Phoneme Feature (DPF) extraction method can be Used.

Cont.....

Slide 2

Robust Speech Recognition

Research Coordinator - Dr. Tsuneo Nitta
Professor of Knowledge-based Information Engineering
Graduate School of Engineering
Toyoashi University of Technology


Research Group

Head : Turrance Nandasara
Member : Niyumal Boleju
University of Colombo School of Computing

R&D on Robust Speech Recognition

Purpose of the Research: (What ?)

- Recognition of Keywords by voice in Actual text, especially in Practical and Question sessions
 - I.e. Numbers, Keyword, etc.



Discrete Fourier Transformation (DFT) method can be Used.

Cont.....

Slide 3

R&D on Robust Speech Recognition

Purpose of the Research: (Why ?)

- WBTe-Learning is one of the major achievement in the field of Information & Communication Technologies (ICTs). Advanced Digital Media Technology Center (ADMT-C) of the University of Colombo School of Computing (UCSC) is the leading institute in the area of developing WBTe materials to be used in the universities and the other training institutes in Sri Lanka. The project is being funded by JICA-Japan.

However, at present Multimedia & Digital Media Technology is being used heavily in the e-Learning/WBTe material development, interactivity can be enhanced with the inclusion of speech recognition capability. Initially speech recognition capability can be introduced as follows:

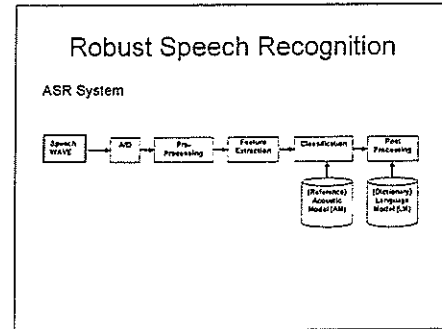
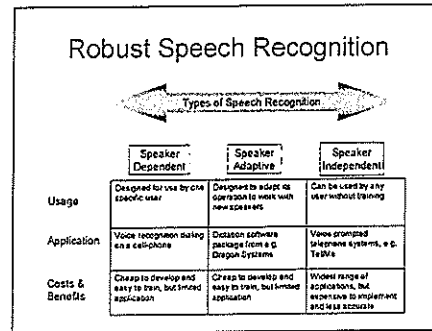
- Recognition of Commands in e-learning environment
 - Recognition of Keywords in Actual text, especially in Practical and Question sessions
 - Keyword spotting in Multimedia Contents
- Cont.....

Robust Speech Recognition

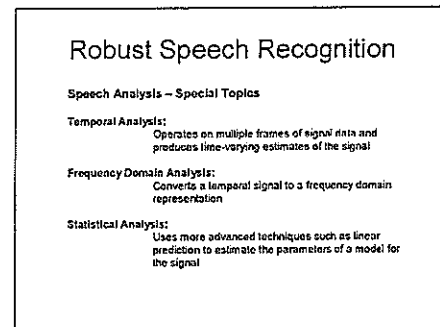
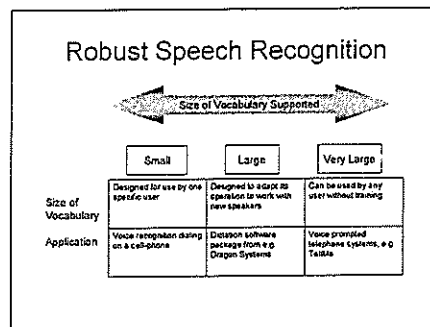
- Theoretical background of Digital Signal Processing
- Understanding ASP related topics
- Understanding Tools, i.e. HTK
- Understanding software used/developed in Prof. Nitta's Lab
- Front-end Processing available in the industry,
- Feature Extraction methods

Handwritten signature

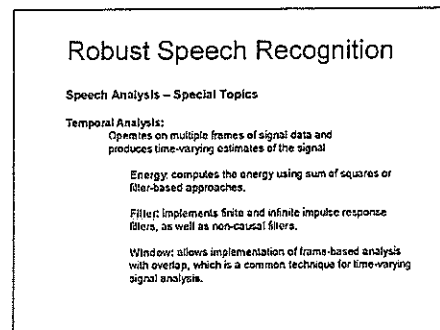
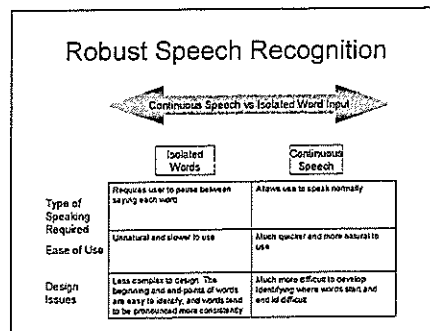
Slide 7



Slide 8



Slide 9



Slide 13

Robust Speech Recognition

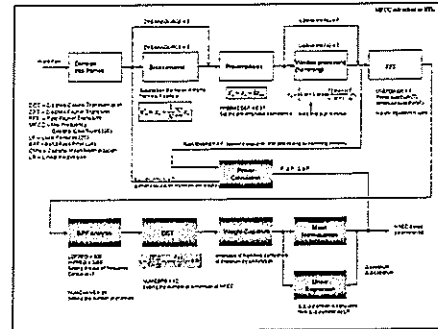
Speech Analysis – Special Topics

Frequency Domain Analysis:
Converts a temporal signal to a frequency domain representation

Cepstrum: a homomorphic signal processing technique that converts the signal into a domain in which short-term and long-term variations in the signal can be separated.

Fourier Transform: implements a variety of techniques for performing Fourier Transforms, including the most effective fast transforms (e.g., Split-Radix, fast Hartley).

Spectrum: an umbrella class that encapsulates most of the frequency domain techniques, and provides a uniform interface. This capability is used extensively in many of front end implementations.



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Robust Speech Recognition

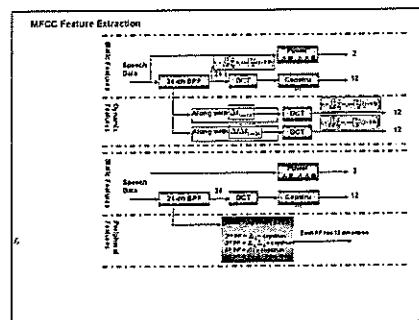
Speech Analysis – Special Topics

Statistical Analysis:
Uses more advanced techniques such as linear prediction to estimate the parameters of a model for the signal

Correlation: implements cross-correlation and autocorrelation; used extensively by the linear prediction classes.

Prediction: one of several representations for linear prediction coefficients; uses a finite impulse response filter representation for the linear prediction model.

Reflection: an alternate linear prediction representation in which a lattice filter



Slide 15

Robust Speech Recognition

Speech Analysis – Special Topics

Non-Parametric Analysis

Fourier Transform (FT) - HTK uses Fourier Transform

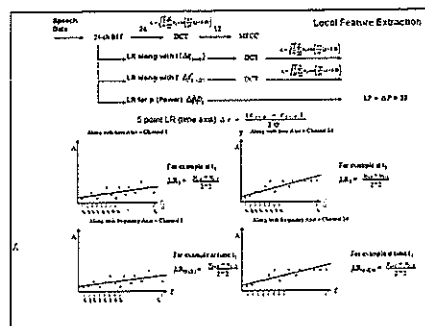
Parametric Analysis

Linear Prediction (LP) - Currently most people use LP Analysis

LPC - Linear Prediction Coding

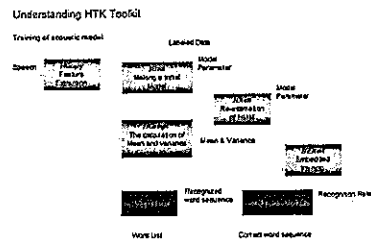
Scalar Quantization (SQ)

Vector Quantization (VQ)



Slide 19

Robust Speech Recognition

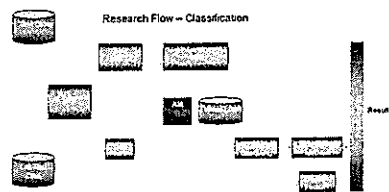


R&D Training on Robust Speech Recognition

- Study on TIMIT Database (English)
- Setting up of the working environment and experiment with
 - ASJ (Train Data set for Japanese Language)
 - Tohokudai-Matsushita (Test data set – isolated word)
- Looking at the possibility of installation and usage of HTK tools on Windows XP

Slide 20

Robust Speech Recognition



R&D Training on Robust Speech Recognition

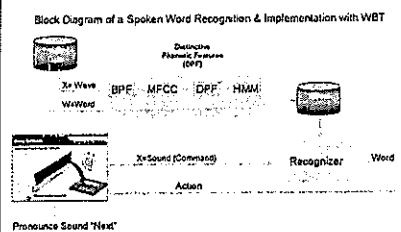
- Texas Instrument & MIT (TIMIT)
- TIMIT has been design to provide useful speech for both the acoustic and phonetic aspect
- TIMIT suited for training and performance evaluation of speaker independent phonetic recognizers
- TIMIT has two sets, train and test corpus
- Each has eight regional variety

Database	Language	# Speakers	Amount of Material	Vocabulary	Labeling
TIMIT	American English	630	6300	6100	Phones & Words

Cont.....

