

Sustainable Audiological Care in Brazil: A Low-Threshold Approach to Locally Manufactured and Custom-Fitted Hearing Aid Solutions

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In short

A hearing aid built on existing infrastructure – from the users' conventional earphones to phone shops for technical support

Clever design: robust device, cheap to produce, using local material and supply chains – and yet technologically advanced

Easy access to an essential health service for all

Motivation

In Brazil, the proportion of the elderly population is growing. By 2045, it is predicted that 90 million Brazilians will be over 49 years old. More than 1/10 of this age group is affected by an age-related hearing loss. Age-related hearing loss mainly manifests itself in reduced speech intelligibility in noisy circumstances, which can have a strong social impact.

Today's hearing aid solutions allow to understand even in difficult acoustic situations. However, these high-end devices are expensive and rely on a network of manufacturer-trained audiologists.

In this contribution we present a hearing aid technique, which abandons the classical development aim of miniaturization and relies on cheaper and physically effective techniques for directional hearing.

The affordable and efficient hearing aid shall be manufactured, fitted and distributed locally. Successful implementation would not only enable a large group of older people to participate in society, but also promote a shift towards sustainable communities with a regional infrastructure of audiological units and audiological expertise.

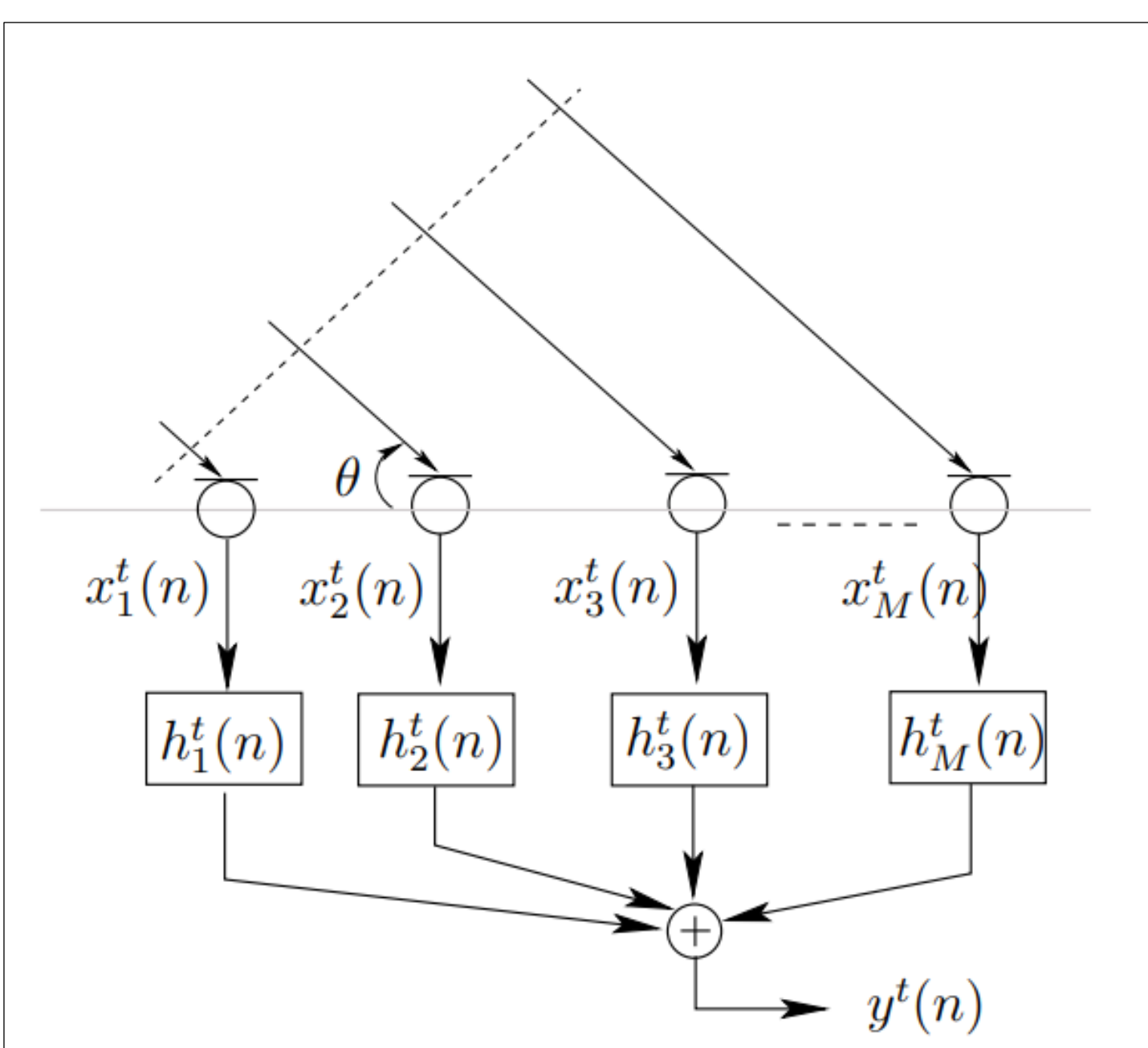


Figure 1: Principle of Minimum Variance Distortionless Response (MVDR) beamforming offering optimal directivity for improving speech in noise



