
ICT Implants: The invasive future of identity?



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Objectives . . .

- An overview of the state-of-the-art
- Establish a scientific basis for some futuristic claims
- Generate discussion on this important topic



Objectives . . .

- An overview of the state-of-the-art
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Not an objective . . .

- To necessarily defend anything as right, wrong, moral, ethical or other.



Introduction to Implantable Devices

- **Restorative:** restore lost functions and replace lost organs and limbs
- **Normalising:** restore some creature to indistinguishable normality
- **Reconfiguring:** creating post-humans equal to but different from humans
- **Enhancing:** nobody mention 'the matrix', please



Introduction to Implantable Devices

Emerging technologies - new and potentially disruptive technologies: nanotechnology, biotechnology, information technology, cognitive science, robotics, AI etc, etc . . .

. . . clusters of technologies that are considered critical to humanity's future



ICT IMPLANTS



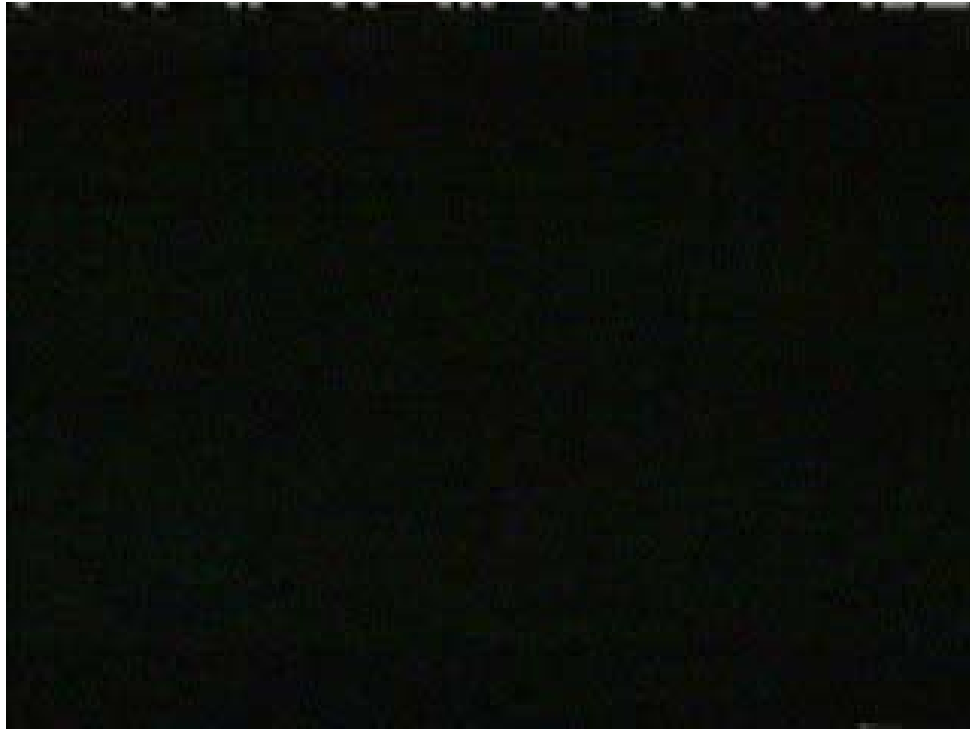
**ICT IMPLANTS =
Ethics**



**ICT IMPLANTS =
Ethics + RFID???**



ICT Implants = RFID?



**Seriously, would
anyone really
implant an RFID
tag?**



Chip on the Shoulder?



**Well, good for
them... But I don't
want one.**



Passive Medical Devices?