Slide 21

R&D Training on Robust Speech Recognition



R&D Training on Robust Speech Recognition

Study on TIMIT Database (English)

- Study on TIMIT Database (English) was completed
- Study on TIMIT Database (English) was completed

District region	Train set			Test Set			Whole Database		
	female	male	total	female	male	total	female	male	total
1	24	14	38	7	4	11	31	18	49
2	15	23	76	18	8	26	71	31	102
3	56	20	76	23	3	26	79	22	102
4	63	15	68	16	15	32	66	31	100
5	45	26	70	17	11	28	62	36	98
6	22	13	35	8	3	11	30	16	46
7	19	18	77	15	6	23	74	26	100
8	14	6	22	8	1	9	22	11	33
Total	326	136	462	112	56	168	436	190	626

Cont...

Slide 25

R&D Training on Robust Speech Recognition

- Study on TIMIT Database (English) was completed
- Setting up of the working environment and experiment with Japanese data set have been completed
 - ASJ (Train Data set for Japanese Language)
 - » Train data set: ASJ Continuous Speech 4503 sentence
 - Tohokudai-Matsushita (Test data set)
 - » Test Data set: Tohokudai-Matsushita Isolated word 1000
 - This includes
 - » Feature extraction and
 - » Creating Acoustic Model (MFCC)

Cont.....

Robust Speech Recognition Sinhala – First Step

- Study the of phonetic Codes, phone and Phoneme
- le phonetic.
 - Lanka la-n-kā
- Phone
 - Lanka l n k
- Phoneme
 - $\left\{ \begin{matrix} l \\ n \\ k \end{matrix} \right\}$

Mora Language Structure $C_v \quad v_1 C_{v2} \quad C_1 C_2$

Slide 26

Robust Speech Recognition Sinhala – First Step

- Collection of 10,000 words
 - Government Printer
 - National News Paper Department

Robust Speech Recognition Sinhala – First Step

- Digitization of Selected Word List
 - Legal 4
 - Government Document 4
 - Commerce 4
 - Stories 4
 - Scientific and Academic 4
 - Fiction 4
 - Historical 4
 - News 4
 - Children 4
 - Health 4
 - Leisure 4

Slide 27


Robust Speech Recognition Sinhala – First Step

- As a model case selection of 250 words from each categories with help of Sinhala Linguistics Expert
 - Government Printer
 - Legal
 - Government Document
 - Commerce
 - National News Paper Department
 - Stories
 - Scientific and Academic
 - Fiction
 - Historical
 - News
 - Children
 - Health
 - Leisure

Robust Speech Recognition Sinhala – First Step

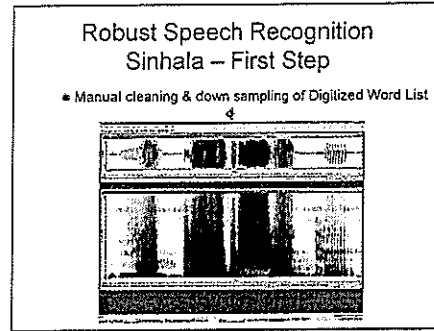
- Manual cleaning & down sampling of Digitized Word List

4



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Slide 31

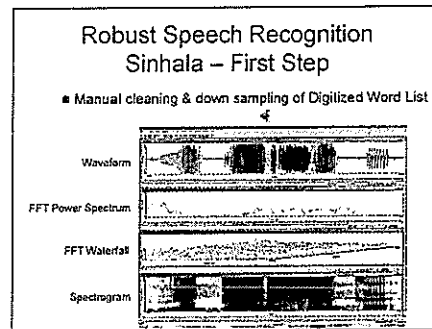


Robust Speech Recognition

Paper Published by Prof. Nitta's Lab

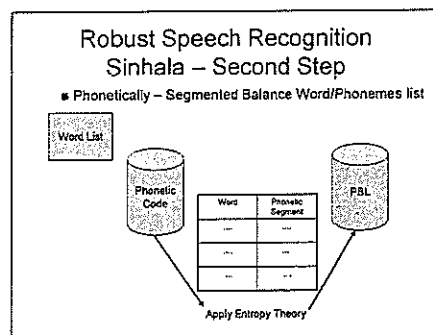
1. Isolated Word Recognition (HMM-GM) ICASSP – 2002
2. Unknown Word Recognition (COV-Word Recognition) (HMM-GM) ICSLP – 2002 (Journal Paper (1)+2)
3. Thesis – Connected Digits (4 Digits) Recognition and Different level of normalization (State level, Monophone Level, Word Level, Utterance Level)
4. Robust HMM-GM – 1, 2, 4 or 8 digits with noise (white noise) and different level of normalization (EuroSpeech 2003)
5. Peripheral Features for HMM-based Speech Recognition, ICASSP2001
6. Local and Peripheral Features for Improving Isolated-word Recognition and LVCSR with CMN, ICASSP2002, (rejected)
7. Improving Performance in Both LVCSR and IDWR Tasks by Using Peripheral Features and CMN Control, ICSLP2002, (rejected)
8. Improving Performance in Both LVCSR and IDWR Tasks by Using Peripheral Features and CMN Control, ICSLP2002, (Japanese Version Accepted)
9. Distinctive Phonetic Feature Extraction for Robust Speech Recognition, ICASSP 2003, accepted
10. Noise-robust ASR by Using Distinctive Phonetic Features Approximated with Logarithmic Normal Distribution of HMM, EuroSpeech, 2003, accepted
11. Noise-robust ASR by Using Orthogonalized Distinctive Phonetic Features Vectors, EuroSpeech, 2003, accepted

Slide 32



- ### Visits
- Advanced Telecommunications Research Institute International
 - Spoken Language Translation Research Laboratory (Dr. Satoshi Nakamura)
 - Presentation by Dr. K. Markov (The Hybrid HMM/BN Acoustic Model)
 - Intelligent Robotics and Communication Laboratories (Dr. Michio OKADA)

Slide 33



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4. Multi-media Database System for Web Based Teaching


4.1 Group Members

- Advisor: Prof. Tsumeo Nitta (Supervisor in Japan)
- Research group leader: Dr. D. D. Karunaratna (Head) Meta-data
- Group members: Dr. G. N. Wickramanayake – Database Design/Implementation
Mr. G. K. A. Dias – Database Design/Implementation
Dr. K. P. Hewagama – User Interface Design/ Implementation

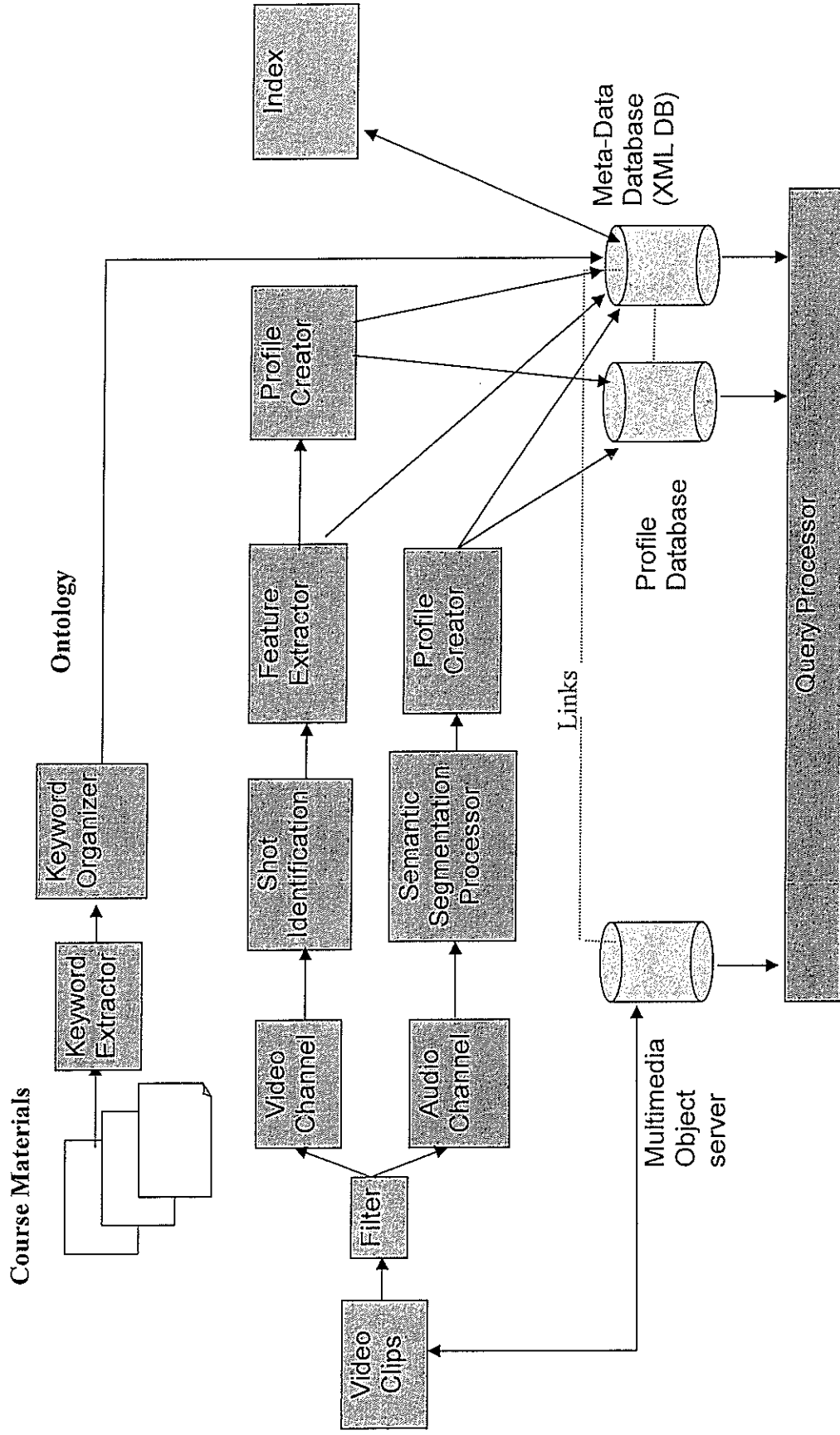
In addition to these group members a full-time M. Phil student and several undergraduate and Postgraduate (MSc) students are working on related projects. One more part-time M. Phil student has joined the group in August 2004. The projects carried out by these students are supervised by the group members listed above.

