Final Version

The Centre for Health Innovation

Technology Services

VACIS Speech Recognition

Feasibility study of Voice enabled input to a VACIS Tablet

Phase 1 - Preliminary Findings Report

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Record of Revisions

Version Number	Section(s) Affected	Brief Description of Change	Date of Issue	Changed By	Authorised By
0.1 "Draft"	All	Creation of new document	NA	Frank Smolenaers	Frank Smolenaers
1.0 "Final"	All	Reviewed and added in appendices	06-11-2008	Frank Smolenaers	Frank Smolenaers

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DISTRIBUTION

This paper is intended for the members of the VACIS project team and was commissioned by Sue Evans, Centre of Research Excellence in Patient Safety Department of Epidemiology (CREPS).

BACKGROUND

The Centre for Health Innovation (CHI) was made aware of the VACIS project during a visit to the Centre by Noelle McCabe from MAS several months ago. At that time, and since, the issue of Paramedic to ED staff handover has been discussed – in particular, the inability of Paramedics to input data (such as notes, observations and medications) whilst gloved, and attending to a patient in the ambulance en route to a hospital ED.

The CHI has working demonstrations of speech recognition solutions with capability to convert speech to text, a technology that is maturing rapidly. It was suggested that perhaps a solution could be researched and initially investigated to see if there is potential for a field trial.

MAS provided a "VACIS Speech Recognition" scope document and CHI responded with a proposal, which was duly accepted by Sue Evans.

PURPOSE

The report provides an overview of the feasibility study performed over the last 6 weeks at CHI. The aim of the exercise was to validate the concept to allow Ambulance officer's hands free input into the VACIS application using naturally spoken commands.

CHI has produced this document to assist in guiding the broader project team on the utility of this potential solution.

METHODOLOGY AND OUTCOMES

The following outlines the steps taken during this evaluation and key outcomes:

1. CHI negotiated the complimentary services of VoicePerfect Systems, a certified integrator of speech recognition solutions based on a world leading speech recognition platform from Nuance.
2. CHI assembled the team of investigators namely:
    a. Ernst Merkenich – VACIS Subject Matter Expert (SME) from MAS
    b. Wayne Doyle – Speech system technical resource from VoicePerfect Systems

c. Carol Yeomen – Project management from VoicePerfect Systems
d. Frank Smolenaers – ICT Innovator and technology consultant from CHI

3. An initial familiarisation meeting to assess if there was merit in to proceeding to an in-house trial, at which:
    a. Ernst delivered the test VACIS Panasonic Tough book Tablet for the purpose of the study under a loan agreement to CHI
    b. Ernst provided a run through of the VACIS application architecture and screens
    c. Wayne provided an overview of speech recognition capability
    d. Discussed were: User licensing (per user), editing mistakes (augmented by audio feedback or post editing), size of user profiles (can be kept to a minimum so as not to invoke unduly network traffic and can have prepared default profile with many key words cached) and HW requirements (1 GB of memory preferred, Dragon uses about 100-200 MB of RAM)
    e. It was agreed to proceed to a small in-house test using a headset and investigate JAVA API's for integration and the size of user profiles – later found no API in the Dragon "Software Development Kit" (SDK)
    f. Ernst agreed to supply a tabulated scoring sheet inclusive of criteria that needed to be assessed
4. Subsequently, CHI & VoicePerfect prepared the tablet for the study by:
    a. Familiarisation with the local desktop login & login to VACIS
    b. Installation of Dragon Naturally Speaking 10 (from USB key)
    c. Installation of a headset
5. The group met again at CHI to commence the in-house test and was joined by Steven Hampton from MAS. The outcome was:
    a. Ernst supplied a first draft of the test criteria in hard copy only – first draft (see Appendix 1) – 2nd draft never received
    b. Wayne configured Dragon Naturally Speaking (initial profile, voice and audio checks etc.) and commenced testing it's ability to command the application
    c. Numerous navigation difficulties were encountered due to constraints in the way VACIS was written (see report in Appendix 2 – lack of hot keys and "Home" position etc.)
    d. Direct speech control of the VACIS application was looking like a huge project unlikely to be completed in the short or medium term

e. Frank suggested it may still be of value to have utterances logged in a document on the tablet, external to the VACIS application. As the Paramedic administered medication or recorded observations, they would utter the information which would be recorded with time and date stamp – possibly with a prefix such as “History”, “Obs” or “Meds” – these prefixes may map into VACIS fields in due course

f. Wayne informed the team that such an application has been developed (called MultiSpeak”, used to date and time stamp the utterances from several participants in a meeting, with aim to auto generate minutes on the fly – it could assist

g. It was agreed that if VACIS could not be commanded by speech, then this interim solution proposed by Frank may be of value as it would:

    i. Record utterances in real time and convert to text
    ii. Provide a time stamped record of all activity
    iii. Fits the current practice of the attending Paramedic calling out his thoughts, observations and actions to a partner driving the ambulance – hence minimal impact on workflow and ease of use
    iv. Could possibly be electronically handed over at ED (or at least read out or printed)
    v. Would serve as a definitive record for the Paramedic to populate info into VACIS post handover (as is the current practice)
    vi. May possibly be parsed by a further application to automate the input into VACIS, saving typing time.

h. It was agreed that Wayne would summarise the issues and recommend a way forward within the technical contraints

At this point, Wayne was hospitalised for an illness and the progress faulted.

