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Voice Access to Technology - Workshop

Aim of Workshop

- To understand the issues around voice access to technology and existing products
- To present the SPECS project and user involvement in the device design
- To involve **you** in the design of a new speech control device

Workshop Programme

- Introduction
- Discussion– "Voice Access – A panacea?"
- Presentation - SPECS Project User Requirements
- SPECS Deivce:
  - Discussion – How to improve existing devices
  - Demonstration – SPECS Interface
  - Discussion – The new SPECS device

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Voice Access – an Introduction

Mark Hawley

- Access
- Control
- Communication
- Assessment
- Treatment

Focus on:

- physical disability
- dysarthria

Access

- Speech recognition provides a means of access for people with physical disability and 'normal' speech
- Recognition accuracy correlated with intelligibility
  - Speech recognition works for 'normal' speech, mild dysarthria and some moderate dysarthria
  - Does not work well for severe dysarthria
- Speaker dependent discrete word recognisers more successful than continuous for severe dysarthria

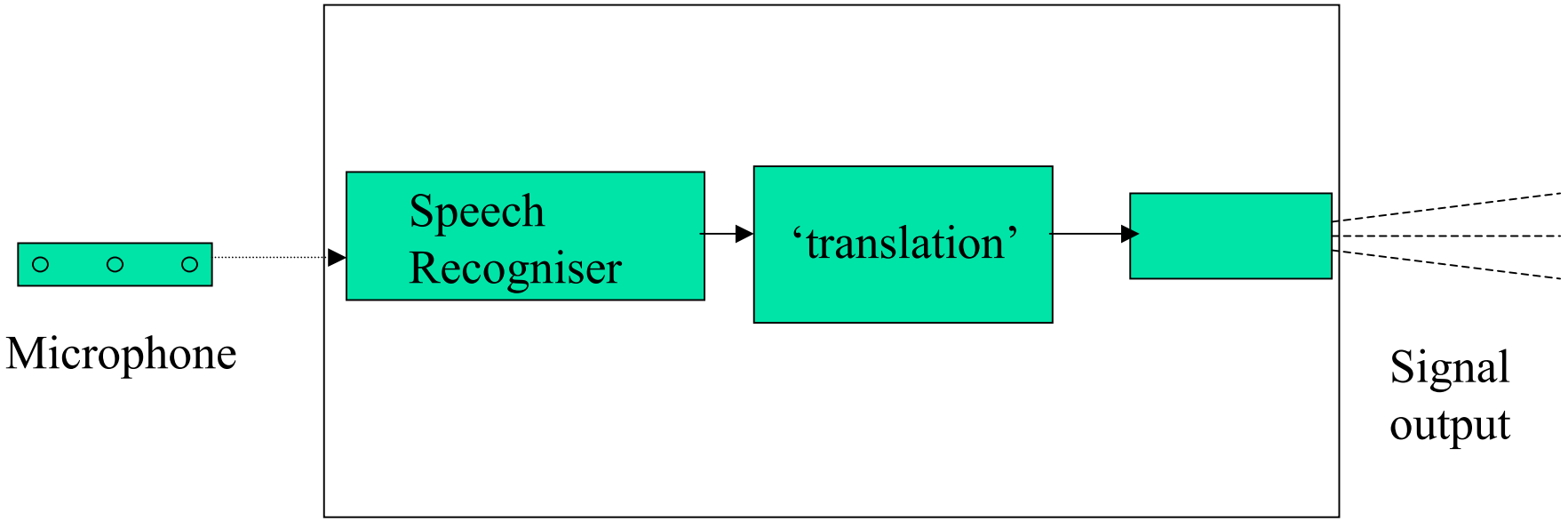
Control

- Control of the environment an essential aspect of independence
- Current control methods can be slow
- Home control systems based on speaker dependent recognition are available
  - but do not perform adequately, especially for disordered speech

