

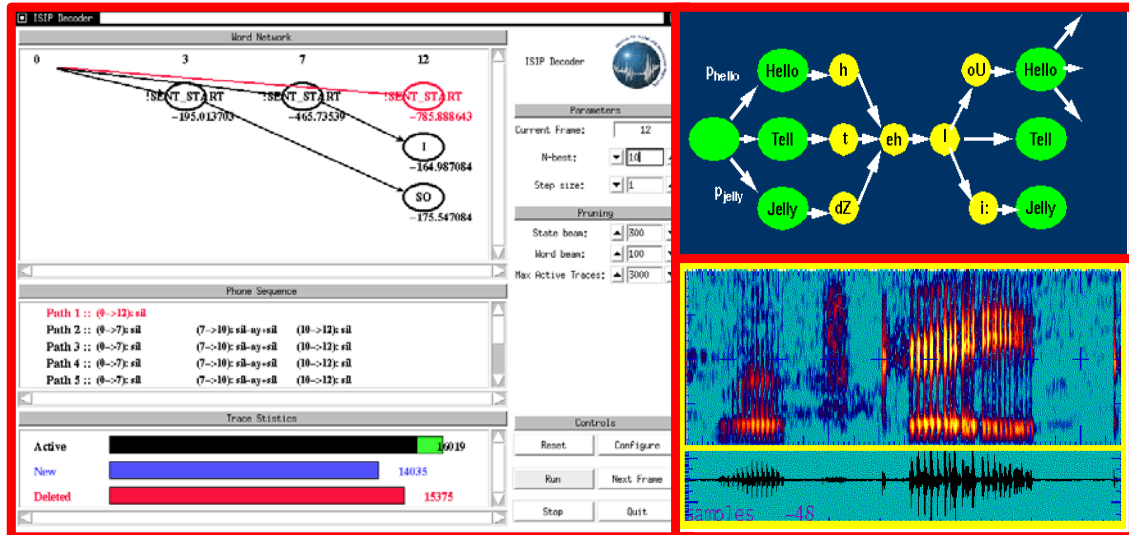
design document for

AVGET: An Audio Visual Information Access System

submitted to:

Professor Joseph Picone
ECE 4512 (or 4522, etc.): Senior Design I (or II)
Department of Electrical and Computer Engineering
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EXECUTIVE SUMMARY

The executive summary must be exactly one page long – no more no less. It should be composed of four paragraphs. The first paragraph contains an overview of the problem (not the approach).

The second paragraph contains an overview of the design constraints. The goal of this paragraph is to make sure the reader understands the key technical challenges.

The third paragraph contains an overview of the approach you are taking to solve the problem. How do you plan to meet your key design constraints? The second and third paragraphs are the longest.

The last paragraph contains an overview of the novelty of your design. This is a fairly short paragraph that summarizes innovation in your project. What other things can be done to improve your design; what will be the impact of success, etc. This paragraph should be about four sentences.

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1. PROBLEM

In this section, you will define the problem you are addressing, explain its significance, and discuss the impact of your solution (not how you are going to solve the problem, but what will happen if you solve the problem). Start with a general overview, background, etc., and then get progressively more detailed. This section must be at least two pages long.

2. DESIGN REQUIREMENTS

Start with an introductory paragraph or two. Then you will list your specific design constraints, followed by an explanation. This section should be at least three pages long.

2.1. Technical Design Constraints

Our five technical design constraints are shown in Table 1. Each team must have five technical design constraints that adequately constrain the circuit and software design of the system. Technical design constraints typically relate to the performance of the system. Note the format of the table and the use of a cross-reference in the text above.

You will need two or three paragraphs explaining these design constraints. Typically these are explained in groups since design constraints are often interrelated. Use constraints that relate to well-known standards (such as UL or FCC specs), and be sure to explain these specifications.

Design constraints must be quantitative and must be testable. The section on evaluation will describe the tests you use to verify your design constraints.

