Outline

- Introduction
  - Speech disorders and current speech recognition technology
- Personal Speech Assistant Platforms
- Use case: mobile phone assistants
- Conclusions

Introduction

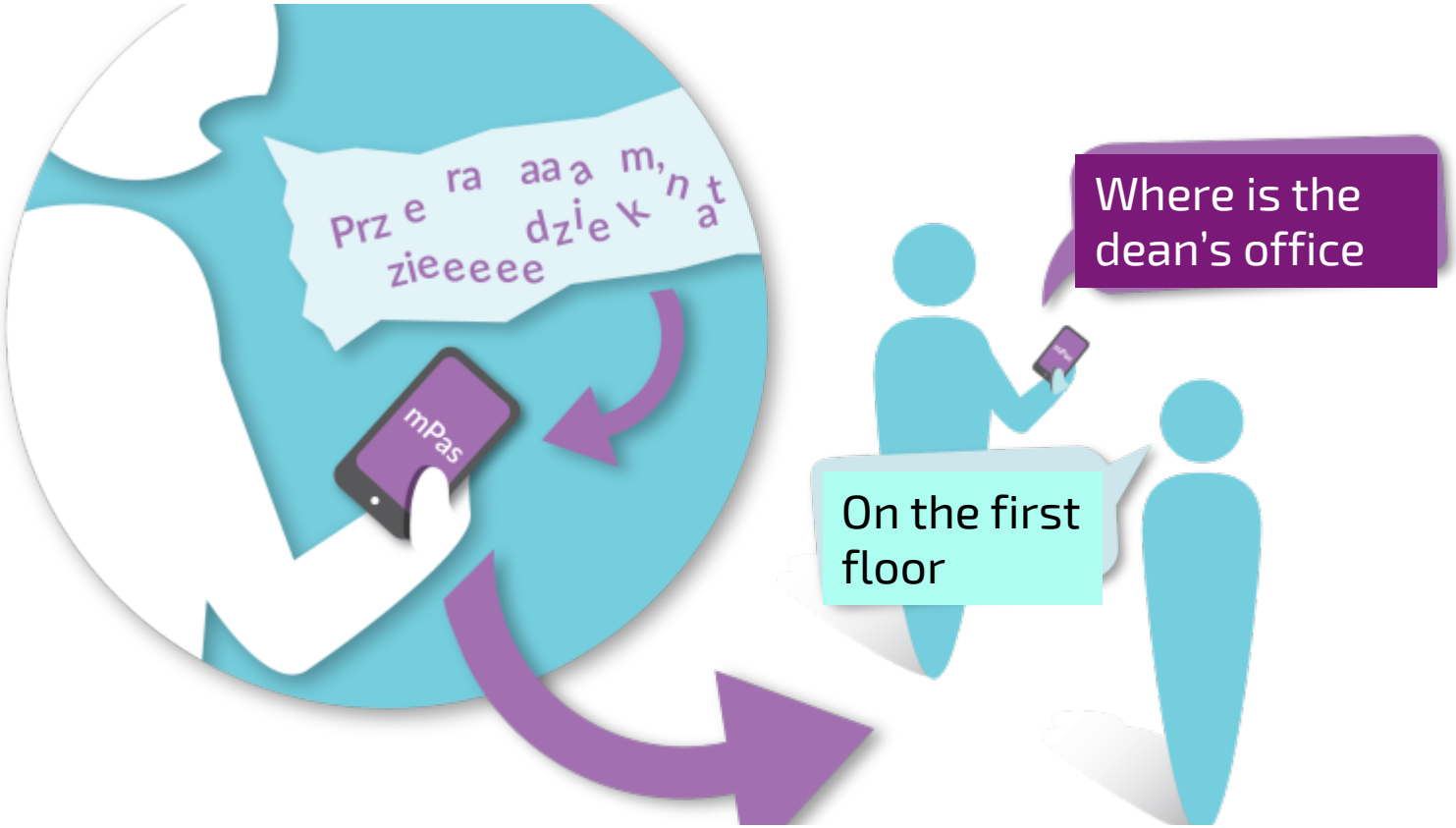
- Speech recognition of disordered speech
  - Devising speaker independent system is difficult (Rosen and Yampolski, 2000)
  - Adaptation of existing state-of-the-art systems is not satisfactory
  - Speaker dependent dysathric speech recognition systems