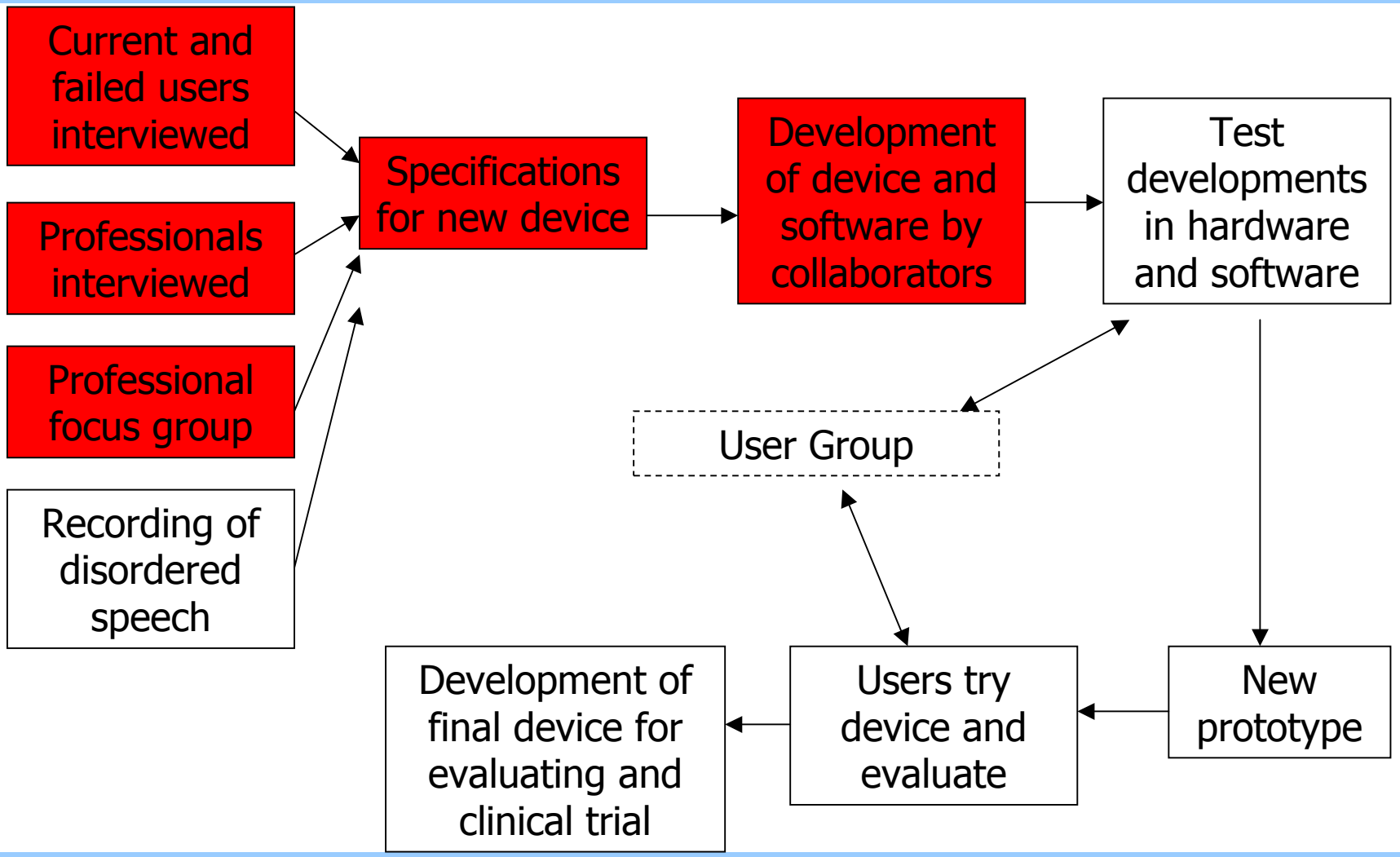
STARDUST

(Speech Training and Recognition for Dysarthric Users of aSsistive Technology)