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2.2. Practical Design Constraints

In the ABET handbook on accrediting engineering programs, it states:

“Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety;

Name	Description
Signal to Noise Ratio	We will achieve a signal-to-noise ratio of 30 dB or greater, and demonstrate that this exceeds performance of existing technology.
Communications Protocol	We will use an RS-232C interface for communications between the module and the base station.
Accuracy	This system's incorrect classification rate will not exceed 3.5% on data whose SNR exceeds 15 dB.
Robustness	The imposter acceptance rate will not exceed 3% on data whose SNR exceeds 10 dB.
Transmission Distance	Our base station will communicate with the server at a maximum distance of 100 feet with a bit error rate not to exceed 1e-05.

Table 1. Technical design constraints for the AVGET system.

social; and political.”

Every senior design project must include five design constraints that address some of these issues. An example of these are shown in Table 2. These typically include things like size, power, weight, and cost. Every project need not address all of the factors specified by ABET. However, all projects must have five design constraints that relate to these issues.

After you provide these constraints, some explanation will be required.

3. APPROACH

In this section, you explain your approach in great detail. This will be the single largest section in the document, often 20 or 30 pages long. It will contain a comprehensive explanation of your design, including theory and practice. It should be somewhat self-contained so that a student with a background similar to yours can understand it. It will most likely use two levels of subsections (e.g., 3.1 and 3.1.1). Only the first level of subsections (e.g., 3.1) needs to be included in the Table of Contents.

Figures should appear as shown below and be referenced in the text as Figure 1. Similarly, tables should be included in the text and be referenced as Table 1 (see the examples in the previous section). All text in figures and tables, including the captions, use a 9 pt. Times New Roman font (as does the text).

Equations in your document should appear as shown below with the equation number in parentheses to the right of the equation. Use a medium-sized font — one that matches the rest of the document.

References are cited in the text using an in-line style. For example, the best way of developing a DC power supply is to use a Duracell battery [1]. Many approaches exist for developing such things [2-6], but my favorite one is an approach which is really space efficient [8]. Note the use of crossreferences in doing this.

3.1. DC Power Supplies

You should probably start this section with a general overview of the primary technology you are developing. Then you can transition into the specifics of the hardware and software design.

Type	Name	Description
Economic	Cost	The expected retail for this price is \$100 based on a parts cost of \$25.
Environmental	Power	The main processor unit will dissipate no more than 3 Watts.
Sustainability	Reliability	This system will be designed to operate over a five year period without failure. The expected battery life is seven years and is the only part requiring regular maintenance.
Manufacturability	Size	The physical dimensions will be 3” high, 4” wide, and 6” deep.
Health and Safety	Safety	We will conform to UL Specification 631 which requires that this unit not deliver an electrical shock to the user under ..., and UL Specification 837 which requires a

Table 2. Practical design constraints for the AVGET system.

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For example, below, in Figure 1, we can see some interesting experimental results. This results are supported by the all important equation of life:

$$y = ax + b \tag{1}$$

We can see in Equation (1) (can someone show me how to crossreference equations?) that the mystery of life is explained.

3.2. Hardware Design

Each project will describe their hardware and software designs in major sections. Hardware design should begin by developing a block diagram of the overall system, and then expanding on the theory and design behind each one of these blocks.

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3.2.1. Theory of DC Power Supplies

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3.2.2. More Interesting Theory

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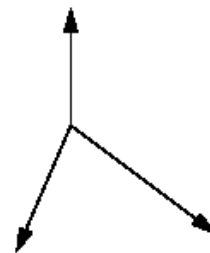


Figure 1. This is an example of a figure. Captions are justified when they are multiple lines, and centered if they are one line. Captions should be no more than about three lines.

enables many useful on-line documents to be developed. Mr. Doe's interactions have helped us add features to the system, some of which make this system very unique compared to other systems. Say a few more good things.

7. REFERENCES

(References must follow the format specification described at the following URL: <http://www.isip.msstate.edu/projects/speech/software/tutorials/general/references/>. You are expected to have at least 20 published scientific references. URLs, technical manuals, newspaper articles, etc., don't count but can be included. Your overall reference list should be close to 50 items.)