Figure 2: Electronic test model with four microphones and a length of ca. 7.5 cm

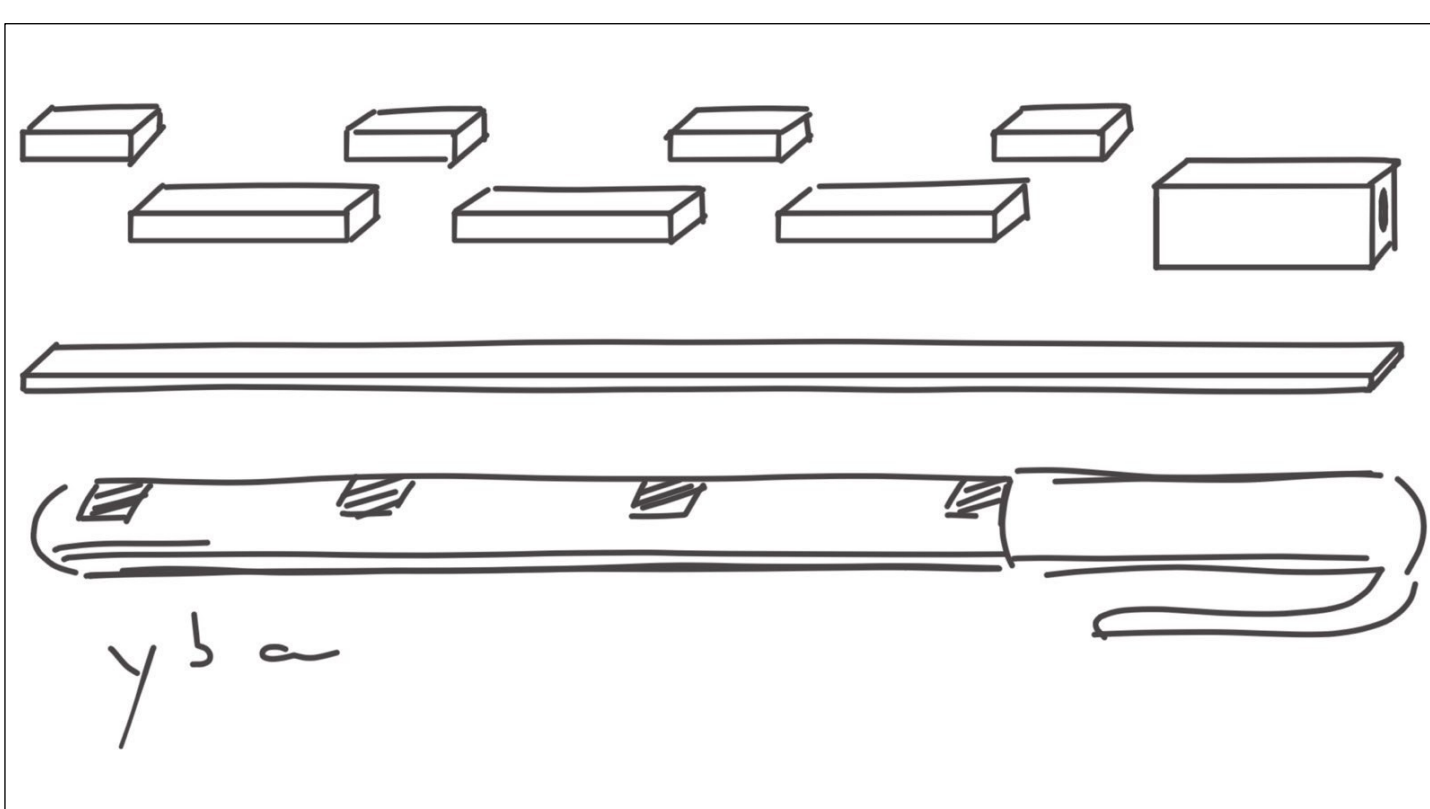


Figure 3: Sketch of possible building blocks

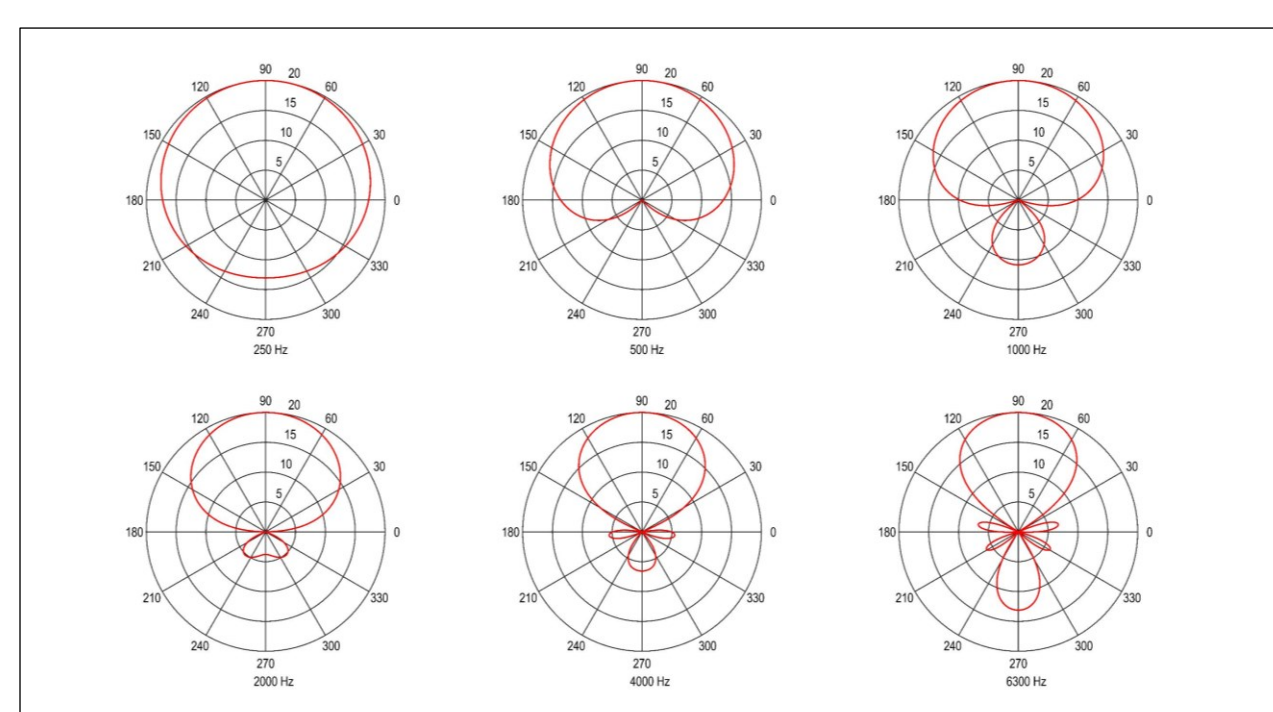


Figure 4: Directivity plots of an MVDR array based on four microphones in six octave bands

Technological concept

1. A pen-sized device with 4 microphones, allows the exploitation of wave arrival time differences between the microphones, resulting in a stable intelligibility gain in noisy environments.
2. The usage of individual headphones renders the custom production of expensive ear molds unnecessary.
3. The result is a highly usable hearing aid that is applied where and when needed. It is bigger and cheaper, but more robust and effective than classical hearing aids.

Regional and fair value chains

1. Locally manufactured and assembled as far as possible, to establish a self-help network for hearing loss. Reducing the Eco-footprint by utilization of local circular economy materials. The product shall use conflict-free resources for the electronic components where available, fair wages in production and good documentation for repairs. Local repair centers reduce non-regional dependencies, improve local skills and prevent waste.
2. Use of free online hearing tests to obtain audiograms for quick and easy hearing aid adjustment (example Mimi-App). Training of medical personnel in rural areas for device adjustment and maintenance.
3. Device pricing: not more expensive than a good pocketknife, suitable for long-term sustainable use.
4. Brazilian signature as an accelerator (examples Orelhão, Telefone de Uso Público, Centros Integrados de Educação Pública).

Towards a turning point in audiological care

1. We want to provide audiological care independent from specialized medical product manufacturers or smartphone operating systems.
2. We explore alternatives to the invisibilization of hearing loss. Instead of ever more miniaturized devices ours puts the fact that there is noise literally on the table.
3. We value the fact that silence and simplicity are assets. In contrast to many other permanently running hearing aids ours are intended to be applied where needed.

Medical product certification and patent protection

1. Exploit the shift towards over-the-counter hearing aids and regulatory implications.
2. Aim to find a solid patent solution that allows product commercialization without conflicting with the intellectual property of traditional hearing aid manufacturers.
3. Intention to publish key hearing aid algorithms openly to foster transparency, community development and maintenance.



LEAVE
NO ONE
BEHIND

