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Developing further speech recognition resources for Welsh

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Welsh Government

S4C

GALLU

- Gwaith Adnabod Lleferydd Uwch
- “Further speech recognition work”
  - Developing speech recognition technology for the Welsh language

Welsh + technology

- ~ 562,000 speakers of Welsh in Wales
- “small” number of speakers
- Languages with small numbers of speakers under-resourced:
  - Availability of funding
  - Interest in funding

Funders:

Encourage "the development of new Welsh-language software applications and digital services"

(Welsh Government, 2013; 12)

- Smart televisions
- Gaming systems

Aims of the GALLU project

- Collect a new Welsh speech corpus through crowdsourcing
- Develop resources for a large-vocabulary continuous speech recognition system (LVCSR) based on this corpus
- Develop a script to control a toy robot using Welsh speech commands (for the Raspberry Pi)

Previous work on Welsh speech technology

- WISPR project (Welsh and Irish Speech Processing Resources)
  - Resources used by private companies to develop commercial Welsh voices
- Sphinx foundation project on Speech Recognition
  - Resulted in laboratory prototypes
- Need for improved speech recognition for Welsh language

Data design: preparing the corpus

- Aim: to cover the most common sound combinations in the language
- Prompt design
- 29 consonants, 13 monophthongs, 13 diphthongs dependent on variety

  (Awbery, 1984; Ball, 1984; Jones, 1984; Ball and Williams, 2001; Mayr and Davies, 2011 etc)

Letter to sound rules

- LTS Rules for mapping orthography onto pronunciation
- Data mining using the LTS rules
  - Most common sounds and words in a corpus of speech
- Combinations of singular sounds, 2 sounds (di-phones) and 3 sounds (tri-phones)
- These checked for readability

Data design

- The final prompt set contains 43 prompts (i.e. lines of words)
- 8 words per prompt
- = 344 words
- Around half an hour to 45 minutes to record

Data Collection

- Large number of speakers required for speech recognition
- Speaker variation also desired
- Recording sessions can be costly and time consuming

crowdsourcing, *n.*

- The practice of obtaining information or services by soliciting input from a large number of people, typically via the Internet and often without offering compensation.

OED Online, 2014

The Paldaruo App

- Smart phones and tablets commonplace
- Purpose made App for iOS and Android
- Read a script used to train the speech recognition system

Crowdsourcing and the Paldaruo App

- Metadata:
  - Age
  - Sex
  - Childhood living area
  - Current living area
  - Frequency speaking Welsh
  - Categorise the accent

What does Paldaruo do?

- Background info:
  - Create a profile
    - Multiple profiles on one device
  - Collects the metadata
  - Terms and conditions
  - More information (including video)
  - Background noise check

Paldaruo

Torfoli Corpws Adnabod Lleferydd Cymraeg

Dewisiwch broffil neu gliciwch 'Ychwanegu Proffil' i greu un newydd

Dewi

Rhys

dewi

dewi

rygdhf

Ychwanegu Proffil

Cychwyn >

Uned Technolegau Iaith, Canolfan Bedwyr, Prifysgol Bangor

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What does Paldaruo do?

- Presents prompts
- Start and end recording
- Automatically *listen t*o recording
  - Option to re-record
- Reports sound levels
  - Prevents too quiet or clipped sound files
- Sends to server

iPad 11:33 100%

Paldaruo

Torfoli Corpws Adnabod Lleferydd Cymraeg

Nôl i'r Cychwyn

Helo Rhys!

12 / 12 testun ar ôl

AGOR AGOR CAU CAU AGOR AGOR CAU CAU

Yn recordio....

