Outline

- Overview of speech applications.
- Emacspeak –Architecture.
- Emacspeak –The user experience.
User explores visual display to:

- Construct a mental model of the interface.
- And interpret intent of the UI.

Aural output – Derived from visual display.
Screen Access Design

- Encapsulate display in an off-screen model.
- Present this model aurally.
- Enable navigation of this model.

Aural feedback is application independent.
Available Screen Access

Character-based interfaces . . . GUI.

Richer layout of GUI

Harder to build OSM

But richer OSM

Enables possibly richer feedback

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Screen Access Innovations

- Speak specific areas of the screen.
- Attach meaningful labels to icons.
- Navigate window hierarchy.

Access separate from application.
What Is UI?

1. Obtain user input

2. Compute on the information

3. Display the results

UI = Input + Output
Speech Enabling Applications

- Treat speech as a first class medium.
- Application produces its own feedback.
- Exploit features of the spoken medium.

Audio output independent of visual display.
## Contrasting Approaches

<table>
<thead>
<tr>
<th>Read Screen</th>
<th>Speech Enable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speak display</td>
<td>Speak information</td>
</tr>
<tr>
<td>No context</td>
<td>Full context</td>
</tr>
<tr>
<td>Independent</td>
<td>Integrated</td>
</tr>
<tr>
<td>Global scope</td>
<td>Local context</td>
</tr>
<tr>
<td>Uses display</td>
<td>Uses environment</td>
</tr>
</tbody>
</table>

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Advantages

- Produce intuitive feedback.
- Provide a simpler user model.
- Reduces users cognitive load.

User works with one –not two– applications.
<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
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</tbody>
</table>

Easy to see relevant information.
EMACS

A customizable, extensible user environment:

- Editing and browsing electronic information.

- Software development.

Unified interface → Cooperating applications

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Emacspeak

- Device independent speech interface.
- Core modules for basic spoken feedback.
- Extensions for various applications.

Does not modify Emacs code-base.

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Advice Overview

BEFORE Called before advised function.

AFTER Called after advised function.

AROUND Called instead of advised function.

Advice enables code re-use.

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Let $x \rightarrow f \rightarrow y$.

**BEFORE** | **AROUND** | **AFTER**

Result in function $f'$ that computes $y'$.

$x \rightarrow \underbrace{f \rightarrow y'}_{f'}$
• Succinct contextual speech feedback.

• Auditory icons augment interaction.

• User action flushes prior speech *immediately*.

*User focuses on task at hand.*
Demonstration – Editing

- Simple editing, search and replace.
- Completion and spell checking.
- Syntax coloring using voice-lock mode.

Intuitive interface enables fluent interaction.
Demonstration – Browsing Information

- Browsing the file system.
- Reading and responding to email and news.
- Browsing the WWW.

Window to digital information.
Voice properties,

Auditory icons,

Sound cues for document elements.

Generate richly formatted *audio* documents.
Demonstration – System Tasks

- Running a shell.

- Running terminal based applications.

Behaves like a traditional screen-reader.
Device Independent Speech

- Dectalk Express and MultiVoice
- Software Dectalk –DEC-ALPHA
- DECFACE –A Talking Face

Supporting other devices is straightforward
Core Modules

Speech enables

- Navigation, editing, and prompting.

Sufficient to implement a working system.
Application Specific Extensions

The icing on the cake!

- WWW browser, Mail and News reader

- Tools: Calendar, Spell checker, . . .

Code-size is less than 1% of original.
### Advice Statistics

<table>
<thead>
<tr>
<th>Package</th>
<th>Code</th>
<th>Ext</th>
<th>%</th>
<th>Advice</th>
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<tbody>
<tr>
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</table>

**Emacspeak – A model of code re-use.**
Conclusion

- Treat speech I/O as a first-class medium.
- Separates UI and computation.
- Enables rich, well-structured interfaces.