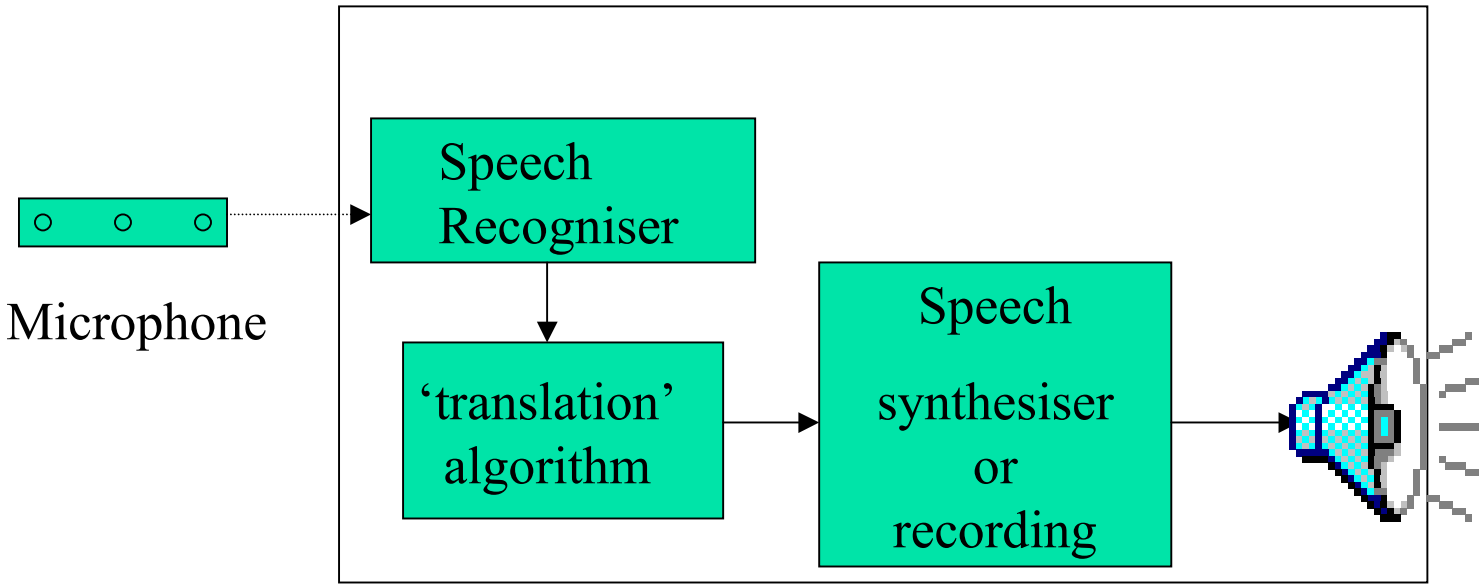
- User-centred approach – aim to make it work
- Speaker dependent recognition
- Small vocabulary of discrete words tailored to speech capabilities of individual
- Closed loop between recogniser training and user training


Speech
Recogniser
‘translation’
Microphone
Signal
output

Overview


Current and failed users interviewed
Professionals interviewed
Professional focus group
Recording of disordered speech
Specifications for new device
Development of device and software by collaborators
Test developments in hardware and software
User Group
New prototype
Users try device and evaluate
Development of final device for evaluating and clinical trial

VIVOCA: Voice-input voice-output communication aid



Consent

- Recording for our records

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Discussion – Voice Access – A panacea?

Answer the following questions…

Demonstration: Existing Systems

- In groups

Discussion

- "Why do you (as practitioners) not use voice access more?"
- "When would you consider using voice access?"
- "Disadvantages of voice access"
- "Advantages of voice access"

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Discussion Feedback

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SPECS Project – User Requirements

Results from the user requirements stage of the project

Data Collection

- 11 interviews with patients and 1 questionnaire
- 2 interviews with professionals
- Focus group of AT Professionals

Data Analysis: Process

- Framework analysis method
  - Qualitative
  - Draws out themes from data
  - Retains subject's comments in the form of a table which is then evaluated
  - Allows for a focused qualitative analysis
  - Suits the requirements of product development.

Data Analysis: Scope

- All data analysed to provide information around the use of speech-driven EC
- Data also analysed to draw out 'blue sky' ideas: ideas/suggestions for new speech-driven Environmental Control.

Data Analysis: Outcomes

- Report on voice control of Environmental Control
  - Users and professionals perceptions
  - Main themes and issues, exampled with quotes
- Input into user-interface & hardware specifications for the new device development

Data Analysis: Themes

- Main themes defined through project specification:
  - Factors influencing failure
  - Factors influencing success
  - Interface
  - SPECS Usage
  - Background issues

Results: Factors influencing failure

- Changes in voice affect system
- Difficulty interfacing with peripherals
- Difficulty of training new functions
- Lack of patience with system
- Lack of Training
- Learning the operation of the device
- Limited menus

Results: Factors influencing failure

- Phonetic similarity of words
- Problems with batteries or IR
- Reliability
- Sound Interference
- Specific Charateristics Required for Voice
- Other

Extracts: Factors influencing failure

- "If my dog barks it will turn the channel over. If my cat cries, the volume goes up. It's just –

I It picks up lots of other noise.