Cliciwch i orffen recordio

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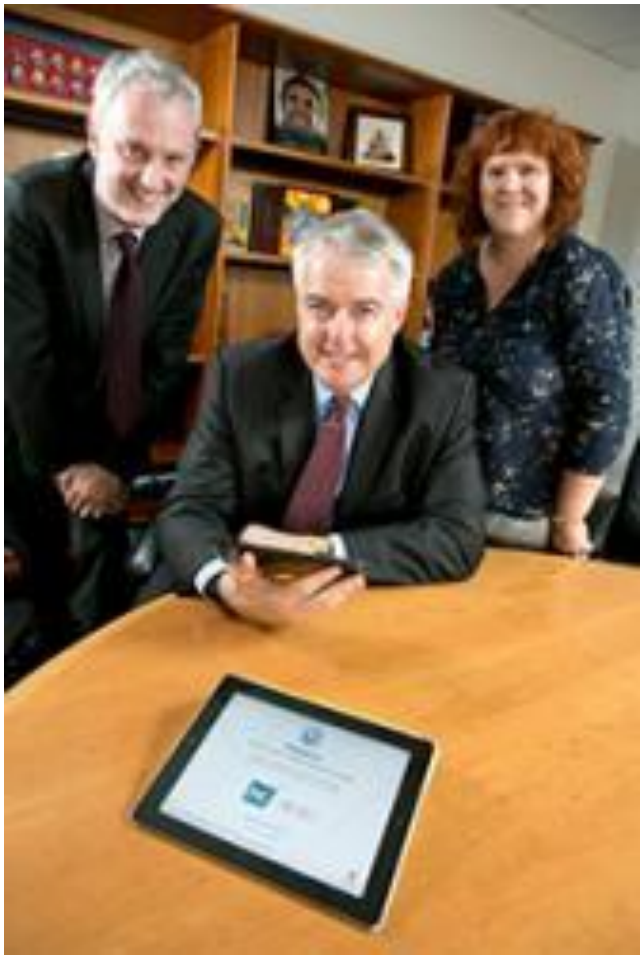
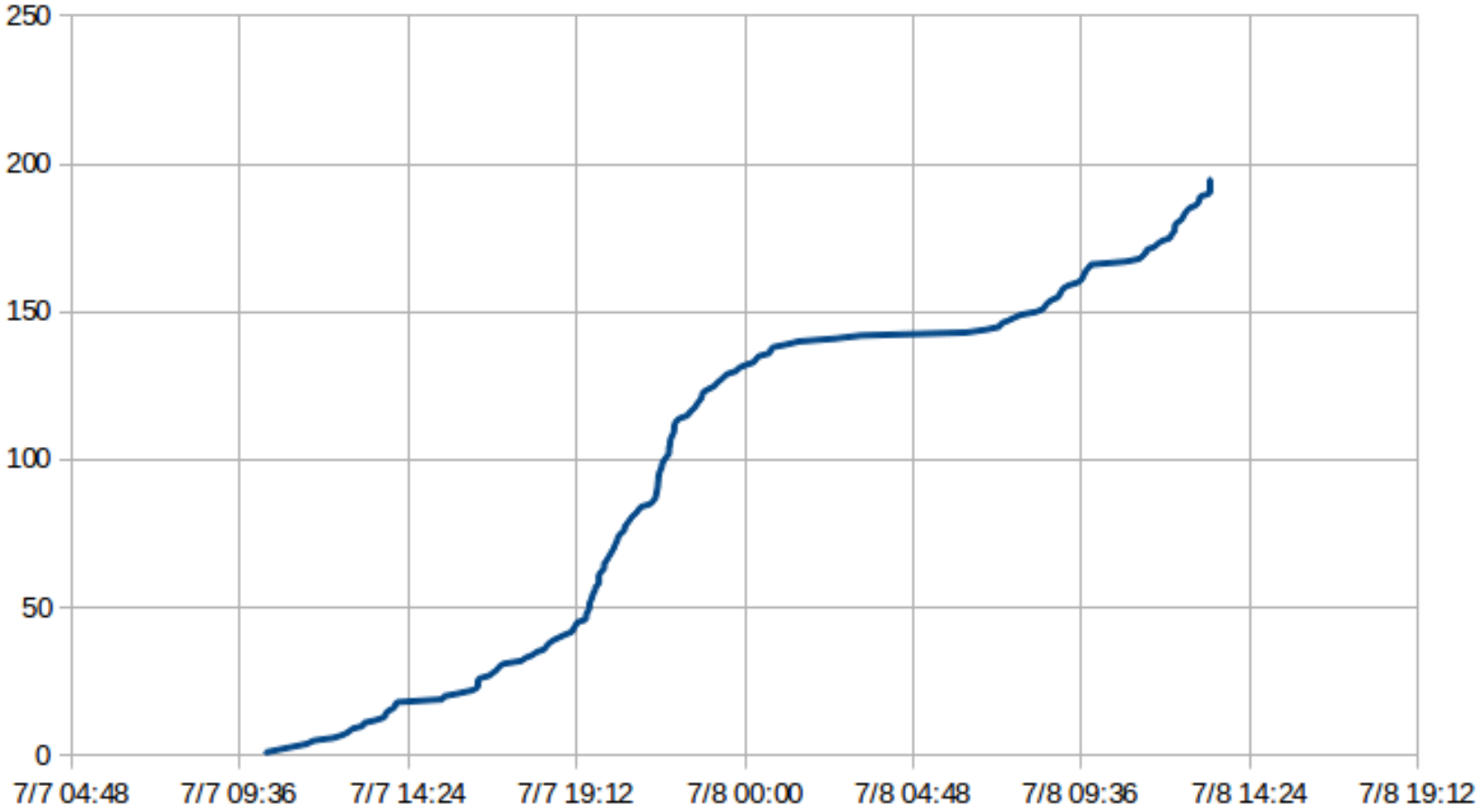
Paldaruo Launch (7.7.14)