- artificial joints
- vascular implants
- artificial valves
-



Active Medical Devices



Active Medical Devices

Cardiovascular pacers
Cochlear and brainstem implants
Deep brain stimulation

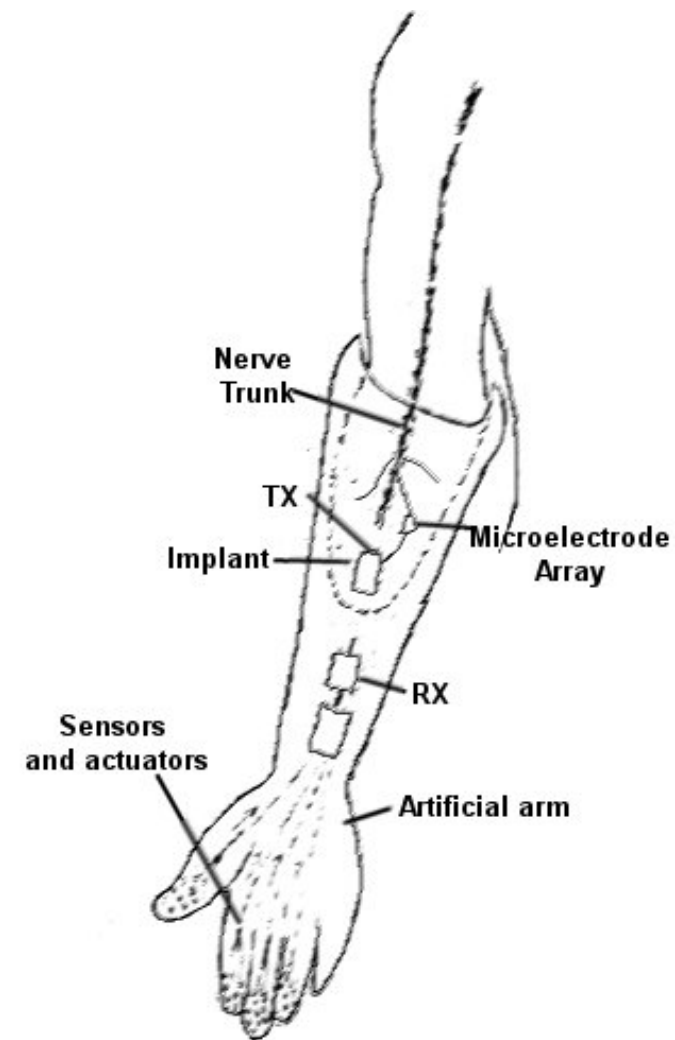
Spinal cord stimulation
Sacral nerve stimulation
Vagus nerve stimulation

Drug delivery pumps
**Intrathecal administration of
Baclofen**

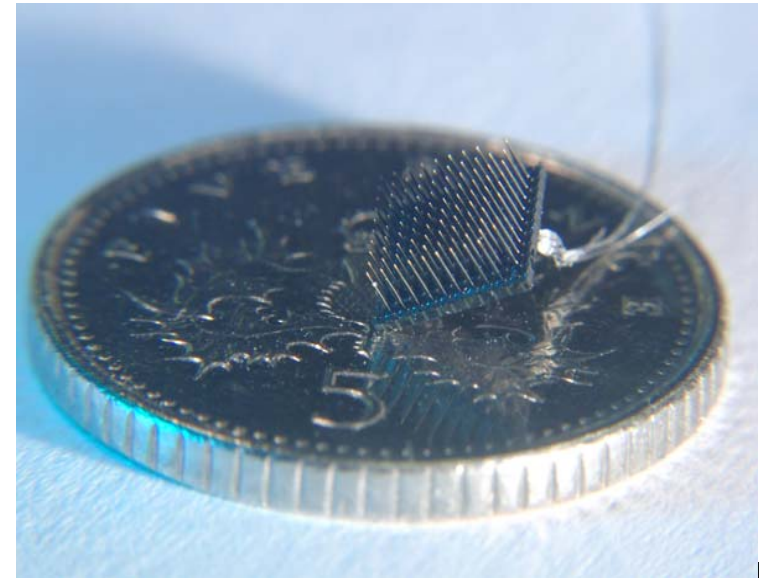
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Active Medical Devices



Active Medical Devices?



