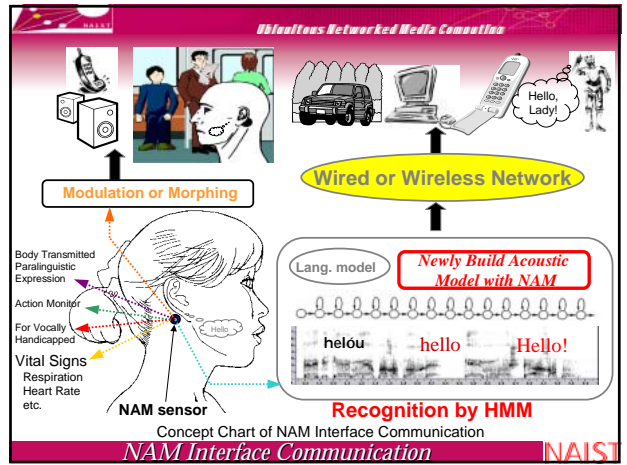
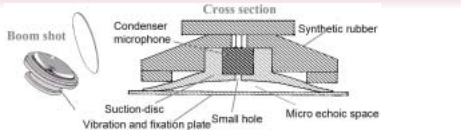


Remodeling of the Sensor for Non-Audible Murmur (NAM) Interface Communication

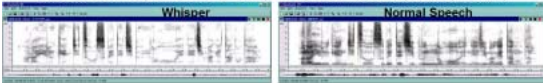
Applied Linguistic Science Lab.
 Yoshitaka Nakajima D2
 Sep. 24 2004



Stethoscopic NAM Microphone



Air Conducted Speech Sound Sampled by Normal Microphone (Control)

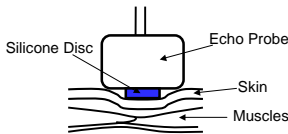
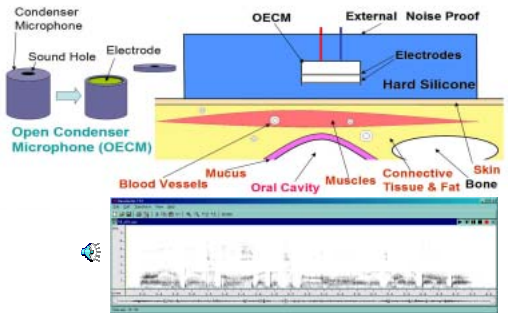


Body Conducted Speech Sound Sampled by Stethoscopic NAM Microphone



"arayuru genjitsu o subete jibun no ho: e nejimagetanoda"

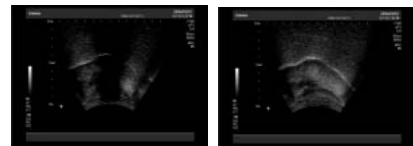
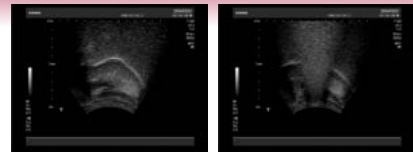
OCWHS Type NAM Microphone (Open Condenser Wrapped with Hard Silicone)



	Sound Speed (m/s)	Acoustic Impedance
AIR	330	0.0004
WATER	1480	1.52
BLOOD	1570	1.62
BRAIN	1540	1.6
FAT	1450	1.35
Soft Tissue (mean)	1540	
BONE	4080	7.8



Visible Difference of Acoustic Impedances by Medical Ultrasonography



Visible Difference of Acoustic Impedances by Medical Ultrasonography

Ubiquitous Networked Media Computing

Soft Silicone NAM Microphone

OCMSS Type NAM Microphone
(Open Condenser Mediated with Soft Silicone)

NAM Interface Communication NAIST

Ubiquitous Networked Media Computing

OCWSS Type NAM Microphone

OCWSS Type NAM Microphone
(Open Condenser Wrapped with Soft Silicone)

NAM Interface Communication NAIST

Ubiquitous Networked Media Computing

TMSS Type NAM Microphone

TMSS Type NAM Microphone
(Transducer Mediated with Soft Silicone)

NAM Interface Communication NAIST

Ubiquitous Networked Media Computing

1. Evaluation of Bandwidth

Air Conducted Speech Sound (Control) OK (Maximum Input Gain Volume)

Whisper Normal Speech

2. Evaluation of the Contact Sensitivity

We fixed input gain volume of microphone amplifier into minimum (50K).

15622 -12176

We estimated contact sensitivity of NAM microphone by the amplitude of NAM signals at fixed gain volume.

NAM Interface Communication NAIST

Ubiquitous Networked Media Computing

Evaluation for Robustness against Noise

Normal Microphone at Ear (Control) Frequency Responses of NMHF
Gain Volume for Sampling Normal Speech

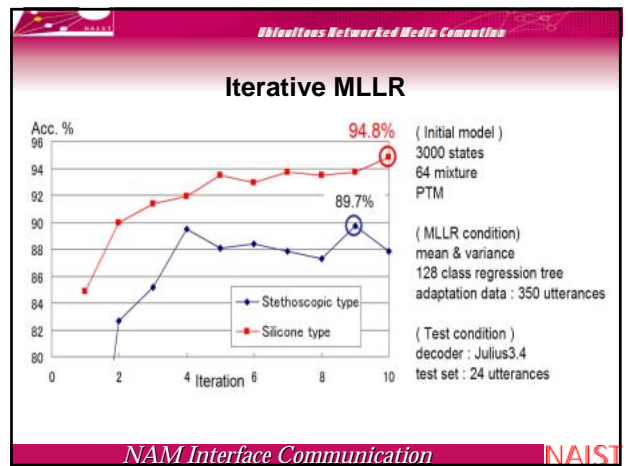
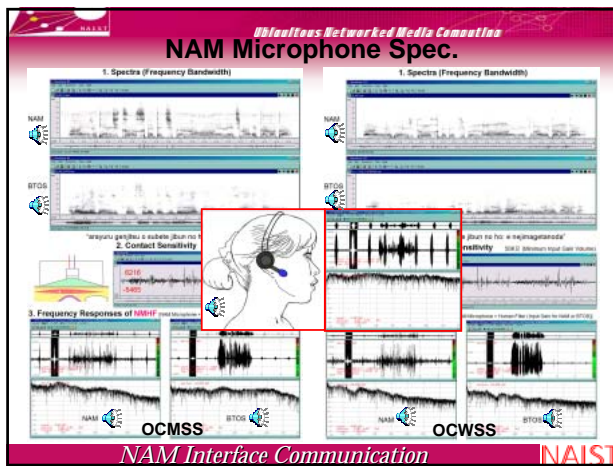
NAM Interface Communication NAIST

Ubiquitous Networked Media Computing

NAM Microphone Spec.

Stethoscopic **TMSS** **BTOS**

NAM Interface Communication NAIST



Ubiquitous Networked Media Computing

Conclusion

- The new **soft silicone NAM microphones** provide higher accuracy of NAM recognition rate, clearer NAM sounds that convey the utterances even without digital signal processing, and more robustness against noise than the former type.
- Not only NAM recognition but also **“NAM phone” (Non-Voice Phone)** will be possible.
- We propose that **NAM** should be used for both **human-to-human** and **human-to-machine** interfaces under the name of **‘NAM Interface Communication’**.

NAM Interface Communication NAIST