Yes. "

- "if I had a full powerful voice it would probably be alright, but it is not and sometimes I have ended up not being able to answer the phone."

- "so if you took the numbers one to nine, so one, two, three, four all sound different, five sounds like nine for some strange reason"

Results: Factors influencing success

- Ability to use any word for commands
- Non speech backup for some functions
- Simplicity of use
- Speed of operation
- System training
- Tailoring the device to the user's needs
- Use of voice when can't access other system
- Using particular voice intonation and patterning (consistency)
- Other

Extracts: Factors influencing success

- "I suppose now my arm movements have got better but my arms still stiffen up, at night time especially, so that's when the voice comes into operation and I rely on my voice more."

- "The main advantages of voice operated is speed, with the Steeper where you have to press the button, you have to go through a menu, irrelevant of what you're doing,"

- "they've both got their benefits and they've both got the pitfalls, but together they're good"

Results: Interface

- Environmental factors
- Feedback
- Finds scanning systems slow
- Importance of Aesthetics
- Microphone Usage
- Understanding how to talk to the device
- Other

Extracts: Interface

- "A typical woman. If you speak calm, get what you want in the end, shout at them, go off in a huff."

- "I found the one where I had to dong, that was very frustrating, I mean that used to send my nerves on end because if I missed the right line you're back to the beginning again and start again."

- "I never use the display, I always listen to it speaking back. I don't even bother sometimes with that, I look and see what it's done to the screen. But yes, sometimes it's useful to listen to the speaking back because you know where the errors have gone, you hear the errors."

Results: SPECS Usage

- Backup Device
- Human Backup
- Choice not to control 'security' functions
- Gives Independence
- Menu Structure
- Reduces load on carers
- Risk assessment of functions to control
- Set up and training
- Used where switch input is not acceptable
- Other

Extracts: SPECS Usage

- "whereas with the TV the worst thing that could happen is you end up watching the wrong channel or it gets too loud and when somebody then does come to assist you, you haven't threatened your existence."

- "One's got to be really careful, if you're controlling things that are a security or life functions then you have to be hugely careful because voice is inherently problematic"

- "I can open and shut a curtain, if I want to look at the moon I can do, if I want some fresh air in the room I can open the window, I can put my heater on if I get a bit cold, so it has made a big difference to my role in the house on my own."

Results: Background

- Carers
- Cognitive Ability
- Computer literacy
- Disability or Condition
- Environmental Control Controllers Used
- Functions controlled with Environmental Control
- Previous EC use
- Previous use of voice recognition
- Good relationship with EC service
- Other

Extracts: Background

- "My background is in computing so consequently I'm used to things like this"

- If you're spinal chord injured it's different because say it didn't' work, you know, you've got a long way to go by definition probably in the 16 to 24 age bracket you've probably got another 40, 50 years to tick along

- "I'm a really busy person, I run Avon, I'm an Avon representative and I'm one of the best sellers of things like this, so that's a little kind of thing I do on the side which keeps me on the go, keeps my mind on the go, I mean I like to do crossword puzzles and things like that."

Summary

- Selection bias towards speech-driven EC
  - Computer literate
  - Previous use of voice to control computer
  - Motivated
  - No or minimum cognitive impairment
- Personal identification of technology

Summary

- Frustration with switch operation
- However in most cases there was a requirement for backup for reassurance
  - Generally backup device was switch operated
- Lack of trust in speech driven EC led to users giving positive feedback about having a back-up system
  - Importance of new device having some form of back-up method of operation was highlighted

Summary

- Users not that bothered by having to repeat commands
  - however often not confident to have only a speech device due to concerns about reliability
- Considerable feedback about reliability
  - Affect of changes in voice (due to time of day or condition)
  - Affect of noise on reliability of device

Summary

- Feedback that using speech can be a faster operation method
- Couple of users using a combination of speech and switch/direct access to achieve most efficient operation for them
  - e.g. a participant who when watching a video and someone comes to the door would answer the door using his switch access EC but then use the speech-driven system to pause the video

Summary

- Training
  - Participants reported finding this tiring
  - Some participants eager to have ability to program the device themselves
  - Comparison with things like Dragon Naturally Speaking which continuously learn and hence reliability gets better

Summary

- Feedback
  - All users used voice feedback – generally positive
  - Views on a visual display were mixed
- General considerations
  - Aesthetics
  - Mounting
  - Size
  - How it will move with the user