4.2 Project Overview

The main objective of the research is to explore how structured Multi-media Databases (MMDBs) could be used to support Web-based Training (WBT), develop a framework to store multimedia objects and to develop tools to enable users to access this database efficiently with multiple modalities.



System Architecture





4.3 Main Activities

Multimedia Database Systems Research Group

Year	2003												2004												2005				
Month	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
Events																													
System Setup																													
Study the available meta data standards (Ex. SCORM)																													
Identify the meta-data required for the research																													
Develop a meta-model to store meta-data and Multimedia Objects																													
MMDB Design																													
Software Development (Server Side)																													
Software Development (Client Side)																													
Prototype System																													
Publications																													

4.4 Current Status of the project

1. **System Setup** : Completed
2. **Study the available meta data standards** : Completed
 - a. Completed the study of Learning Object Metadata (LOM), Resource Description Framework (RDF) and Sharable Content Object Reference Model (SCRM) meta-data standards.
3. **Identify the meta-data required for the research** : Completed
 - a. A subset of meta-data elements defined in SCORM was identified to be used initially for our work.
4. **Develop a meta-model to store meta-data and Multimedia Objects** :
 - a. A decision was made to use a Relational Database Management System to store meta-data and a XML database to store the multimedia objects. A Relational Database has been designed to store meta-data.
5. **Software Development (Server Side)** : Not Complete
 - a. Programs have been developed to segment educational video clips into semantic segments based on the presenter on audio and video tracks. This software also provides facility to annotate the semantic segments with associated meta-data.
 - b. Main parts of the front-end interface needed to store meta-data in the relational database have been built.
6. **Software Development (Client Side)** : Not Complete
 - a. One of the main software components of the client side of our architecture is the query process. Currently we are working on a PROLOG based query processor.
7. **Prototype System** : Not Complete
 - a. The initial prototype system would be completed by the end of February, 2005.

.1 Publications

1. K. P. Hewagamage and S. Lekamarchi "Learning Patterns: Towards the Personalization of E-Learning" in Proceedings of International Information Technology Conference (IITC2003), December 2003.
2. S.C. Premaratne, D.D. Karunaratna, G.N. Wickramanayake, K. P. Hewagamage, and G.K. Dias, "An Architecture of a Media Based System to Support e-Learning" in The Bulletin of the British Computer Society Sri Lanka Section, October 2004.
3. K. P. Hewagamage, D.D. Karunaratna, G.N. Wickramanayake and G.K. Dias, "An Open Multimedia Database for Web Based Teaching" in Proceedings of International Conference of Virtual Systems and Multimedia (VSMM2004), November 2004
4. S.C. Premaratne, D.D. Karunaratna, G.N. Wickramanayake, K. P. Hewagamage, and G.K. Dias, "Profile Based video Segmentation System to Support E-learning" in Proceedings of 6th International IT Conference 2004 (IITC2004), November 2004
5. T. Silva, D.D. Karunaratna, G.N. Wickramanayake, K. P. Hewagamage, and G.K. Dias, "Speaker Search and Indexing for Multimedia Databases" in



Proceedings of 6th International IT Conference 2004 (IITC2004),
November 2004

6. S.C. Premaratne, D.D. Karunaratna, G.N. Wickramanayake, K. P. Hewagamage, and G.K. Dias, "Implementation of a video segmentation system to support E-learning " in Proceedings of the International Conference on Information Management in a Knowledge Society (ICIM 2005), Mumbai, India, February 2005

The presentation manuscript is as follows:

A handwritten signature in black ink, appearing to be 'y m' with a small flourish at the end.

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Multimedia Database System for WBT

Academic Staff

- A. P. Madurapperuma (Left in June/2003)
- D.D. Karunaratna,
- G.N. Wickramanayake
- K. P. Hewagamage (Joined in 2002)
- G.K. Dias
- Postgraduate Students

Collaborated with Dept. of Knowledge-based Information Engineering

YIT 台湾科技大学
YONSEI UNIVERSITY OF TECHNOLOGY

JICA Japan International Cooperation Agency

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Current Status

3. Develop a meta-model to store meta-data and Multimedia Objects : Once the required meta data set is identified, it is necessary to store both meta-data and multi-media objects in a databases. Currently relational data bases and XML databases have been used for this purposes and each of these methods has its own advantages and disadvantages. We need to evaluate these two approaches in order to determine which approach is more suitable for our research and what modifications and extensions are required for these approaches.	Accomplished
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Objective

- The main objective of the research is
 - to explore the current status of Multimedia Database systems and
 - to develop and implement a framework and supporting software tools for a multimedia database system to support web-based training.

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Current Status

4. MMDB Design : The outcome of this stage would be an architecture of a data management system based on the data model identified in section 3. , to store and manage meta-data and multi-media objects in a multimedia Database. During this stage It is essential to identify the functionality required both at the user side and the server side.	Accomplished
5. Software Development (Server Side) : Develop software for server side requirements.	Almost accomplished
6. Software Development (Client Side) : Develop software for client side requirements	Almost accomplished
7. Prototype System : Build a prototype system by combining and integrating all software components developed up to this stage.	Half-way to accomplishment

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Current Status

1. System Setup : A research lab is set-up with the required hardware. The necessary software is installed and configured.	Accomplished
2. Study the available meta data standards : It is essential to use meta-data to describe the content of multi-media objects. Generally, the meta-data set required to describe the semantics of data objects depends on the application. Since our goal is to explore how Multi-media databases could be used for Web-based Training, It is essential to study meta-data sets used by similar projects and the advantages and disadvantages of using these sets. The main aim of this study to identify the core meta-data set required for our research.	Accomplished

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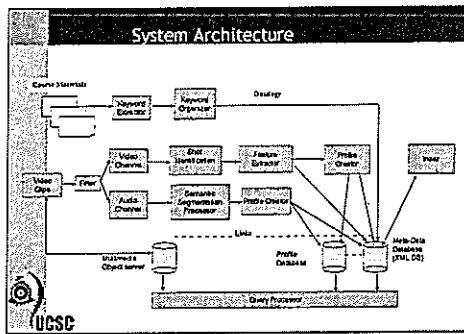
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Equipment Received

- One File Server (Received on 01/Oct/03)
- Three Workstations
- Two Laptop PCs
- One Digital Still Camera
- One Digital Video Camera
- One Scanner
- One Colour Laser Printer
- One internal CD Duplicator
- Four UPSs
- Media Drive (Received on 25/Feb/04)

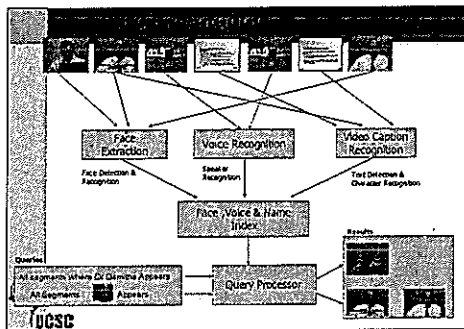
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Metadata Management System

- Subset of SCORM
- Supports around 90 metadata elements.
- Metadata is stored in a RDBMS



Multimedia Database 1

User Interface

File: Learning Resource:

Order: Semantic Density:

Version: Difficulty:

Status: Special Learning:

Duration: Aggregation Level:

Cost: Purpose:

Copyright: Date:

Query Capture Query Further Data

MMDB Standards

- SCORM (Sharable Content Object Reference Model)
- MPEG-7
- XML
- XPath
- Xindice
- Java