- Carwyn Jones, First Minister the first to contribute
- Press release and subsequent news stories:
  - Radio:
  - Television
  - News websites
  - Twitter

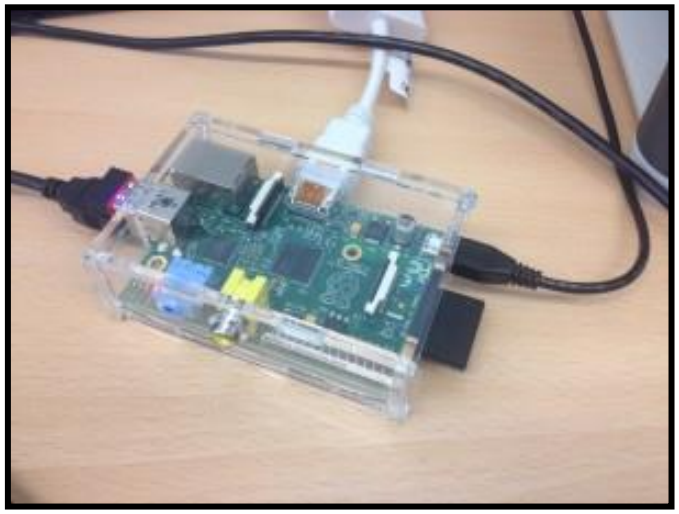


Paldaruo Launch



Pilot Data Application

- Raspberry Pi: small credit card sized computer £30
- Small toy robotic arm
- Use basic speech recognition system to control the robotic arm



Pilot data set

- 20 recordings of people reading prompts designed system for the robotic arm
- Used a beta version of the Paldaruo App to collect the data
- This was useful in raising issues such as noise levels
- Data set available now on http://techiaith.bangor.ac.uk/resources/gallu/samples/

Developing Speech Recogniton

- HTK: Hidden Markov Model Toolkit
  - used primarily for speech recognition research
  - Used to create acoustic models
- Julius: open-source large vocabulary speech recognition engine

Licensing

- permissive open-source licensing
- MIT licence
- allows royalty-free use in both open-source and proprietary systems

Resources available at the end of the project

- Data
- Tutorial on creating acoustic models for robotic arm
- Acoustic models for large data set
- App Source Code

Diolch

techiaith.bangor.ac.uk/gallu

AppStores: Paldaruo

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Example prompts

rhybuddio, Elen, uwchraddio, hwnnw, beic, Cymru, rhoi, aelod

rh @ b U1 dd IO | E1 l E n | UW ch r A1 dd IO | h W1 nn W
b EI1 c | c @1 m r U | rh OI1 | AE1 l O d

hyn, newyddion, ar, roedd, pan, llun, melin, sychu

h Y1 n | n EW @1 dd IO n | A1 r | r OE1 dd | p A1 n | ll U1 n
m E1 l I n | s @1 ch U