Next Steps

- Trial user interface and concepts with users
- Trail ‘Alpha prototypes’ and concepts with users
- Feedback -> design ‘Beta’ version
- Clinical Trials
- Release

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Discussion: Solutions

Suggest solutions to each of the factors indentified by users

(Groups)

Factors influencing failure

- **Changes in voice affect system**
  - This was a quite well referenced sub-theme, many participants reported how different problems with their voice affected the system – reasons for this included temporary illness, time of day, general deterioration, or variation in voice throughout the day.
- **Solutions**
  -

Factors influencing failure

- **Difficulty interfacing with some peripherals**
  - Some practical issues were raised around the problems with access to some household and specialist equipment – some of these problems were perceived as being due to having two separate systems, others were around equipment that had not been added to the system and interfacing with the phone seemed to have particular issues
- **Solutions**
  -

Factors influencing failure

- **Difficulty of training new functions**
  - The majority of participants did not train the device themselves and did not feel comfortable asking carers and so relied on asking the Environmental Control service to do it which is not always convenient.
- **Solutions**
  -

Factors influencing failure

- **Lack of patience with the system**
  - Several participants expressed that they got frustrated and angry with the system in some circumstances and this was perceived to be detrimental to the operation of the device.
- **Solutions**
  -

Factors influencing failure

- **Lack of training & Learning the operation of the device**
  - Some participants identified lack of training as having a negative impact on their success with the device, in addition several participants identified that speech-driven devices had a significant learning curve.
- **Solutions**
  -

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- **Solutions**
  -

Factors influencing failure

- **Limited Menus**
  - Although this was not heavily referenced, some participants identified the limited menu structure on the device as a problem.
- **Solutions**
  -

Factors influencing failure

- **Phonetic similarity of words**
  - A fairly well referenced sub-theme related to the speech-driven devices being less reliable with words that sound similar and the requirement to have strategies to cope with the system's inability to discriminate between these words.
- **Solutions**
  -

Factors influencing failure

- **Problems with batteries and IR**
  - Practical issues were raised about device's battery life and battery warnings and the issues with Infra Red requiring careful device positioning and not working with some modern TVs etc.
- **Solutions**
  -

Factors influencing failure

- **Reliability**
  - The most heavily referenced perceived reason for failure, reliability was seen as a key issue by many participants. One of the main problems of reliability was identified as sound interference (see separate sub-theme) and included misinterpretation of commands, however most participants had an overall feeling that the device was not reliable. Participants identified a range of frequencies of unreliability, but most experienced problems daily.
- **Solutions**
  -

Factors influencing failure

- **Sound Interference**
  - Strongly identified as a reason for failure, sound interference problems were fairly common in nature – with interference coming from other people, background noise, or noise from other equipment (particularly telephones and TVs).
- **Solutions**
  -

Factors influencing failure

- Specific characteristics required for voice
  - As well as other issues relating to voice input to the device (e.g. phonetic similarity of words, changes in voice, sound interference) participants reported that they perceived that there was a specific way in which the device should be 'spoken to'

- **Solutions**
  -

Factors influencing failure

- **Variability in voice and acoustics due to environment**
  - Some participants noted that environmental factors affected the operation of their device, these included location of use and device location relative to user.
- **Solutions**
  -

Factors influencing failure

- **Other issues influencing failure**
  - There were some other general reasons that participants regarded as being negative attributes of speech-driven EC, these included nervousness of using it (linked to reliability), issues with installations, problems with support and microphones.
- **Solutions**
  -

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Demonstration

New voice device

User Interface of new device

Additional Features

- Reliability / Recognition – based on STARDUST work:
  - Reliable recognition of dysathric speech
  - Training method to improve reliability
- Wireless connectivity
  - headset/speakers/switch
- Possible external display connections (TV etc)
- Speech synthesis and/or recording
- Alternative operation modes - scanning

Discussion: Design

- Two groups
- Critique the design
  - Hardware
  - Software/User Interface
  - Other factors

Design Critique

- Hardware
  - Size
  - Display
  - Mounting etc…

Design Critique

- User Interface
  - Feedback
  - Programming

Design Critique

- General/Other Improvements

Feedback - Design

Summary

- Speech access is a viable method of access
- Existing voice access solutions exist
- SPECS project developing 'Speech Enabled EC' device suitable for dysarthric speech

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Thanks!

Leave your card/email address for updates.