



## Vocal Prototyping Workshop

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## Why Vocal Prototyping

- Vocal Prototyping: *Prototyping sound designs using the human voice*
- Vocal Prototyping useful when working on:
  - Interactive designs
  - Early prototyping stages, when the design is very open
    - Unknown technological solutions
    - Multiple technologies combined
    - Hard-to-manage input
    - Extreme environments (water, weather, children)
  - Working with people from different disciplines

Example from the gesture-sound workshop (Bencina, Wilde & Langley): <http://www.daniellewilde.com/docs/gesture-sound.html>

# The Human Voice

- The human voice has great expressive power
- Normal speech (fundamental frequency) between
  - Male: 80-150Hz
  - Female: 160-250Hz
- Fundamental frequency range ~2-4 octaves
- The human vocal tract capable of producing a variety of sounds.
  - coughing, laughing, yawning, speech sounds, kissing, yodling, gurgling....

# Speech sounds

- 58 pulmonic consonants + clicks, implosives and ejectives
- Theoretically unlimited number of vowels + vowel combinations
- 5 known tone contours + various accents
- Articulatory modifications

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal		m ɱ		n ɳ		ɳ̠	ɲ	ŋ	ɴ		
Trill				ʀ							
Tap or Flap				ɾ		ɽ					
Fricative		f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant				ɹ			j	ɰ			
Lateral approximant				l			ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

**CONSONANTS (NON-PULMONIC)**

	Clicks	Voiced implosives	Ejectives
Bilabial	ɓ	ɓ̥	
Dental	ɗ	ɗ̥	ɗ̥
Postalveolar	ɠ	ɠ̥	ɠ̥
Palatoalveolar	ɠ	ɠ̥	ɠ̥
Alveolar lateral	ɠ	ɠ̥	ɠ̥

**OTHER SYMBOLS**

ʍ Voiced labial-velar fricative  
 ʋ Voiced labial-velar approximant  
 ɹ Voiced labial-palatal approximant  
 ɻ Voiced alveolar fricative  
 ɣ Voiced epiglottal fricative  
 ʕ Voiced epiglottal fricative  
 ʡ Epiglottal plosive

ɕ Affricate and double articulation can be represented by two symbols joined by a tie if necessary  
 ʎ Epiglottal plosive

**DIACRITICS** Diacritics may be placed above a symbol with a descender, e.g. ɲ̥

	Voiced	Voiced	Voiced	Voiced	Voiced	Voiced	Voiced	Voiced	Voiced	Voiced	Voiced
Voiced	ɲ	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Voiced	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Approximant	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
More rounded	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Less rounded	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Advanced	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Retracted	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Combinatorial	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Mid-centralized	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Syllabic	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Non-syllabic	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥
Rhoticity	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥	ɲ̥

**VOWELS**

## Examples

- Lucia Di'Lammermoor, il dolce suono (Inva Mula): <http://www.youtube.com/watch?v=E33Nt8f6UwI&feature=related> (3:20->)
- Pink Panther (Bobby McFerrin): [http://www.youtube.com/watch?v=L\\_aFQe0Cyg4&feature=related](http://www.youtube.com/watch?v=L_aFQe0Cyg4&feature=related)
- Beatboxing: <http://www.youtube.com/watch?v=ghBgnv3XCal&feature=related> (1:29->2:16)
- Xhosa (Miriam Makeba): <http://www.youtube.com/watch?v=2Mwh9z58iAU&feature=related>
- Tuvan throat singing: [http://www.youtube.com/watch?v=MZFFjIZIMKw&watch\\_response](http://www.youtube.com/watch?v=MZFFjIZIMKw&watch_response)

IEEE - Interactive Embodied Emotional Experience



**Exercises – Move into groups of three/four people**



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## Exercise 1 - onomatopoesis

- Onomatopoesis: *"figure of speech that copies natural sounds"*
- **Exercise:** Think about typical onomatopoeic words in different language
- **Part 1.** Try to find a type of sound with as many possible onomatopoeic variations you can. Write them down.
- E.g. how do pigs sound like in different languages?  
"n6f n6f", "oink oink", "r6h r6h" etc.
- **Part 2.** Now, imitate the sounds you wrote down. Try to imitate it so the sound reminds of the different onomatopoeic words you identified
- Tip: try to figure out what it is in the sound that motivated writing it in a certain way.

## Exercise 2 – inner workings

- Design a machine that produces a **living creature** from **sawdust**
- Process: input -> middle result -> output
- **You have 30 minutes to:**
  - Design what is actually happening in the process
  - Sonify the process
  - Rehearse your performance
- Then you will perform it to the rest of class
- **SOUND DESIGN THEMES**
  - Group 1: 1800's steam engines + magic
  - Group 2: sci/fi futuristic + intelligence
  - Group 3: organic life form + horror
  - Group 4: comic style + music
- You may listen to the provided sound samples to get familiar with the style and type of sounds within each genre!