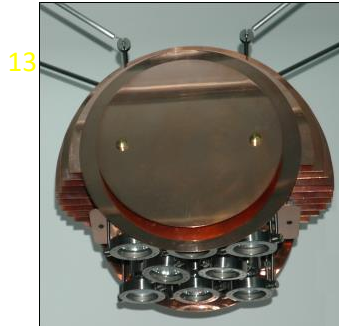


ELONICA

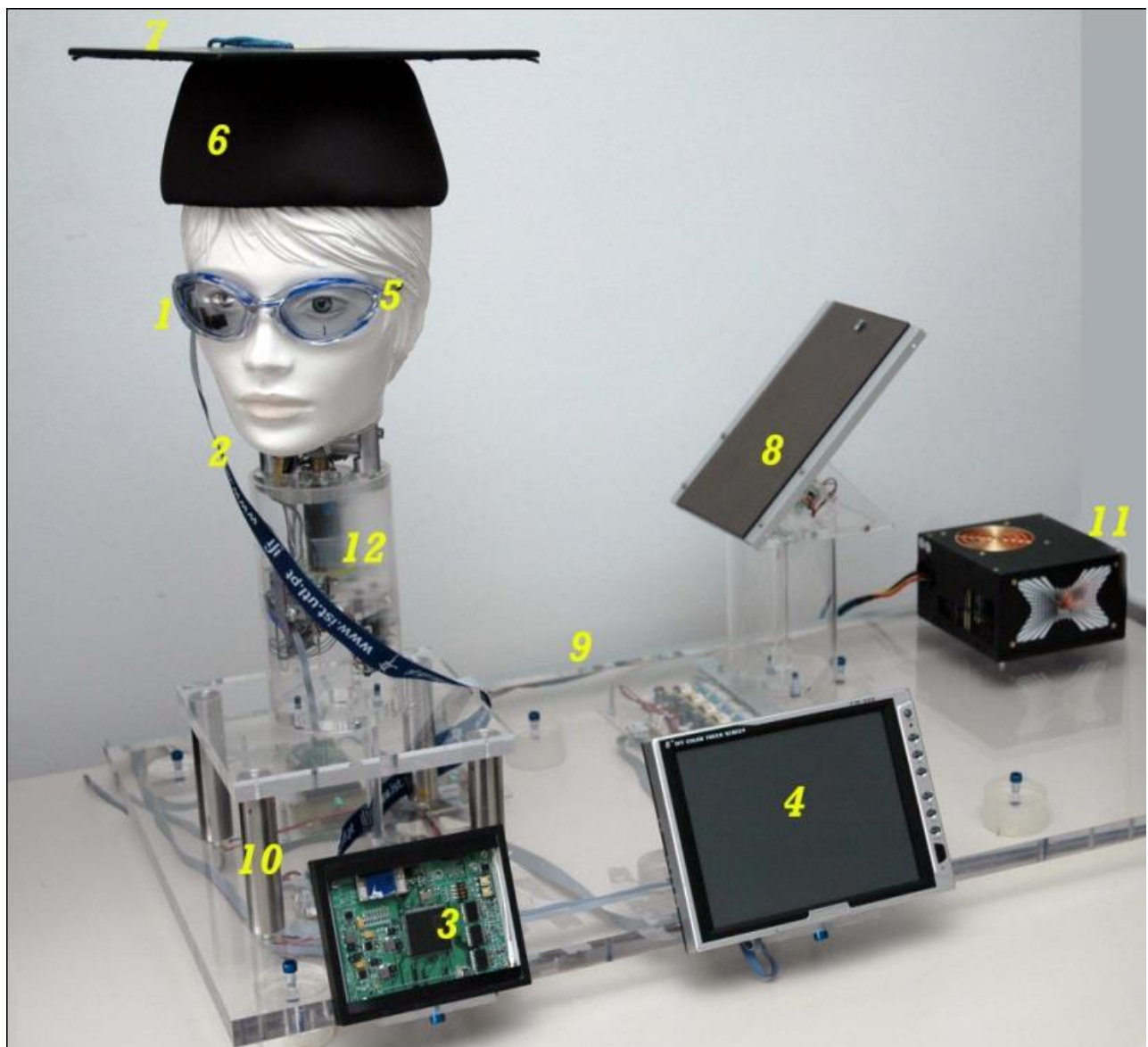
Authors: Moisés Piedade, António Nunes e José Vaz.

INESC-ID, and DEEC /IST, Lisbon

ELONICA is an interactive demonstrator of a Visual Prosthesis base on direct Stimulation of the Visual Cortex. Elonica is based on a motorized head of a girl model and was completed in October 2007.



ELONICA was supported by the Electrical Engineering Department of Instituto Superior Técnico, European research project CORTIVIS and FCT research project "ICONS – Intracortical Neuronal Stimulator": PTDC/EEA-ELC/68972/2006.