Introduction

- Current approaches
  - Systems created in laboratory conditions
  - Limited vocabulary and grammar
  - Final user is required to take part in training sessions at University or company premises
    - Mobility issues
    - Time of each session is limited

The National Centre for Research and Development

mPAS project



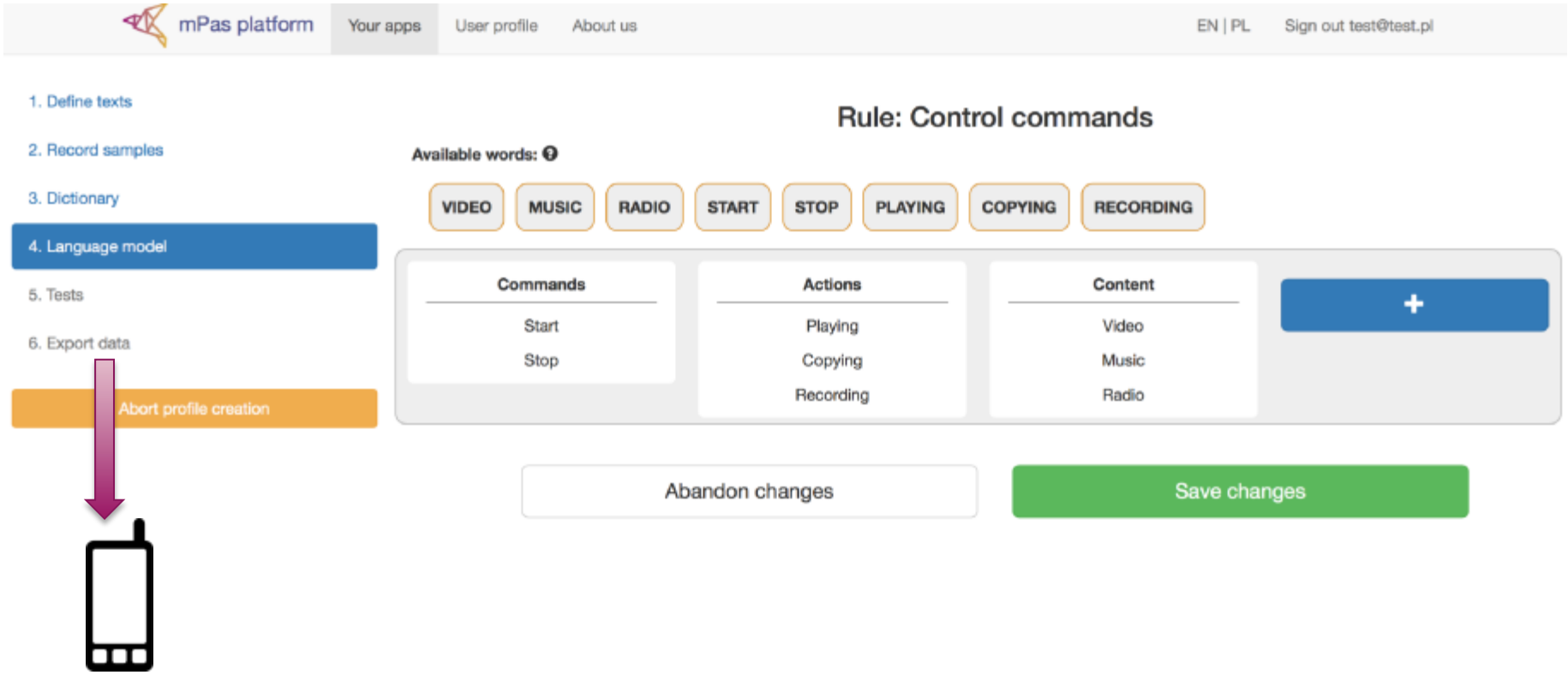
GIDO LABS

Personal speech assistant platform

- Platform that guides through the process of designing and building automatic disordered speech recognition systems
  - non-technical users develop their own speech recognition systems tailored to their needs and disabilities
  - No expert knowledge is required