CHI has been able to obtain a draft of Wayne’s document and it is attached in Appendix 2.

The study was terminated and this report finalised to meet the reporting deadline of the greater VACIS project.

CONCLUSIONS

1. The design of VACIS screen layout/navigation, and the lack of JAVA integration between Dragon Naturally Speaking and VACIS, renders direct speech control of VACIS impractical.
2. CHI is sensitive to the needs of all health workers in that they are time poor and any viable solution needs to add value and not be onerous. This useability requirement could not be met by the initial concept that was tested due to the tedious command sequence to navigate to a fields and enter data using speech.
3. The development time and cost to facilitate smooth speech command of VACIS is not practical.
4. A plausible solution to add value to the handover process, and subsequent retrospective keying in of information into VACIS, may a solution such as MultiSpeak - recording utterances as they occur and converting to time stamped typed sentences.

RECOMMENDATION

Should the opportunity arise, it is recommended that consideration be given to evaluate the benefit of a having an electronic record of utterances available at handover to ED and during subsequent keyboard entry into VACIS.

If successful, further investigation could carried out to ascertain if this record (now in the form of typed text) could be provided electronically to the ED at handover and or parsed to automatically populate the data into VACIS.

APPENDIX 1 – ASSESMENT CRITERIA (DRAFT)

(Author: Ernst Merkenich)

Criteria	Assessment Category	Requirement
VACIS Integration		
	Support for Java integration	mandatory
	OS independence	desirable
Workflow Impact		
	Ability to incorporate SR actions within normal conversation	mandatory
	Ability to incorporate SR actions within normal background noise	mandatory
Training		
	User profile maintenance	mandatory
	User profile deployment	mandatory
Speed & Accuracy		
	Dictation rate	desirable @ normal conversational speed
	Error Rate	desirable @ 100%
Navigability		
	Ability to discern between data entry and navigation commands	mandatory
	Ability to recognise screen elements (eg. comboboxes, listviews, treeviews, buttons, etc.)	mandatory
Vocabulary		
	Clinical vocabulary support	mandatory
	Learning and update to user profiles	mandatory

APPENDIX 2 – ISSUES AND OPTIONS

(Author: Wayne Doyle)

Speech recognition from Dragon NaturallySpeaking for use by the ambulance members infield to create reports in real-time and enter results.
Without significant changes to the user interface of VACIS Dragon NaturallySpeaking will not be a practical solution.

Changes needed include:

- **Hotkeys**
  As the VACIS application does not support the use of hotkeys preliminary testing of any voice user interface to the system would require us to use of the screen position of the buttons and mouse clicks. This is inherently unstable and not ideal for proper testing.

- **Dragon NaturallySpeaking API integration (client SDK)**
  Dragon NaturallySpeaking API integration would allow for the VACIS application to control the Dragon NaturallySpeaking engine. This would allow the speech recognition engines grammar to be limited to only the required parts of the screen for example in the name prefix field only having the words Mr, Mrs, Miss, Dr in the active dictionary.
  The API integration would need to be entered into by agreement with Nuance and costs around 5000 USD per year.
  API integration would require a significant amount of development time and cost.
  As the application is also written in Java (not natively supported by the Dragon SDK) help and access to resources and materials for the development team will be limited.

- **VUI (voice user Interface) development**
  The application will also require a voice user interface to be developed so that various parts of the Interface can be navigated to by voice commands, this interface would require extensive testing from the users.
  Some of the ideas around in this interface would include commands like "new observation", "blood pressure".

- **User Acceptance Testing**
  Another part of the project would require that the members themselves are consulted and that the interface that is developed would also be accepted and used by the members.

Other possibilities
During the discussions it has come to our attention that what may be a better solution and warrants further investigation is using a speech recognition application to capture events within the ambulance:

Keyword	Data
"Medical Record"	"10 cc adrenaline"
"Observations"	"BP 120/60"

These events could be directly inserted into the VACIS database and allow for a quick handover at the hospital ER.
This particular application would be easier to develop then the integration of Dragon NaturallySpeaking within VACIS, and as it would sit outside of the application not require the use of Java (not natively supported by the Dragon SDK).

Wayne Doyle
Operations Manager, Voice Perfect Systems