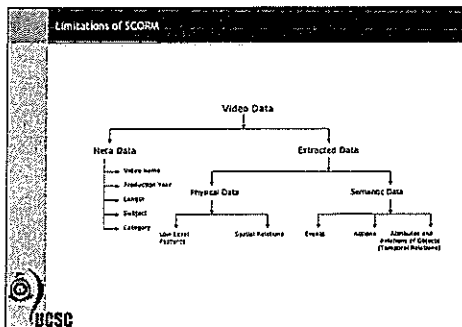
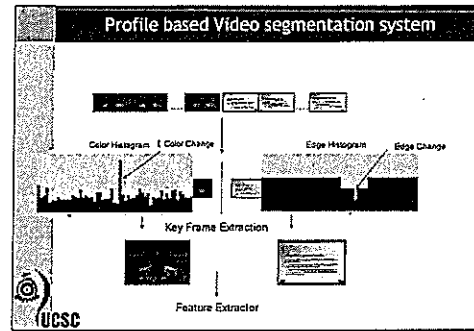
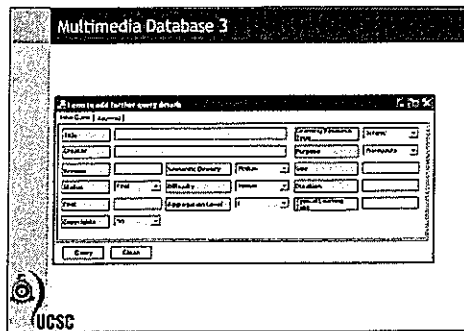
Multimedia Database 2

Query Results

Learning Resource	Order	Version	Status	Duration	Cost	Copyright	Date
1. 0.001	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2. 0.002	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3. 0.003	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4. 0.004	4.0	4.0	4.0	4.0	4.0	4.0	4.0
5. 0.005	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6. 0.006	6.0	6.0	6.0	6.0	6.0	6.0	6.0
7. 0.007	7.0	7.0	7.0	7.0	7.0	7.0	7.0
8. 0.008	8.0	8.0	8.0	8.0	8.0	8.0	8.0
9. 0.009	9.0	9.0	9.0	9.0	9.0	9.0	9.0
10. 0.010	10.0	10.0	10.0	10.0	10.0	10.0	10.0

Query Results

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Feature Extraction & Profile Creation

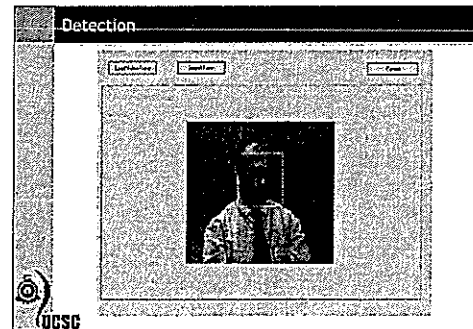
- Features are extracted using Principle component analysis (PCA).
- Profiles are constructed using facial features.
- For each presenter we create a profile.
- Profiles are saved in a profile database.

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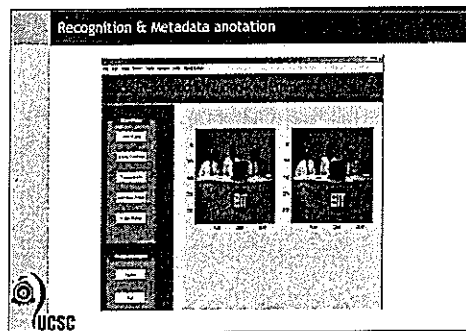
Query Types on Video Data

- Object Appearance Queries
e.g.: All Segments where Mr. X appears
- Spatial - Temporal Queries
e.g.: All the Segments where Mr. X is sitting west to Mr. Y
All the Segments where Mr. X speaks before Mr. Y
- Speaker Recognition Queries
e.g.: All the segments where Mr. X speaks
- Metadata Queries
e.g.: All the video comes under subject "DBMS"

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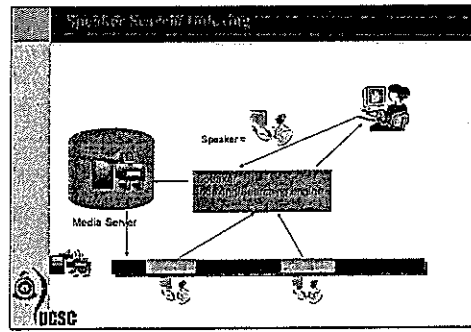
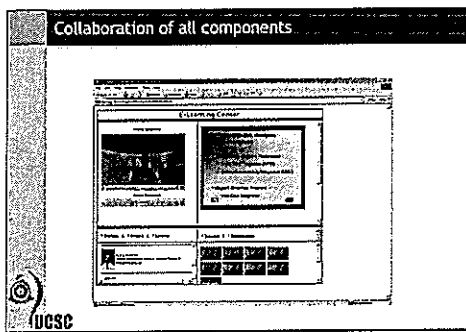
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Speaker Search/ Indexing

- Segmentation is based on Mel Frequency Cepstral Coefficients (MFCC).
- Speaker recognition is done by using Gaussian Mixture Models (GMM).
- Expectation Maximization (EM) algorithm is used to build the best GMM to represent each speaker during system training.

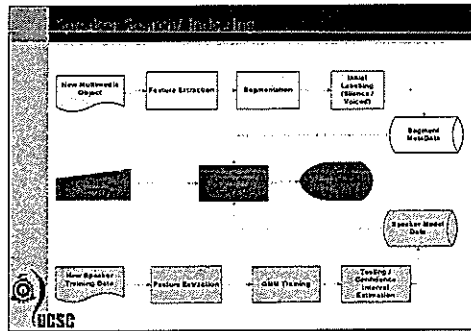
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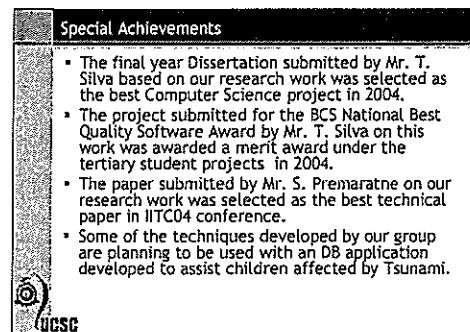
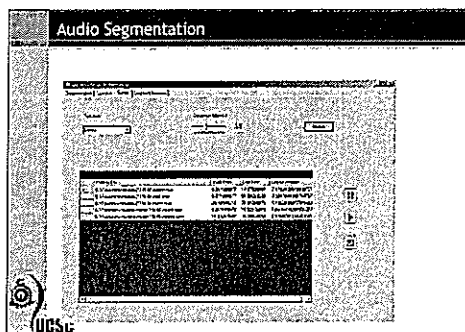
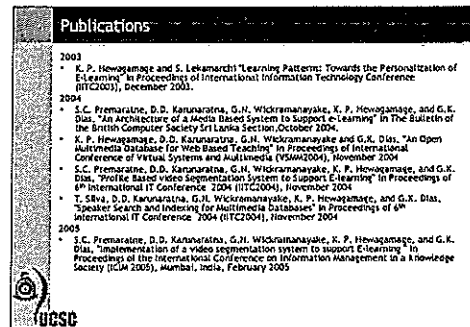
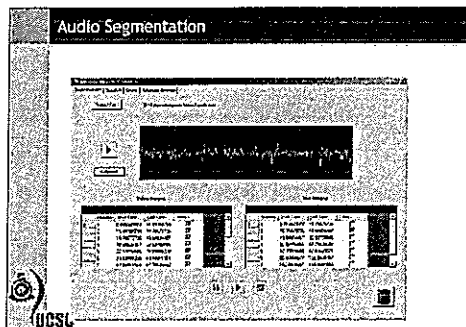
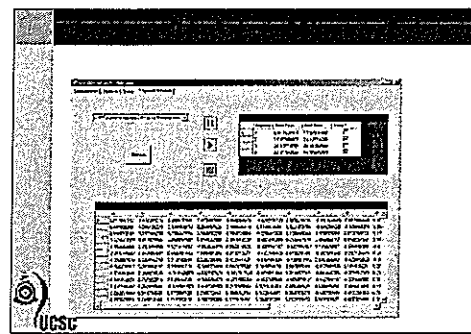
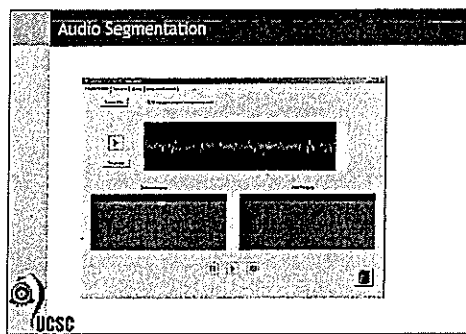
Speaker Search/ Indexing

- **SEGMENTATION** - Breaking the audio track logically into semantically similar sections
- **SPEAKER RECOGNITION**- Verify the specific speaker within the segment
- **INDEXING** - Creating metadata/annotation and organize these annotations in an index to facilitate searching for a speaker within a database of clips

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Achievements

- Completed most parts of the initial plan.
- Set up a Multimedia lab which can be used for future research.
- Established a Multimedia research group.
- Published 6 papers (National and International)




Special Thanks

- Mr. Kamigane Kohei
- Mr. Iwamoto Masamichi





Main Difficulties


- Not receiving the equipment on time.
- Non availability of required books and journals locally.



Special Thanks


- Japan International Cooperation for Fully Funding the Project 
- Professor Tsuneo Nitta from Toyohashi University for his valuable advices 

thank you



Future Work

- Extending SCORM (Spatial and Temporal Relations)
- Develop a query processor to access educational content efficiently.
- Improve and refines the techniques currently used.
- Improve the accuracy of the system outcome based on user responses.
- Utilize ontologies to access multimedia documents efficiently.
- Integrate the tools we have developed with an open source LMS.
- Publish two more papers on our work in this year.
- Deploy the system to BIT students around October 2005.