Onwards and Upwards . . .

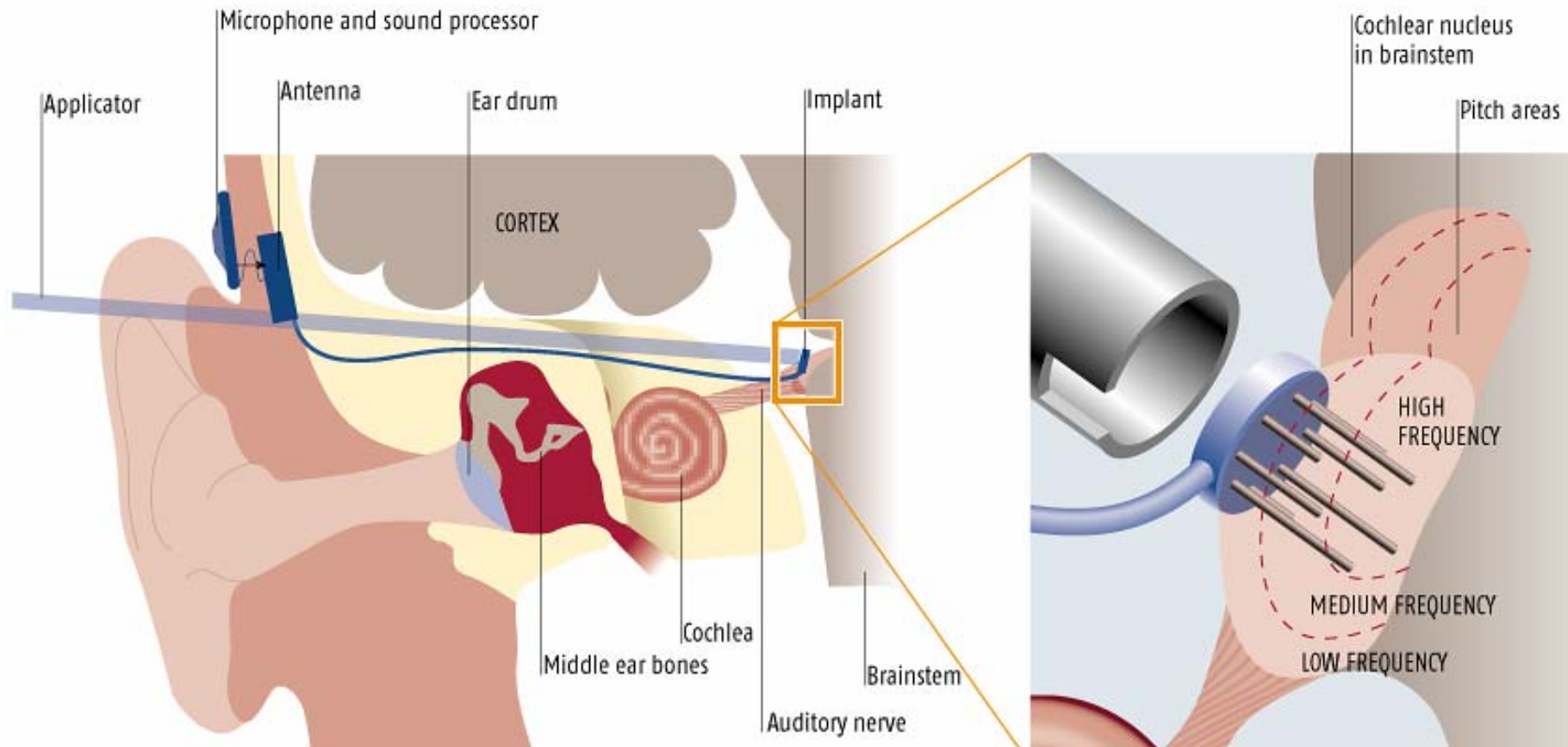
- Interfaces with the Central Nervous System