1. A. Ganapathiraju, N. Deshmukh, Y. Wu, and J. Picone, "An Internet-Based Public Domain Speech-to-Text Toolkit," *Quarterly Status Report for the Department of Defense*, Institute for Signal and Information Processing, Mississippi State University, August 1999.
2. A. Ganapathiraju, N. Deshmukh, Y. Wu, and J. Picone, "An Internet-Based Public Domain Speech-to-Text Toolkit," *Quarterly Status Report for the Department of Defense*, Institute for Signal and Information Processing, Mississippi State University, August 1999.
3. A. Ganapathiraju, N. Deshmukh, J. Hamaker, and J. Picone, "An Internet-Based Public Domain Speech-to-Text Toolkit," *Quarterly Status Report for the Department of Defense*, Institute for Signal and Information Processing, Mississippi State University, May 1999.
4. A. Ganapathiraju, N. Deshmukh, V. Mantha, J. Hamaker, and J. Picone, "Towards an Extensible Public Domain Speech Recognition System," *Proceedings of the Hub-5 Conversational Speech Recognition Workshop*, Linthicum Heights, Maryland, USA, September 1998.
5. J. Picone, et. al., "ISIP Software Documentation," http://www.isip.msstate.edu/projects/speech/education/tutorials/isip_env/index.html, Institute for Signal and Information Processing, Mississippi State University, July 1999.
6. J. Picone, "Managing Software Complexity in Signal Processing Research," *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing*, pp. III-41-III-44, Minneapolis, Minnesota, USA, April 1993.
7. J. Garofolo and J. Fiscus, "Speech Header Resources (SPHERE) version 2.6", <http://www.itl.nist.gov/div894/894.01/software.htm>, National Institute for Standards and Technology, Gaithersburg, Maryland, USA, June 1996.
8. G. Strong, "DARPA Communicator Program," <http://www.darpa.mil/ito/research/com/index.html>, Defense Advanced Research Projects Agency, USA, 1998.
9. J. Markel and A. H. Gray, Jr., *Linear Prediction of Speech*, Springer-Verlag, New York, New York, USA, 1980.

APPENDIX A: PRODUCT SPECIFICATION



SONY

PCV-RX755

Sony VAIO® Digital Studio™ PC

- CD-RW Drive - Create your own CDs!
- Intel® Pentium® 4 Processor 2A¹¹¹ GHz¹
- 512MB PC-2100 DDR / 60GB¹¹ Hard Drive
- DVD-ROM Drive
- High-speed Internet Ready with 10Base-T/100Base-TX Fast Ethernet
- i.LINK® (IEEE 1394) Interface and USB Connectors¹



MEMORY STICK



i.LINK®
(IEEE 1394)

* Display sold separately.





FEATURES

- Intel® Pentium® 4 Processor 2A¹¹¹ GHz¹
- 512MB PC-2100 DDR (expandable to 1GB)
- 400MHz Front Side Bus
- 60GB¹¹ Ultra ATA/100 Hard Drive
- CD-RW Drive - Create your own CDs!
- DVD-ROM
- Music, Movies, and Photo Software:
 - DVgate
 - MovieShaker™
 - SonicStage™ for VAIO®
 - PowerDVD
- Memory Stick® Media Slot
- Front and Rear Accessible i.LINK (IEEE 1394) Interfaces and USB Connections¹
- High-Speed Internet Ready with 10 Base-T/100Base-TX Fast Ethernet