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Annex 17 Training Courses on WBT

Original Course

Course	Outline / Contents	Duration
Course I: Multimedia Content Development for WBT	<p>This course has been designed to teach authoring tools for developing WBT systems. Through this training course participants will obtain the skills needed to develop dynamic multimedia content with image, animation and video/audio in a WBT environment.</p> <ol style="list-style-type: none"> 1. Introduction to Web Authoring 2. Imaging 3. DHTML 4. Animation with Flash 5. Authoring Tools for WBT 6. Movie Editing 7. Web Streaming 	5days Weekdays
Course II: Instructional Design for WBT	<p>This course has been designed to bridge the gap between theory and practice of deciding, designing and developing WBT materials. Through this training course participants will obtain the skills needed to direct the development of effective WBT materials.</p> <ol style="list-style-type: none"> 1. What is Instructional Design and what is WBT? 2. Child and Adult Learning 3. Instructional Design Systematic Model 4. Training Need Analysis 5. Content Analysis 6. Course Mapping Process 7. Activities for WBT 8. Student Evaluation 9. Course Evaluation 10. Storyboard Creation 11. How to Design Web Pages for Learning 12. Managing Web Based Training Projects 	5days Weekdays
Course III: System Development for WBT	<p>This course has been designed to teach the concept, methodologies and tools for developing a dynamic and interactive WBT system environment. Through this training course participants will obtain the skills needed to install, configure and develop a WBT system environment.</p> <ol style="list-style-type: none"> 1. Preparing Environmental Settings 2. Understanding Database Concepts and Functions 3. Programming Server-side Scripts 4. Building Fully-fledged Dynamic Websites 	5days Weekdays

Revised Course (October 2004 -)

Course	Outline / Contents	Duration
Workshop on Instructional Design Methodology for e-Learning	<p>This course has been designed to bridge the gap between theory and practice of deciding, designing and developing e-Learning/WBT materials. Through this training course participants will obtain the skills needed to direct the development of effective e-learning/WBT materials.</p> <ol style="list-style-type: none"> 1. Introduction to Instructional Design & e-Learning 2. Child and Adult Learning 3. Instructional Design Systematic Model 4. Analysis Techniques 5. Course Mapping Process 6. Learning Activities for e-Learning 7. Student and Course Evaluation Methodologies 8. Designs Web Pages for e-Learning Materials 9. Managing e-Learning/Web Based Training Projects 	3days Weekends
E-Learning Content Development & Delivery using an Open Source Environment	<p>This course has been designed to teach authoring tools for developing WBT contents. Through this training course participants will be able to maintain an LMS, develop dynamic Multimedia Content with image animation, following Instructional Design Methodology.</p> <ol style="list-style-type: none"> 1. Introduction to Learning Management System (LMS) 2. Installation and Maintenance of LMS (Installing ATutor) 3. Instructional Design Concepts 4. Course Map Development & Storyboard Creation Using I.D. Methodology 5. Content Authoring using DHTML 6. Image Creation using Photoshop CS 7. Animation Creation using Flash MX 2004 	6days Weekends
Tools and Techniques for CD-ROM Based Multimedia Content Development	<p>This course has been designed to teach the concept, methodologies for developing an interactive e-Learning/WBT course.</p> <ol style="list-style-type: none"> 1. Instructional Design Methodology 2. Flash Development Environment 3. Symbol Creation such as Movies, Buttons and Graphics using Flash 4. Animation in Flash 5. User Interface Handling with Flash Scripts 	6days Weekends

Training Courses held in chronological order

No.	Training Course	Date	Venue	No. of Participants	Note
W1	Workshop on WBT	23 October 2003	UCSC Auditorium	103	One-day workshop
C1-1	Course II: Instructional Design for WBT	17 - 21 November 2003	ADMTC	7	Instructed by Ms. Nakahara
C1-2	Course III: System Development for WBT	24 - 28 November 2003, 9 - 13 December 2003	ADMTC	13	
C2	Special course for M.Sc Students	19 March 2004	ADMTC	23	Introduction to I.D.
C3-1	Course I - Content Development for WBT	10 - 14 May 2004	ADMTC	9	
C3-2	Course II - Instructional Design Methodology for WBT	17 - 21 May 2004	ADMTC	9	
C3-3	Course III - System Development for WBT	24 May - 4 June 2004	ADMTC	5	
C4-1	Course I - Content Development for WBT	5 - 9 July 2004	ADMTC	13	
C4-2	Course II - Instructional Design Methodology for WBT	12 -16 July 2004	ADMTC	6	
C4-3	Course III - System Development for WBT	19 - 30 July 2004	ADMTC	4	
S1	Seminar for JCC&IUF members	30 Sep 2004	ADMTC	20	30 minutes presentation
C5-1	E-Learning Content Development & Delivery using an Open Source Environment	29 Oct - 7 Nov 2004	ADMTC	14	Revised course
C5-2	Tools and Techniques for CD Rom Based Multimedia Content Development	12 Nov - 21 Nov 2004	ADMTC	14	Revised course
C6	Tools and Techniques for CD Rom Based Multimedia Content Development	Mar 2005 (planned)	Ruhuna Univ.	30	On site course
Total				270	

Teaching Materials Developed

No.	Teaching Material	Training Course on WBT
1	Multimedia Content Development	Course I: Multimedia Content Development for WBT E-Learning Content Development & Delivery using an Open Source Environment Tools and Techniques for CD-ROM Based Multimedia Content Development
2	Computer Network Technology	Course III: System Development for WBT
3	Information System Management	Course III: System Development for WBT
4	Database System Management	Course III: System Development for WBT E-Learning Content Development & Delivery using an Open Source Environment
5	WBT System Technology	Course III: System Development for WBT E-Learning Content Development & Delivery using an Open Source Environment
6	Instructional Design Methodology	Course II: Instructional Design for WBT Workshop on Instructional Design Methodology for e-Learning E-Learning Content Development & Delivery using an Open Source Environment Tools and Techniques for CD-ROM Based Multimedia Content Development

Feedbacks from Trainees

No.	Training Course	Course Evaluation						Lesson Evaluation									
		1	2	5	6	7	Avg.	1	2	3	4	5	6	7	8	Avg.	
C1-1	Course II: Instructional Design for WBT	1.17	0.67	0.33	0.67	-	0.71	0.69	0.75	0.54	1.04	-	0.56	0.99	1.21	0.83	
C1-2	Course III: System Development for WBT	0.70	0.70	1.20	1.40	-	1.00	0.71	0.67	0.57	0.79	-	0.70	0.56	0.40	0.63	
C2	Special course for M.Sc Students	0.17	0.50	0.56	0.89	0.39	0.50	0.94	0.22	-0.44	0.83	0.78	0.67	0.83	0.61	0.56	
C3-1	Course I - Content Development for WBT	1.11	1.11	1.78	1.89	1.22	1.42	1.40	0.57	1.23	1.30	1.43	1.20	1.23	1.10	1.18	
C3-2	Course II - Instructional Design Methodology for WBT	0.63	1.13	1.25	1.38	0.63	1.00	0.88	0.65	0.92	0.92	0.96	0.77	1.04	1.27	0.93	
C3-3	Course III - System Development for WBT	0.67	0.67	1.33	1.33	0.67	0.93	1.23	0.35	1.29	1.29	1.39	1.26	1.23	1.29	1.17	
C4-1	Course I - Content Development for WBT	0.42	0.67	1.58	1.42	0.92	1.00	0.91	0.31	0.60	0.98	1.02	0.78	0.82	1.20	0.83	
C4-2	Course II - Instructional Design Methodology for WBT	-	-	-	-	-	-	0.73	0.36	0.86	0.68	1.00	0.73	0.77	0.86	0.75	
C4-3	Course III - System Development for WBT	1.33	1.33	2.00	2.00	1.33	1.60	1.58	0.77	1.35	1.68	1.74	1.39	1.42	1.48	1.43	
C5-1	E-Learning Content Development & Delivery using an Open Source Environment	0.40	0.70	1.60	1.70	1.10	1.10	0.81	0.44	0.60	1.09	1.14	1.21	0.87	1.10	0.91	
C5-2	Tools and Techniques for CD Rom Based Multimedia Content Development	0.70	0.40	1.30	1.40	1.00	0.96	1.05	0.49	0.87	1.10	1.16	1.26	0.95	1.05	0.99	
	Average	0.73	0.79	1.29	1.41	0.91	1.02	0.99	0.51	0.76	1.06	1.18	0.96	0.97	1.05	0.93	

Course Evaluation

- 1 How is the topic coverage? Is contents enough for you or not?
- 2 How is the consistency of topics? Is correlation between topics clear?
- 3 Do you think that any topics should be added in the course? (*descriptive*)
- 4 Do you think that any topics should be removed from the course? (*descriptive*)
- 5 How is the equipment for training (computer, network etc.)?
- 6 How is the room and facilities for the training?
- 7 How do you evaluate blending approach (classroom learning using online coursework)?