GIDO LABS

Personal speech assistant platform

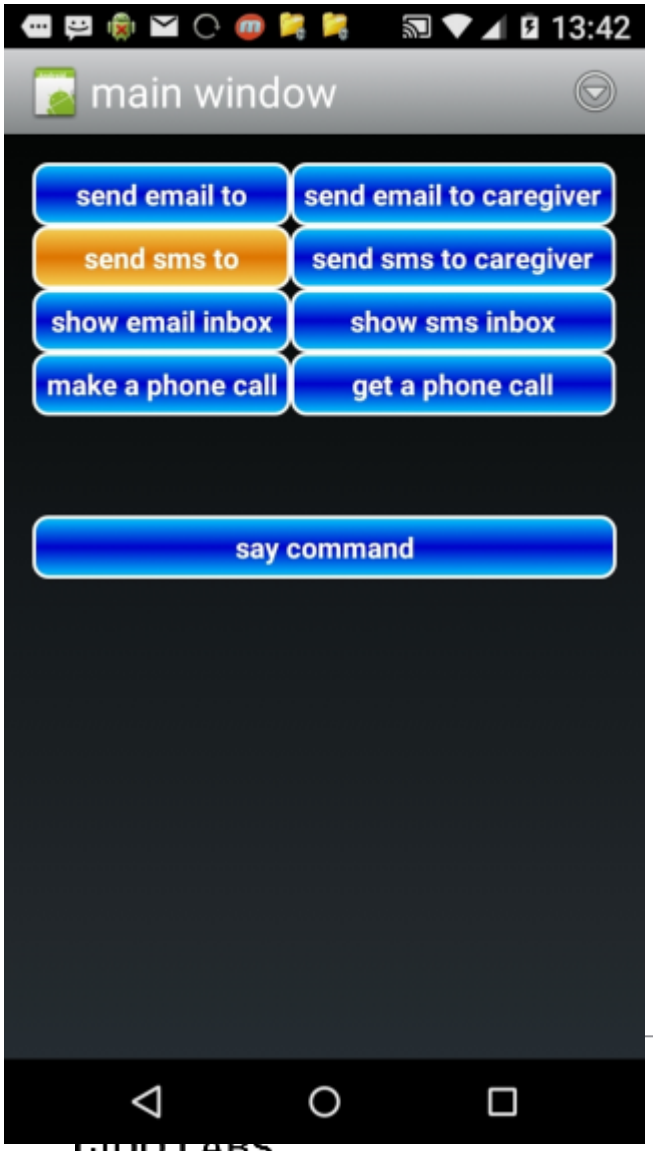


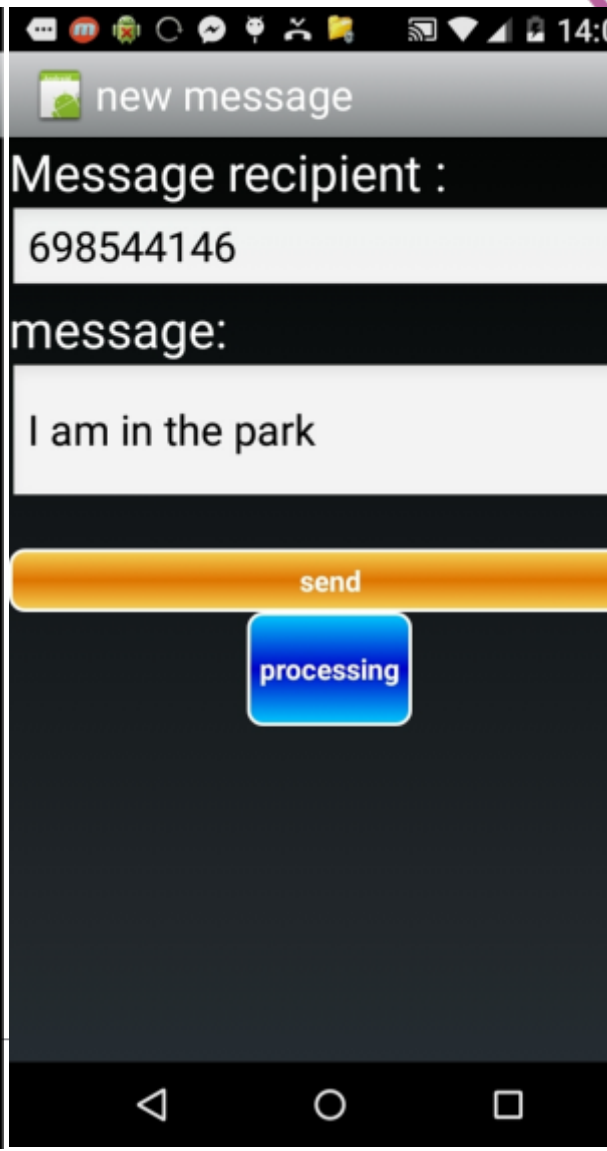
GIDO LABS

Mobile Speech Assistant

- Target group: people with motor disabilities and articulation dysfunctions
- Goal: control mobile phones by voice
  - send predefined emails and SMSs
  - Receive emails and SMSs
  - Make phone calls
- Design
  - User friendly GUI that minimizes the chances of executing wrong commands

Mobile Speech Assistant





Experimental setup

- User : a person with cerebral palsy and with distorted, explosive speech

- 21 different phrases
  - 8 predefined messages
  - 13 action commands
- Vocabulary size : 26 words

GIDO LABS

Experimental setup (1)

- Each phrase was recorded 30 times
- Sampling rate: 16000 Hz, frame period: 25 ms with 10 ms shift
- Mel Frequency Cepstral Coefficients: 12 static features, energy, 12 delta features, delta energy, 12 delta delta features, and delta delta energy
- Monophone HMM with 3 states
- One to eight mixtures per state

Experiment 1

- Laboratory conditions
- Training set: 2,4,6,8, or 10 examples of each phrase chosen randomly
- Test set: remaining data
- Cross validation method: 20 times, results averaged

83% to 99% of speech recognition system accuracy

Experiment 2

- Over 70 commands were spontaneously spoken to the mobile phone speech assistant
- User with explosive speech
  - Home/office environment
  - 82 commands
- User with modal speech
  - Outdoors with relatively strong wind
  - 72 commands

GIDO LABS

Experiment 2 - results

Commands	User with modal speech	User with speech disorders
Action	100%	81%
List control	89%	88%
Pre-defined messages	96%	80%
Total	94%	84%

GIDO LABS

Experiment 3

- Four actions:
  - Send SMS or email to a chosen person with predefined messages