SPECIFICATIONS

<p>MODEL PCV-RX755</p> <p>PROCESSOR Intel® Pentium® 4 Processor 2A¹¹¹ GHz¹</p> <p>CACHE MEMORY 512KB Integrated On-Die Level 2</p> <p>FRONT SIDE BUS SPEED 400MHz</p> <p>STANDARD RAM 512MB PC-2100 DDR (expandable to 1GB)</p> <p>HARD DRIVE 60GB¹¹ Ultra ATA/100 Hard Drive</p> <p>CD-RW DRIVE CD-RW (24X max. write / 10X max. rewrite / 40X max. read)</p> <p>DVD-ROM DRIVE 16X max. DVD-ROM Read / 40X max. CD-ROM Read</p> <p>FLOPPY DISK DRIVE 3.5" 1.44 MB Floppy Disk Drive</p> <p>VIDEO & GRAPHICS S15650 Integrated Graphics with Real256™ 2D/3D Graphics Accelerator 32MB Shared Graphics Memory (64MB Max.)</p> <p>ETHERNET 10Base-T/100Base-TX Fast Ethernet</p> <p>MODEM V.90 compatible data/fax modem</p> <p>EXPANSION SLOTS One AGP Three PCI (one occupied by Modem) Memory Stick® Media Slot</p> <p>EXPANSION BAYS Two 5.25" Half-Height (two occupied) One External 3.5" (occupied) Two Internal 3.5" (one occupied)</p> <p>PORT CONNECTORS Four USB (two front/two rear) Two PS/2® (Mouse/Keyboard) One VGA monitor port One Serial / One Parallel One 6pin i.LINK port (rear) One 4pin i.LINK port (front) One Headphone / One Microphone One Line In</p> <p>SUPPLIED ACCESSORIES Speakers (Stereo) VAIO Smart™ Keyboard PS/2® Wheel Mouse RJ-11 Phone Cord Power Cord</p> <p>POWER REQUIREMENTS 100-120V -3A (50/60Hz)</p> <p>POWER MANAGEMENT ACPI 1.0 Compliant</p>	<p>DIMENSIONS (CPU) 8.0"(W) x 14.2"(H) x 14.6"(D)</p> <p>WEIGHT (CPU) 28.5 lbs.</p> <p>SERVICE One Year Limited Express Repair Service (upon registration; 90 days without registration)*</p> <p>LIMITED WARRANTY One Year Parts and Labor (upon registration; 90 days without registration)*</p> <p>TELEPHONE SUPPORT Hardware: One Year Software and Operating System: 90 Days</p> <p>PRE-INSTALLED SOFTWARE</p> <p>OPERATING SYSTEM Microsoft® Windows® XP Home Edition Sony PCs use Genuine Microsoft® Windows® Operating Systems www.microsoft.com/piracy/howtotell</p> <p>SONY ORIGINAL SOFTWARE DVgate™ SonicStage™ for VAIO® MovieShaker™ Smart Capture DigitalPrint PowerDVD</p> <p>OTHER SOFTWARE APPLICATIONS Corel WordPerfect® Office 2002 Adobe® Photoshop® Elements Adobe® Acrobat® Reader® Apple QuickTime® Intuit Quicken® 2002¹ Microsoft® Outlook® Express</p> <p>ANTI-VIRUS & RECOVERY SOFTWARE Trend Micro PC-Cillin® Sony Application Recovery CD(s) Sony System Recovery CD(s)</p> <p>ONLINE CENTER VAIO Support Agent America Online®** EarthLink TotalAccess®***</p>
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1 GHz denotes microprocessor internal clock speed; other factors may affect application performance.

11 GB means one billion bytes when referring to Hard Drive capacity. Accessible capacity may vary.

111 Naming of 2GHz, based on 13 micron core and secondary cache of 512KB.

* Certain conditions apply.

** Requires payment of additional fees or subscription for use.

1 i.LINK is a trademark of Sony used only to designate that a product contains an IEEE 1394 connector. All products with an i.LINK connector may not communicate with each other.

2 Previous Quicken users may require additional upgrades.

APPENDIX B: SOME INTERESTING RELEVANT DERIVATION

Software listings are generally NOT included in the document. These should be on the web site and referenced from the document using a URL.

It is common, however, to want to discuss a specific point or derive an important relationship. Such details, when not immediately relevant to the document, are best included as appendices.