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ACELP

Augmenting Communication using Environmental Data to drive Language Prediction

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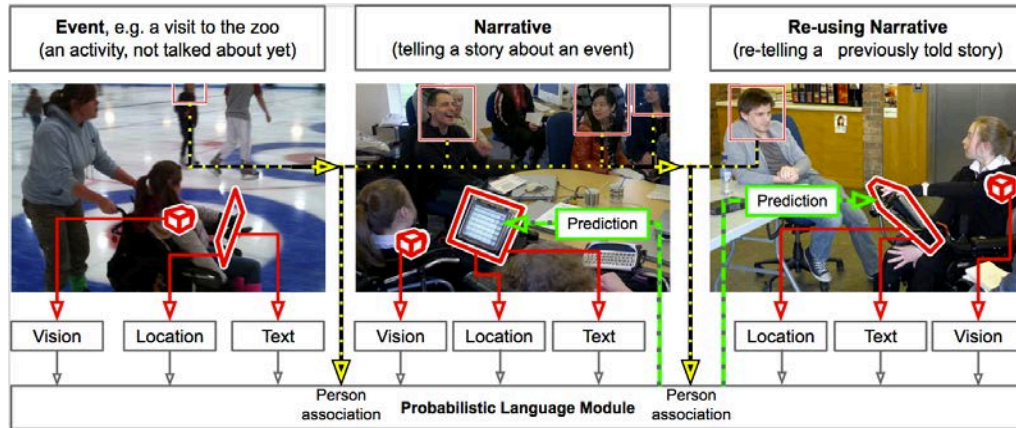
Our Aim

Our aim is to develop a communication system for nonspeaking people which will improve on the speed of communication by automatically populating the system with appropriate conversational items within an adaptive interface that provides control over timing and delivery whilst minimising physical and cognitive load.

Speech rate comparison: Natural speech (top), AAC: average (middle), switch access with acceleration, example (bottom)

150 words/minute	
12 w/min	
2 w/min	

Event, e.g. a visit to the zoo (an activity, not talked about yet)	Narrative (telling a story about an event)	Re-using Narrative (re-telling a previously told story)
Vision / Location / Text	Vision / Location / Text / Prediction	Prediction / Location / Text / Vision

Person association — **Probabilistic Language Module** — Person association

Proposed System

Integrated contextual, adaptive SGD for individuals with physical disabilities:
- Use of computer vision and contextual data collection to inform prediction;
- Development of a new user interface for access to predicted words, phrases and stories.

Possible through:
- Recent advances in environmental data collection;
- Ability to process large amounts of data in real-time;
- Probabilistic language modelling and the availability of mobile platforms.

Current AAC Technology

Text-based Speech Generating Devices (SGDs):
- Keyboard: direct access / scanning;
- Encoding, expansion, prediction, disambiguation.

Use of Conversational Language Models:
- Handcrafted contextual conversational items;
- Stages of conversation (e.g. greetings, farewells);
- Data-to-text sentence generators for narrative based systems.

Use of Sensor Data :
- Context prediction;
- Story generation.

Word and phrase prediction, on-screen keyboard, direct or scanning switch access. claro-apps.com

Script based utterance system for situational conversations. McCoy et al. 2010

Location context determination using GPS and Wifi on iPhone; myvoiceaac.com

Disambiguation with direct access through eye gaze with dwell-free typing. tobiidynavox.com
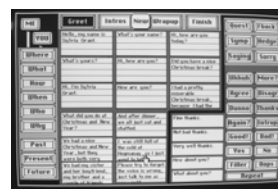
T.A.L.K. with handcrafted conversational items. Todman et al. 1994
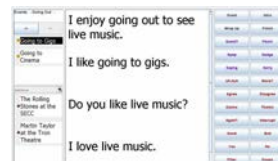

Egocentric video data for context relevant vocabulary identification and provision. Shamdani and Peña 2015

Encoding (Semantic Compaction) with direct or scanning switch access. minspeak.com

Data-to-text for automatic phrase generation based on personal experience data. Dempster et al. 2010

Limitations:
- Scanning word lists (prediction)
- Access method needs training (disambiguation)
- Limited vocabulary (encoding)
- Need to remember the existence and location of conversational items (encoding, pre-stored);
- Not timely or fitting (script, pre-stored)

References

Dempster M, N Alm and E Reiter (2010). Automatic generation of conversational utterances and narrative for Augmentative and Alternative Communication: a prototype system. SLPAT Workshop, Los Angeles, USA.
McCoy KF, J Bedrosian and L Hoag (2010). Implications of Pragmatic and Cognitive Theories on the Design of Utterance-Based AAC Systems. SLPAT Workshop, Los Angeles, USA.
Shamdani S and A Peña (2015). Verse: Contextual augmented reality communication aid. Communicaiton Matters Conference, Leeds, UK.
Todman J, N Alm and L Elder (1994). Computer-aided conversation: a prototype system for nonspeaking people with physical disabilities. Applied Psycholinguistics.

Acknowledgements

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