1. Micro digital camera
2. Digital camera cable
3. Artificial retina processor
4. Video display of processing phases
5. Eye glasses
6. Robotized Hat
7. Solar panel
8. Optoelectronic display
9. Illuminated Acrylic Table
10. High power LED illuminators
11. Power supply
12. Motorized Neck
13. Artificial Sun

Elonica is powered by five electric motors. Lithium ion batteries placed inside the head are recharged by the hat solar panel that captures the light produced by the artificial Sun.

Under computer control (not represented) Elonica head can be oriented to several objects illuminated by controlled lights. In the video monitor can be seen 4 images corresponding to different processing phases of the artificial retina (spatial and temporal filtering and retina coding spikes).

Hat can be tilted in order to see electronic circuitry and the wireless energy and data transmission system for the intracortical prosthesis developed in projects ICONS and

CORTIVIS.

References:

- <https://cortivis.umh.es/>
- <https://ieeexplore.ieee.org/document/1556773>
- <https://110.tecnico.ulisboa.pt/files/sites/125/elonica-2.pdf>
- <https://110.tecnico.ulisboa.pt/arquivos/episodio-57-elonica-protese-visual/>
- <https://www.youtube.com/watch?v=nJEmMd55jZo>
- <https://www.youtube.com/watch?v=v4tcQI0HhWg> (Artificial Retina)
- <https://cordis.europa.eu/project/id/QLK6-CT-2001-00279>
- <https://clinicaltrials.gov/study/NCT02983370>
- https://expresso.pt/blogues/bloguet_ciencia/FalarGlobal/ver-atraves-da-lingua-video=f581179
- https://link.springer.com/chapter/10.1007/978-3-319-41876-6_15
- <https://www.springerprofessional.de/en/neurolight-alpha-interfacing-computational-neural-models-for-sti/16712640>
- <https://www.scitepress.org/Papers/2008/10516/10516.pdf>
- <https://youtu.be/i-Wwr8YIN4M> (INESC-ID)
- [Real time clinical operation of implanting a device \(Prof. Lobo Antunes in Dobelle Labs\)](#)
- <https://www.youtube.com/watch?v=9ETYPpPCfPU> (Brain Chips)
- <https://www.bionic-vision.org/implants/cortivis>

- [Review of Cortical Visual Prosthesis](#)
- [Latest Progress](#)

CORTIVIS and ELONICA

- <https://www.goodreads.com/book/show/26715326-visual-cortical-neuroprosthesis-a-system-approach>
- <https://cortivis.org/overview>
- [TVI](#) Reporter (2010)
- [Exame Informática](#) (2010)

Research in artificial vision beginning with Dr [William Dobelle](#) (1941-2004), the CEO of [Dobelle Institute](#) with headquarters in Lisbon with the collaboration of the Portuguese neuroscientist Prof. [João Lobo Antunes](#) (1944- 2016).

First Artificial Vision System

On January 17, 2000, news broke that a man known as "Jerry," who had gone blind 36 years earlier after a blow to the head, had regained his sight thanks to a visual prosthesis. This prosthesis was developed by American surgeon William Dobelle. The system was based on glasses coupled to a miniature video camera and an ultrasonic rangefinder.

A computer attached to Jerry's belt receives these signals, processes the data from the captured image and the rangefinder, and then sends them to an electronic system that excites 68 platinum electrodes implanted on the surface of Jerry's visual cortex, producing visual phosphenes.

Jerry was said to be able to read letters two inches across from a distance of five feet.

[Towards Bionic Eye.](#)

[Chirurgical Implants in Portugal.](#)

[Artificial Vision Implants](#)

[Jerry Implant](#)

[Expresso Falar Global](#)

[Visão – Exame Informática](#)