Lesson Evaluation

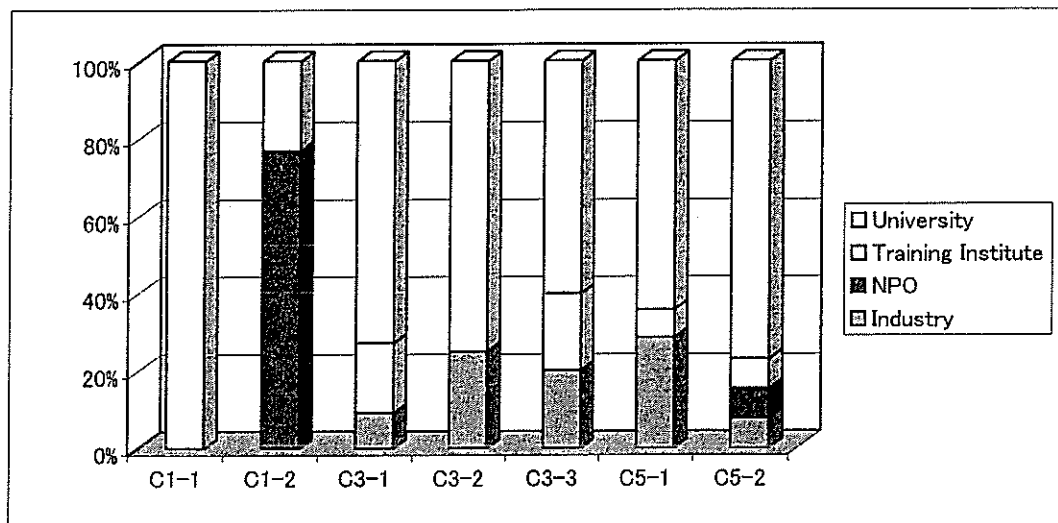
- 1 Give us your overall evaluation on this lesson
- 2 Do you think this lesson should be explained more in detail or shortened?
- 3 How were the materials (text book, handouts) of this lesson?
- 4 How was the presentation by lecture?
- 5 How was the interaction (Q&A, feedback of your question) by lecturer?
- 6 How was the instructions by the practice instructors
- 7 How well did you understand the contents of this lesson?
- 8 How much do you think you can apply the obtained knowledge to your work?

Evaluation Criteria

Excellent	2
Good/Appropriate	1
Fair/Shortened	0
Poor/More in detail	-1
Very poor	-2

Participants Domain

Course	No. of Participants			
	Industry	NPO	Training Institute	University
C1-1	0	0	0	7
C1-2	0	10	0	3
C3-1	1	0	2	8
C3-2	1	0	3	0
C3-3	1	0	1	3
C5-1	4	0	1	9
C5-2	1	1	1	10



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Annex 18 Progress of WBT Modules

Progress of WBT Module Development

No	WBT Module	Lesson	C/P in charge	hours	Completed (%)
1	Fundamentals of Programming	L1 Introduction to Java Programming Language	Jeneefar	2	100
		L2 Interacting with Java Programs	Jeneefar	3	100
		L3 Fundamentals of Java Programming	Jeneefar	15	100
		L4 Program Design Techniques	Jeneefar/Ravi	15	100
		L5 Object Oriented Concepts and Techniques	Jeneefar/Ravi	15	100
		L6 An Overview of Abstract Window Toolkit and Applets	Ravi	2	100
		L7 Streams and Error Handling in Java	Ravi	6	0
		L8 An Overview of Testing, Debugging and Documentation	Ravi	2	0
		Total		60	87
2	Computer Network & Communication	L1 Communication System Components	Malinda	2	100
		L2 Data Transmission Systems	Malinda	8	100
		L3 Standards in Data Communications	Malinda	10	100
		L4 Security in Data Communications	Malinda	4	100
		L5 OSI Reference Model and Network Architecture	Malinda	4	100
		L6 TCP/IP	Malinda	11	0
		L7 LAN	Malinda	12	0
		L8 WAN	Samantha	6	0
		L9 Introduction to Network Management	Samantha	2	0
		L10 Introduction to Network Operating Systems	Samantha	1	0
		Total		60	47
3	Computer Driving License	L1-1 Computer Basics 1	Thushani	7.5	100
		L1-2 Computer Basics 2	Thushani	7.5	100
		L2 Word Processing	Thushani	24	100
		L3 Spreadsheets	Ravi	24	0
		L4 Database	Thushani	24	0
		L5 Presentation	Thushani	18	27
		L6-1 Electronic Media - Internet	Thushani	3	100
		L6-2 Electronic Media - eMail	Thushani	2	100
		Total		110	40
4	English for ICT	Sample Course	Ravi	1	100
		Total		1	100
5	Digital Video Technology	L1 Video Basics	Danika	2	100
		L2 DV Technology		3	0
		L3 Configuring Your System		3	0
		L4 The Creative Process		3	0
		L5 Video Capture		3	0
		L6 Non-Linear Editing		3	0
		L7 Effect and Motion Graphics		3	0
		Total		20	14
6	Image Processing	L1 Digital Image Fundamentals	Samantha	3	100
		L2 Image Enhancement	Samantha	3	100
		L3 Image Processing in Frequent Domain	Samantha	3	100
		L4 Computer Graphics and Graphics	Samantha	5	50
		L5 Image Segmentation	Samantha	3	0
		L6 Representation and Description	Samantha	3	0
		Total		20	58
7	Animation Fundamentals	L1 Introduction and Overview of Multimedia	Kumaratunge/Ravi	0.5	100
		L2 Multimedia Theory Overview	Kumaratunge/Ravi	0.5	100
		L3 Computer Animation Software	Kumaratunge/Ravi	1	100
		L4 Modeling Basics (2D&3D)	Kumaratunge/Ravi	2	100
		L5 Animation Basics	Kumaratunge/Ravi	2	100
		L6 Creating Objects & Navigation	Kumaratunge/Ravi	2	100
		L7 Transforms	Kumaratunge/Ravi	2	100
		L8 Modifying & Animation	Kumaratunge/Ravi	2	100
		L9 Editing Meshes & Shapes	Kumaratunge/Ravi	2	100
		L10 Compound Objects & Lights	Kumaratunge/Ravi	2	100
		L11 Creating Materials & Working with Maps	Kumaratunge/Ravi	2	100
		L12 Rendering and Output	Kumaratunge/Ravi	2	100
		Total		20	100
8	Instructional Design	L1 What is Instructional Design and what is WBT?	Thushani		100
		L2 Child and Adult Learning	Thushani		100
		L3 Instructional Design Systematic Model	Thushani		100
		L4 Training Need Analysis	Thushani		100
		L5 Content Analysis	Thushani		100
		L6 Course Mapping Process	Thushani		100
		L7 Activities for WBT	Thushani		100
		L8 Student Evaluation	Thushani		100
		L9 Course Evaluation	Thushani		100
		L10 Storyboard Creation	Thushani		100
		L11 How to Design Web Pages for Learning	Thushani		100
		L12 Managing Web Based Training Projects	Thushani		100
		Total		30	100
9	Fundamentals of Programming (Streaming Type)	L1 Applications, Applets and Flow Controls	Boteju/Gamage		100
		L2 Object Oriented Concepts and Techniques	Boteju/Gamage		100
		L3 Arrays in Java	Boteju/Gamage		100
		L4 Error Handling in Java	Boteju/Gamage		100
		Total		20	100

Progress of WBT Module Implementation

No.	WBT module	Target Subject (BIT, M.Sc & others)	Delivery Period	Cumulative No. of Students Accessed				Parent Population	
				Feb 11 (*1)	Mar 1 (*1)	May 31 (*2)	Mar 1 (*1)	May 31 (*2)	
1	Fundamentals of Programming	Fundamentals of Programming	Nov 04 - Mar 05	74	97	97	1534	1534	
2	Computer Network & Communication	Data Communication and Networks	Mar 05 -			200		600	
3	Computer Driving License	Data Communication and Computer Network	Mar 05 -			16		20	
4	English for ICT	PC Applications	Nov 04 - Mar 05	53	75	75	1534	1534	
5	Digital Video Technology	Digital Video Processing	Jan 05 - May 05	4	7	15	19	19	
6	Image Processing	Digital Video Processing	Jan 05 - May 05	1	3	15	19	19	
		Graphics & Image Processing	Mar 05 -			13		16	
7	Animation Fundamentals	Computer Graphics & Vision	Jan 05 - May 05	0	1	50	62	62	
8	Instructional Design (*2)	Instructional Design Methodology for e-Learning	Mar 04 -	101	102	141	146	176	
9	Fundamentals of Programming (Streaming type)	Fundamentals of Programming	Feb 05 - Mar 05	9	28	28	1534	1534	
Total No. of Students (BIT)				136	200	400	4602	5202	
Total No. of Students (M.Sc & others)				106	113	250	246	312	

(*1) Actual number derived from LMS

(*2) Estimated

(*3) Instructional Design Module has been introduced as a supplemental material for training course on WBT.