  - Send SMS or email to a caregiver with predefined messages
- Measurements: time required to accomplish the action
  - By voice
  - By a traditional touch input

GIDO LABS

Experiment 3 - results

Action	Time – spoken input	Time manual input
Send SMS to caregiver	31 s	56 s
Send SMS to a person from a contact list	53 s	56 s
Send email to caregiver	33 s	65 s
Send email to a person from a contact list	60 s	65 s

Time gain: from 5% to 49%

User Quality Experience: voice interface preferred by the user

GIDO LABS

Conclusions

- Personal Speech Assistant platform
  - Non-technical user
  - No expert knowledge required
- Mobile Speech Assistant
  - User with motor and speech disorders indicated voice interface as the preferred one
  - Time gain ranging from 5% to 49%

GIDO LABS

GIDO LABS

Thank you for your attention!

a.b.cavalcante@gidolabs.eu

GIDO LABS

About Gido Labs

About Gido Labs

- Spin-out of Zylia sp. z o.o. (formery Telcordia Poland)
- SME, scientific and research organization
  - Development of new technologies in the area of machine learning, speech recognition, digital signal processing, and wireless networking
- We have sucessfuly completed several EU proposals and projects
- Our team member has served as an European Comission expert / reviewed proposals submitted to FP7 framework

GIDO LABS

Our achievements

- Successfully completed many research projects carried out in national and international consortia
- One full and one provisional patent application in the field of mobile ad hoc networks
- Publications in major international journals and conferences
- Award for outstanding young scientist given to one of our board members in the NCBR LIDER programme 2012 (Poland)

GIDO LABS

GIDO LABS

Thank you for your attention!

www.gidolabs.eu