Active Medical Devices

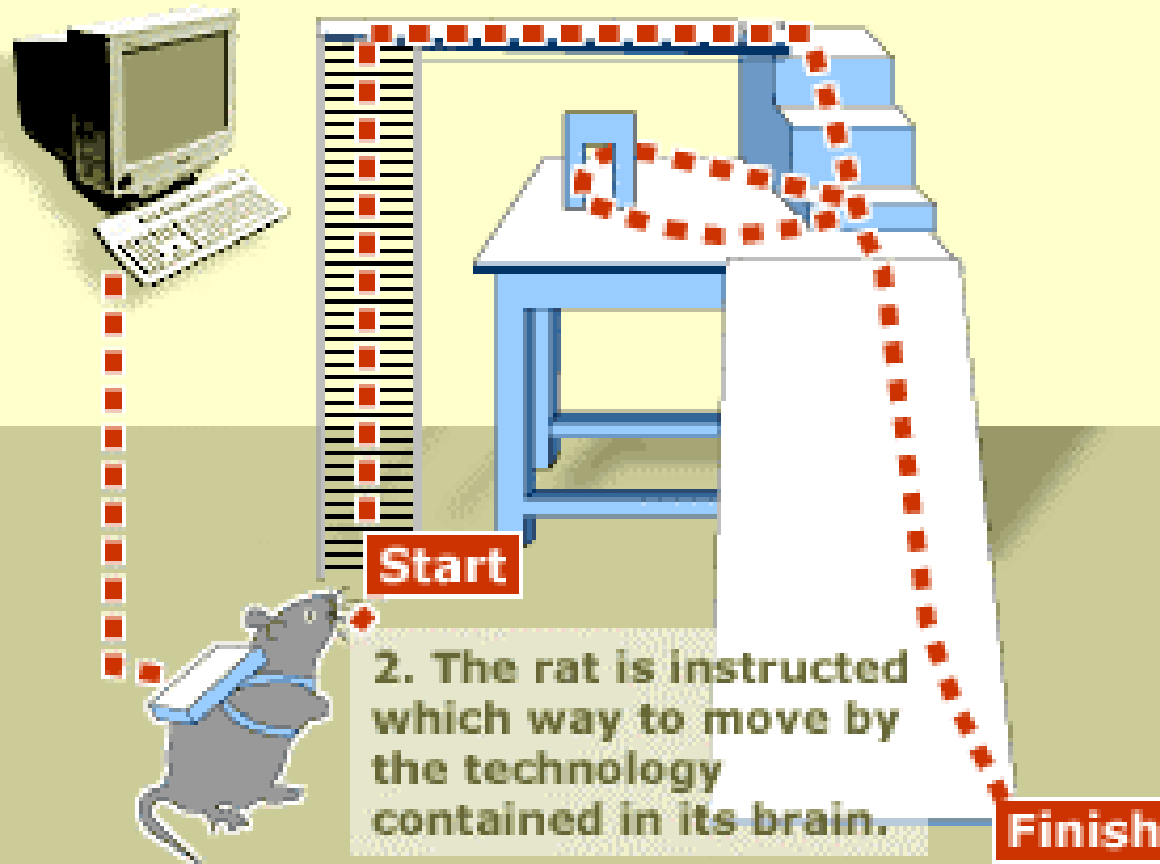
THE PENETRATING AUDITORY BRAINSTEM IMPLANT

The implant might restore some hearing to people with damaged cochlea or auditory nerves, by directly stimulating the brainstem



SCIENTISTS CONTROL RAT'S MOVEMENTS

1. The scientist sends signals to a rat's brain.



A Case Study: Deep Brain Stimulation



A Case Study: Deep Brain Stimulation

Why use Deep Brain Stimulation?