Record of CD-ROM based Self-learning Material Development and Sales

No.	Title		Author	No. of copies sold
1	PC Application	BIT Semester 1	Dr. G.N. Wikramanayake Mr. Mahen Jayawardena	55
2	Mathematics for Computing	BIT Semester 1	Dr. D.D. Karunaratna Mr. Upali Wickramasinghe	62
3	System Analysis & Design	BIT Semester 1	Mr. G.K.A. Dias Mrs. Jacintha de Silva	46
4	Fundamentals of Programming	BIT Semester 1	Mrs. Girty Gamage Mr. G.P.N. Boteju	56
	(Supplementary CD)	BIT Semester 1		13
5	Software Engineering	BIT Semester 2	Dr. N.D. Kodikara Mr. Nalaka Jayasena	23
6	Computer Systems	BIT Semester 2	Mr. M.J.P.U. Samanthilaka Mr. P.A.D. Sunil	34
7	Database Management Systems	BIT Semester 2	Dr. G.N. Wikramanayake Mr. Mahen Jayawardena	29
8	Data Structures & Algorithms	BIT Semester 2	Mr. Upali Wickramasinghe Mr. Nalaka Jayasena	20
	(Supplementary CD)	BIT Semester 2		8
			Total	346



Annex 19 Publication and Other Activities

Collection/Dissemination of Information

No.	Date
1. International IT Conference 2002	04-09 October 2002
2. Joint Meeting on Sri Lanka-Japan Business Cooperation Committee and Joint OECD/UN/WB Global Forum on Knowledge Economy: Integration ICT in Development Programmes, OECD, Paris	25, 26 November 2002
3. National e-Government Conference	04, 05 March 2003
4. CSSL Conference on e-Government	09 May 2003
5. International IT Conference 2003	03 July 2003
6. CSSL Conference	01-07 December 2003
7. International IT Conference 2004	08, 09 July 2004
8. International Conference on E-Governance 2004	26 November - 1 December 2004
9. ASOCIO ICT Summit 2004	29 November - 1 December 2004
10. Project Brochure (1st edition)	30 November - 5 December 2004
1. Project Brochure (2nd edition)	March 2003
2. Project Brochure (3rd edition)	February 2004
3. Project Web Site (English) (*1)	February 2005
4. Project Web Site (Japanese) (*1)	July 2003
5. Project Web Site (Japanese) (*1)	November 2004

(*1) <http://www.admtc.lk/>

Visitors

No.	Date
1. Japanese Parliament Mission	13 September 2002
2. IITC 2002 participants	07 October 2002
3. Staff of Ministry of Health (GIS Seminar)	21 November 2002
4. Staff of Japan External Trade Organization (JETRO)	09 December 2002
5. Rev. Bishop Oswald Gomis, Chancellor, University of Colombo	13 January 2003
6. JICA Mission (Foundry Project)	26 February 2003
7. Mr. Kawakami Takao, JICA President	25 March 2003
8. Sir Arthur C. Clarke	28 July 2003
9. CICC survey team on document style	20 January 2004
10. Prospective JICA Experts	03 March 2004
11. Staff of UNIDO	09 March 2004
12. JICA Study Mission (Vocational Training Project)	13 October 2004
13. Staff of JETRO	14 October 2004
14. JICA Resident Representatives	22 October 2004
15. Director, Technical Cooperation Div. METI, Japan	21 November 2004
16. CICC survey team on OSS	30 November 2004
TCTP participants, staff of UNIDO, Sri Lankan Visitors, Indian Visitors, Swedish visitors, Korean visitors, Japanese visitors	

Study Tour

Objectives
1) to share the information and experiences on JICA technical cooperation projects in foreign countries,
2) to develop the human network with them,
3) to seek for the possibility of future collaboration with them
Members
Dr. A.R. Weerasinghe,
Mr. S.T. Nandasara
Dr. G. N. Wikramanayake,
Mr. K. Kamigane
Period
11-16 July 2004
Visits to Malaysia
Networked Multimedia Education System (NMES) Project at Multimedia University (MMU)
Visit to Thailand
The Project for Capacity Building on the Development of Information Technology for Education (ITEd)
(Ministry of Education, Non-Formal Education Center at Chiang Mai),
National Electronics & Computer Technology Center (NECTEC),
Chulalongkorn University, Chiang Mai University
Results
The Study Tour Team visited six (6) institutions in Malaysia and Thailand. They made presentations on their organization, projects and activities. The team also made presentations on our Project, and tours of inspection of facilities and activities, and had opportunities to discuss the matters concerned. This tour was informative and useful not only for the Project but for UCSC.

Annex 20 Achievement Grid

(Legend)

Method

I : Interview by the evaluation team

S : Survey by the evaluation team

M : Material, includes interview and survey by other party

Target

G : Government related IN : Industry, except IT training company

IT : IT training company U : University

Overall goal

Narrative Summary	Objectively Verifiable Indicators	Data Sources / references																																																														
Overall Goal Both quality and quantity of IT related human resources in Sri Lankan industries are improved.	1. Number of skilled IT personnel in industries, trained at UCSC, increases at certain rate of growth.																																																															
	The total number of IT graduates is increased.	M – “National IT Workforce Survey” Sri Lanka ICT Association (SLICTA)																																																														
	<table><tr><th rowspan="2">Level of education</th><th colspan="2">Gov. Univ.</th><th colspan="2">Gov. Technical college</th><th colspan="2">Private degree award inst.</th><th colspan="2">Total</th></tr><tr><th>2004</th><th>2005</th><th>2004</th><th>2005</th><th>2004</th><th>2005</th><th>2004</th><th>2005</th></tr><tr><td>Ph.D</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Master</td><td>307</td><td>511</td><td>76</td><td>204</td><td>159</td><td>100</td><td>542</td><td>815</td></tr><tr><td>Post Graduate Diploma</td><td>121</td><td>220</td><td>0</td><td>53</td><td>33</td><td>0</td><td>154</td><td>273</td></tr><tr><td>Degree</td><td>1,162</td><td>1,328</td><td>515</td><td>640</td><td>767</td><td>550</td><td>2,444</td><td>2,518</td></tr><tr><td>Total</td><td>1,590</td><td>2,059</td><td>591</td><td>897</td><td>959</td><td>650</td><td>3,130</td><td>3,606</td></tr></table>		Level of education	Gov. Univ.		Gov. Technical college		Private degree award inst.		Total		2004	2005	2004	2005	2004	2005	2004	2005	Ph.D	0	0	0	0	0	0	0	0	Master	307	511	76	204	159	100	542	815	Post Graduate Diploma	121	220	0	53	33	0	154	273	Degree	1,162	1,328	515	640	767	550	2,444	2,518	Total	1,590	2,059	591	897	959	650	3,130	3,606
	Level of education			Gov. Univ.		Gov. Technical college		Private degree award inst.		Total																																																						
			2004	2005	2004	2005	2004	2005	2004	2005																																																						
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Total	1,590	2,059	591	897	959	650	3,130	3,606																																																								
Among 13 government universities, the number of the students graduated from UCSC in 2004 was about 270.																																																																
2. IT utilization in industries improves both in terms of quantity of personnel and technology level																																																																
Our company has shared the technology which was trained through IT training course in UCSC, among our e-learning team, and are developing e-learning contents for our in-house training purpose.	I-IN																																																															
I have studied through WBT contents with my friends in order to gain JAVA and PC application skill.	I-BIT																																																															

Course	No. of Participants			
	Industry	NPO	Training Institute	University
C1-1	0	0	0	7
C1-2	0	10	0	3
C3-1	1	0	2	8
C3-2	1	0	3	0
C3-3	1	0	1	3
C5-1	4	0	1	9
C5-2	1	1	1	10

This table does not cover some participants whose organization is not clear.

Ym w

Project Purpose

Narrative Summary	Objectively Verifiable Indicators	Data Sources / references
<p>Project Purpose</p> <p>UCSC increases its capacity in conducting IT trainings that match the needs of Sri Lankan industries in a more effective and efficient manner for IT related staff in universities, IT training institutes and industries</p>	The capacity of UCSC staff members for IT training courses and R&D relating to WBT is built.	
	UCSC is the best organization which provides with IT training course on WBT in Sri Lanka and even in South Asia.	I-C/P
	Even in the area of South Asia, the level of UCSC is top, and everyone wants to go to UCSC.	I-G
	I have studied through WBT contents, and we could access repeatedly so that it was convenient, efficient and effective for us.	I-BIT
	In UCSC IT training, the knowledge about the way how to structure the IT training course gained through the instructional design course, so that it was very effective. This knowledge is indispensable for me as a branch manager of IT training school. The cost is very reasonable, so that I learned efficiently.	I-IT
	LMS, Flash, HTML, Photoshop, Instruction Design were covered by our course. I am fully satisfied for course content, instructor, instrument, time allocation.	I-IN
	Flash, CD-ROM content development and instruction design were covered which was a new technology for me. I am in charge of education technology and my job is to make a multimedia learning material, such as CD-ROM. I have learned Now I am trying to apply this technology to make my CD-ROM.	I-U
	R&D has provided with valuable technology which is important to produce advanced WBT contents	I-C/P