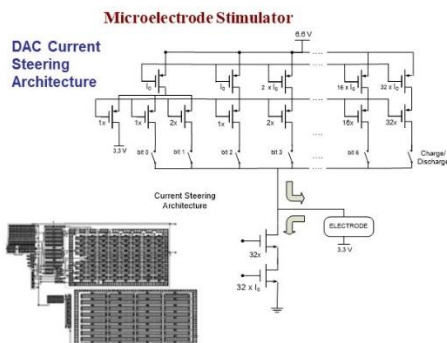
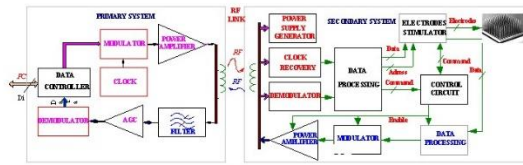
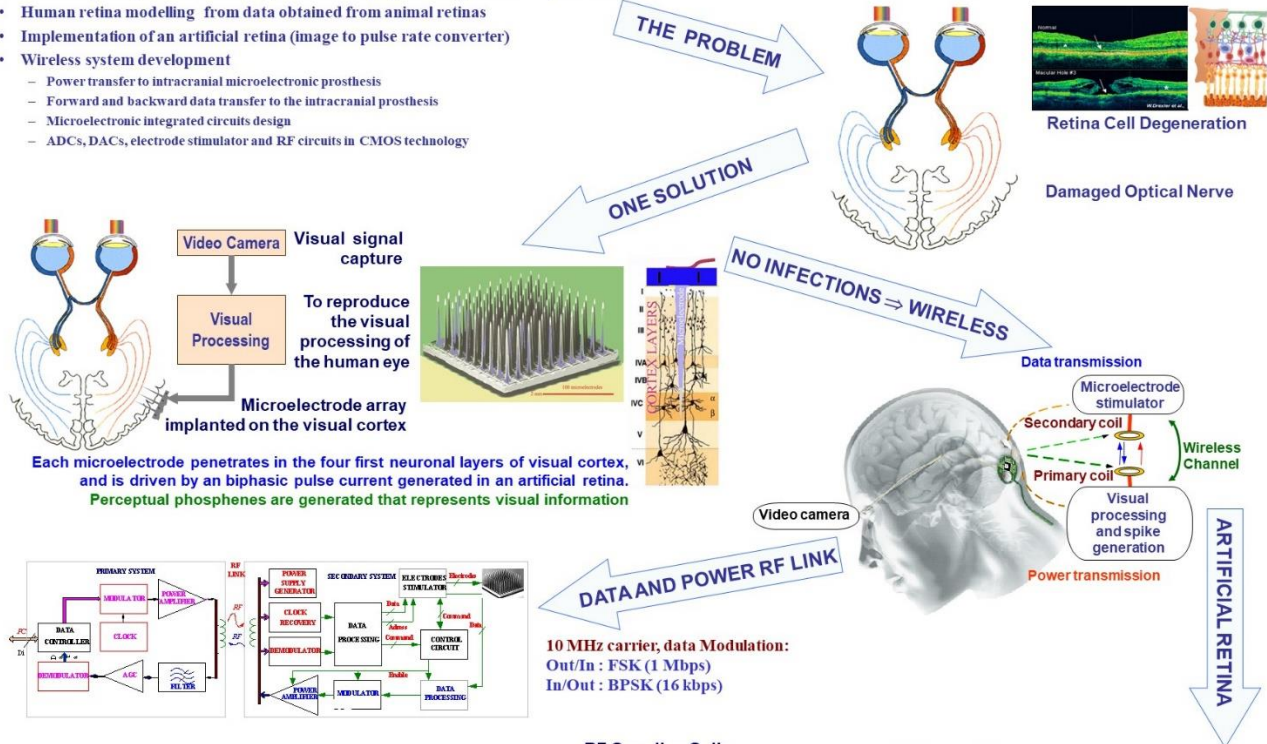
[Retina Reconfigurable](#)

WIRELESS VISUAL PROSTHESIS FOR BLIND PEOPLE

EC project "Cortical Visual Neuroprosthesis for the Blind"



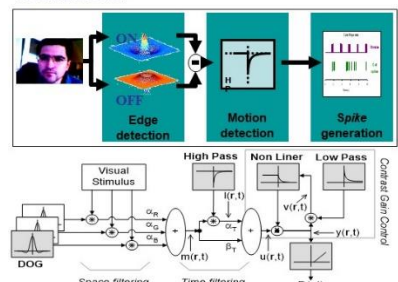
- Development of a cortical neuroprosthesis, interfaced with the visual cortex, as a means through which a limited but useful visual sense may be restored to profoundly blind people
- Research work developed by several students from EEC Electronics Systems profile and IST professors
- Interdisciplinary international project for developing a new type of visual prosthesis
- Human retina modelling from data obtained from animal retinas
- Implementation of an artificial retina (image to pulse rate converter)
- Wireless system development
 - Power transfer to intracranial microelectronic prosthesis
 - Forward and backward data transfer to the intracranial prosthesis
 - Microelectronic integrated circuits design
 - ADCs, DACs, electrode stimulator and RF circuits in CMOS technology



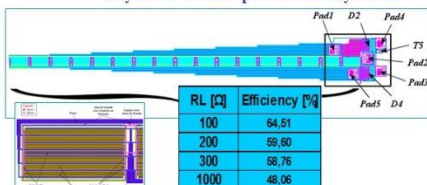
RF Coupling Coils



Retina model

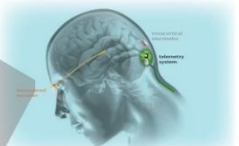


Layout of CMOS power recovery circuit



Achieved work:

- 1- Wireless power transfer to intracranial prosthesis (10 MHz, 50 mW at 2 cm distance)
- 2- RF data link design 1 Mbps (10 MHz carrier FSK data modulation - Prototype working at 100 kbps)
- 3- IC design of electrode stimulator ADC and DACs for 1024 channels
- 4- Artificial retina model and prototype implemented in an FPGA
- 5- New ideas for future development



Design and implementation of a video processor

Coding of video in a spike sequence
Video output port (VGA) for spike decoding verification

ELECTRONICS and Signal Processing:
IST - <http://acel.ist.utl.pt/projects.html>

Profs:
Moisés Piedade; Leonel de Sousa; José Gerald;
Gonçalo Tavares; Marcelino Santos; Jorge Fernandes
Graduation, MSc and PhD students