- Alleviates the motor symptoms of conditions such as Parkinson's Disease
- Avoids the disabling side effects of long term treatment with L-dopa by reducing medication requirements
- An option following failure of conventional drug treatments
- Similar effects to lesioning, but largely reversible

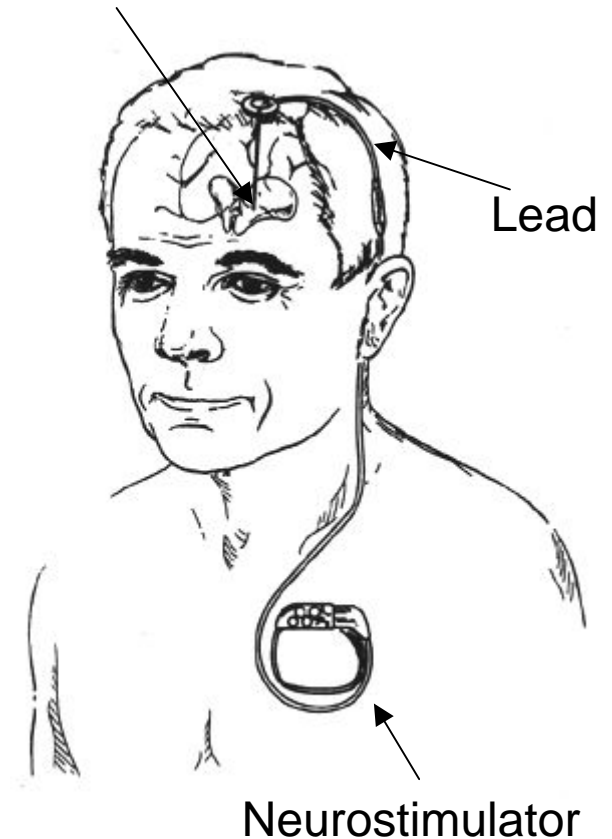


A Case Study: Deep Brain Stimulation

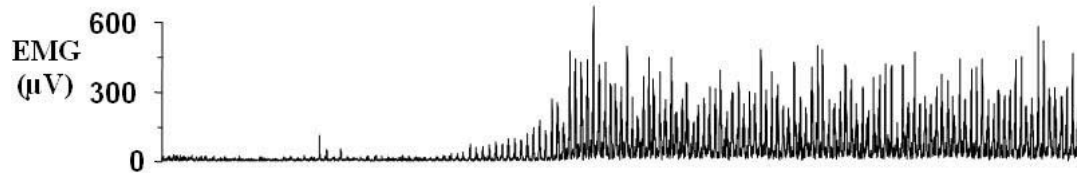
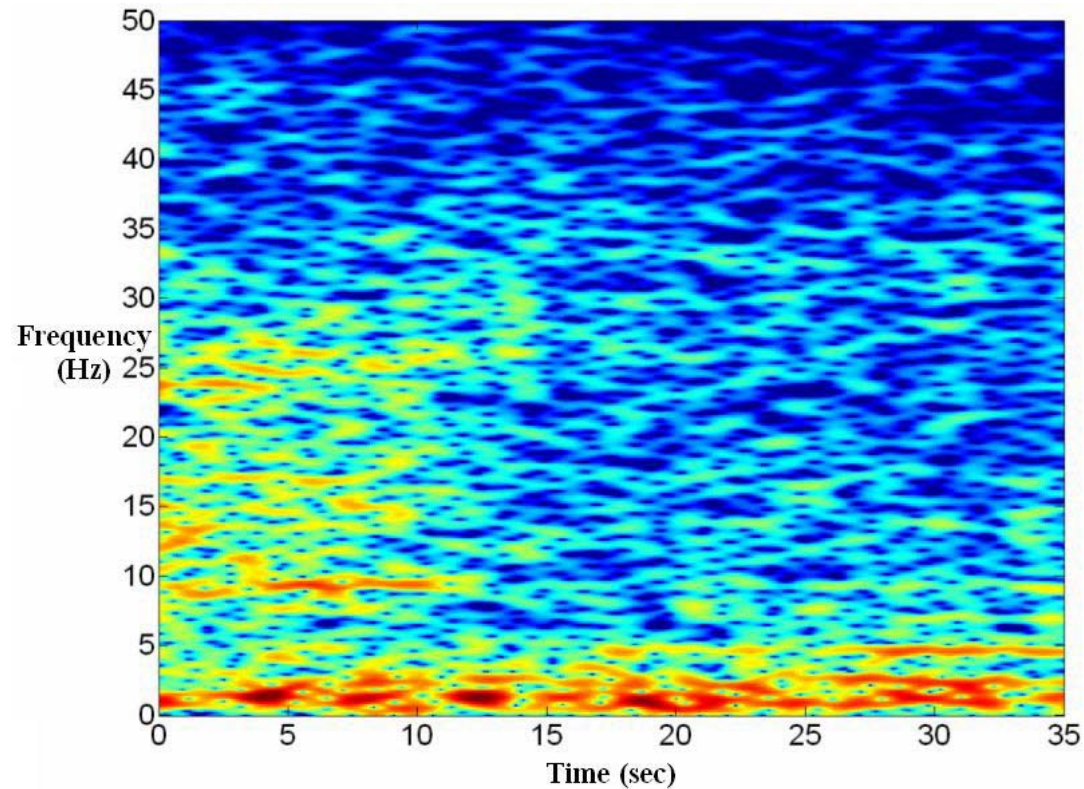
What is Deep Brain Stimulation?