Outputs

Narrative Summary	Objectively Verifiable Indicators	Data Sources / references												
Output1. Organization/functions of UCSC are strengthened.	1. Number and capability of staff members, budget, equipment and facilities, and management system at UCSC are increased / enhanced.	M												
	Annex 6,9													
	<table><tr><td></td><td>2002</td><td>2003</td></tr><tr><td>Staff members</td><td>37</td><td>39</td></tr><tr><td>Budget (*2)</td><td>70,697,915</td><td>116,872,285</td></tr><tr><td>Equipment and Facilities (*3)</td><td>100,514,647</td><td>161,511,677</td></tr></table>			2002	2003	Staff members	37	39	Budget (*2)	70,697,915	116,872,285	Equipment and Facilities (*3)	100,514,647	161,511,677
			2002	2003										
	Staff members		37	39										
	Budget (*2)		70,697,915	116,872,285										
Equipment and Facilities (*3)	100,514,647	161,511,677												
(*1) Total number of academic and academic support staff who's position is beyond instructor (including instructor)														
(*2) Income														
(*3) Property, Plant & Equipment														
	The Project	I-C/P												
Output 2 C/Ps acquire necessary IT skills and technologies for the implementation of WBT.	2-1. 6 advanced UCSC instructors on WBT are trained	M												
	Annex 5, 14													
	2-2. 18 staff members at UCSC are trained as WBT content developers/IT trainers	M												
	Annex 5, 14													
Output 3 UCSC provides IT training courses on WBT.	3-1. 6 basic teaching materials on WBT are prepared.	M												
	Annex 17, the third sheet "Teaching materials"													
	3-2. 200 WBT content developers/IT trainers in universities, IT training institutes and industries are trained.	M												
	Annex 17, the second sheet "training courses held in chronological order". Total number of trainees who have been trained is 240.													

	<p>According to the result of Web survey to the training participant, the evaluation of IT training course by trainees are quite good.</p> <table border="1"> <tr> <th>Level</th> <th>Content</th> <th>Lecturer</th> <th>Instrument</th> <th>Overall</th> </tr> <tr> <td>Very poor</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Poor</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Fair</td> <td>4</td> <td>3</td> <td>1</td> <td>2</td> </tr> <tr> <td>Good</td> <td>9</td> <td>11</td> <td>5</td> <td>11</td> </tr> <tr> <td>Excellent</td> <td>2</td> <td>1</td> <td>9</td> <td>2</td> </tr> </table> <p>According to the result of Web survey to the training participant, the achievement of IT training course by trainees are also good.</p> <table border="1"> <tr> <th>Achievement</th> <th>Number</th> <th>Percentage (%)</th> </tr> <tr> <td>90 or more</td> <td>0</td> <td>0</td> </tr> <tr> <td>75-90</td> <td>6</td> <td>40</td> </tr> <tr> <td>60-75</td> <td>5</td> <td>33</td> </tr> <tr> <td>40-60</td> <td>4</td> <td>26</td> </tr> <tr> <td>25-40</td> <td>0</td> <td>0</td> </tr> <tr> <td>10-25</td> <td>0</td> <td>0</td> </tr> <tr> <td>less than 10</td> <td>0</td> <td>0</td> </tr> </table>	Level	Content	Lecturer	Instrument	Overall	Very poor	0	0	0	0	Poor	0	0	0	0	Fair	4	3	1	2	Good	9	11	5	11	Excellent	2	1	9	2	Achievement	Number	Percentage (%)	90 or more	0	0	75-90	6	40	60-75	5	33	40-60	4	26	25-40	0	0	10-25	0	0	less than 10	0	0	S- Training participan ts
Level	Content	Lecturer	Instrument	Overall																																																				
Very poor	0	0	0	0																																																				
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90 or more	0	0																																																						
75-90	6	40																																																						
60-75	5	33																																																						
40-60	4	26																																																						
25-40	0	0																																																						
10-25	0	0																																																						
less than 10	0	0																																																						
Output 4 UCSC provides WBT courses.	<p>4-1. 8 WBT modules were developed and 6 were provided. A total of 300 students and other trainees are trained by UCSC.</p> <p>More than 300 students have used WBT modules.</p> <table border="1"> <tr> <th></th> <th>Date</th> <th>Feb 11</th> <th>Feb 22</th> <th>Mar 1</th> </tr> <tr> <td rowspan="4">BIT</td> <td>Fundamental pf Programming</td> <td>74</td> <td>96</td> <td>97</td> </tr> <tr> <td>Java Streaming</td> <td>9</td> <td>25</td> <td>28</td> </tr> <tr> <td>Computer Driving License</td> <td>53</td> <td>72</td> <td>75</td> </tr> <tr> <td>Sub Total (BIT)</td> <td>136</td> <td>193</td> <td>200</td> </tr> <tr> <td rowspan="4">M.Sc & Others</td> <td>Image Processing</td> <td>1</td> <td>3</td> <td>4</td> </tr> <tr> <td>Digital Video Technology</td> <td>4</td> <td>6</td> <td>7</td> </tr> <tr> <td>Instructional Design (*1)</td> <td>101</td> <td>101</td> <td>102</td> </tr> <tr> <td>Sub Total (M.Sc+)</td> <td>106</td> <td>110</td> <td>113</td> </tr> </table> <p>(*1)Number of Students accessed to I.D. includes those who accessed as a supplemental for Training course on</p>		Date	Feb 11	Feb 22	Mar 1	BIT	Fundamental pf Programming	74	96	97	Java Streaming	9	25	28	Computer Driving License	53	72	75	Sub Total (BIT)	136	193	200	M.Sc & Others	Image Processing	1	3	4	Digital Video Technology	4	6	7	Instructional Design (*1)	101	101	102	Sub Total (M.Sc+)	106	110	113	M- Content access log, number of students attending the class															
	Date	Feb 11	Feb 22	Mar 1																																																				
BIT	Fundamental pf Programming	74	96	97																																																				
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	Digital Video Technology	4	6	7																																																				
	Instructional Design (*1)	101	101	102																																																				
	Sub Total (M.Sc+)	106	110	113																																																				

	WBT and Indirect C/Ps accessing for self-learning.	
	Annex 18	
	4-2. 1000 BIT students get training using WBT contents.	
	It is not achieved yet. (reference above)	
Output 5 R&D capabilities relating to WBT are strengthened in the UCSC.	3 academic papers related to WBT are presented at domestic/international academic meetings.	
	<p>The total number of academic papers which have been presented at domestic/international academic meeting are eleven (10), and the list is as follows:</p> <ol style="list-style-type: none"> 1. "Image Coding Using the Self Similarity of Wavelet High Frequency Components" at the 5th International IT Conference (IITC 2003), Dec. 2003 2. "Asymmetry in Facial Expressions : 3D Analysis using Laser Rangefinder Systems" at the 5th International IT Conference (IITC 2003), Dec. 2003 3. "An Architecture of a Media Based System to Support e-Learning" at the British Computer Society Sri Lanka Section, Oct. 2004. 4. "From 2D to 3D: A case study from Sri Lankan Virtual Heritage" at the 10th International Conference on Virtual Systems and Multimedia (VSMM 2004), Nov. 2004 5. "An Open Multimedia Database for Web Based Teaching" at International Conference of Virtual Systems and Multimedia (VSMM2004), Nov. 2004 6. "Edge Enhancement of Digital Images Using Edge Profile Analysis" at 6th International IT Conference (IITC 2004), Nov. 2004 7. "Learning Patterns: Towards the Personalization of E-Learning" in Proceedings of International Information Technology Conference (IITC2003), Dec. 2003. 8. "Profile Based video Segmentation System to Support E-learning" at the 6th International IT Conference 2004 (IITC2004), Nov. 2004 9. "Speaker Search and Indexing for Multimedia Databases" at the 6th International IT Conference 2004 (IITC2004), Nov. 2004 10. "Implementation of a video segmentation system to support E-learning " at the International Conference on Information Management in a Knowledge Society (ICIM 2005), Feb. 2005 	M

Inputs

Activities	Objectively Verifiable Indicators	Actual inputs
Input by Sri Lankan side		
- Facilities	Facilities for training and R&D at the UCSC	(Annex 10)
- C/P personnel	Direct C/P: 6 Indirect C/P: 18 of which 3 at least are also R&D C/P	Direct C/P: 6. 2 left. Indirect C/P: 18. 1 left. 6 were also R&D C/P (Annex 8)
- local cost	Operating costs for the Project	Total local cost was 72,628 thousands LKR (Annex 9)
Input by Japanese side		
- Expert	2 Long-term experts (Chief advisor, Technical coordinator) 4-8 short-term experts in IT per year (technology transfer of WBT) 2-4 short-term experts in R&D per year (R&D in WBT) (Total of 40 M/M at maximum for the project period)	2 Long-term experts (Chief advisor, Technical coordinator) The number of short term experts Year 2002 : 6 Year 2003 : 5 Year 2004 : 4 Year 2005 : 2 (planned) The number of short term experts in R&D Year 2002 : 2 Year 2003 : 3 Year 2004 : 2 Total 75.7 M/M as of March 9, 2005 (Annex 4)
- Equipment	Equipment for development such as PC, Server and related software. Equipment for training such as PC, Server, network equipment and related software	(Annex 6, 7)
- Training in Japan	several members per year	The number of C/P training in Japan Year 2002 : 2 Year 2003 : 4 Year 2004 : 9 (Annex 5)
- Cost	(not described)	Total cost is 376,125 thousands yen (Annex 7)