- Classic DBS uses *continuous* stimulation of deep brain structures (thalamus, sub-thalamus or globus pallidus for the treatment of tremor, Parkinson's, dystonia and pain)
- Suppression of symptoms occurs at amplitudes of 1-8mA, pulse widths of 60-120 μ sec, and rates of 130-185Hz
- It is hypothesised that DBS locks neurons to every 5th-10th stimulus preventing the slow synchronous cycles that may cause motor symptoms

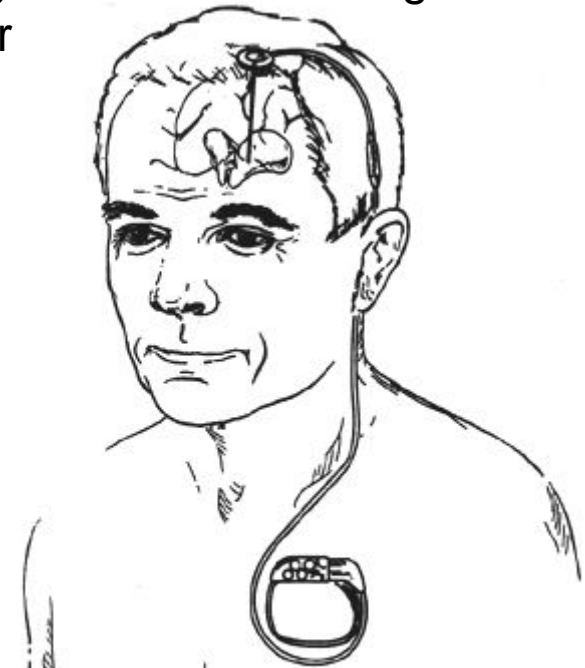
Implanted Electrodes



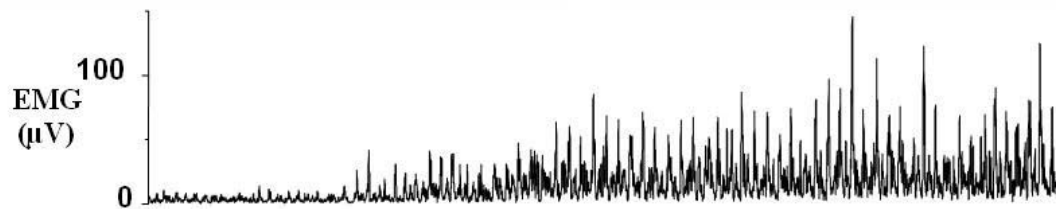
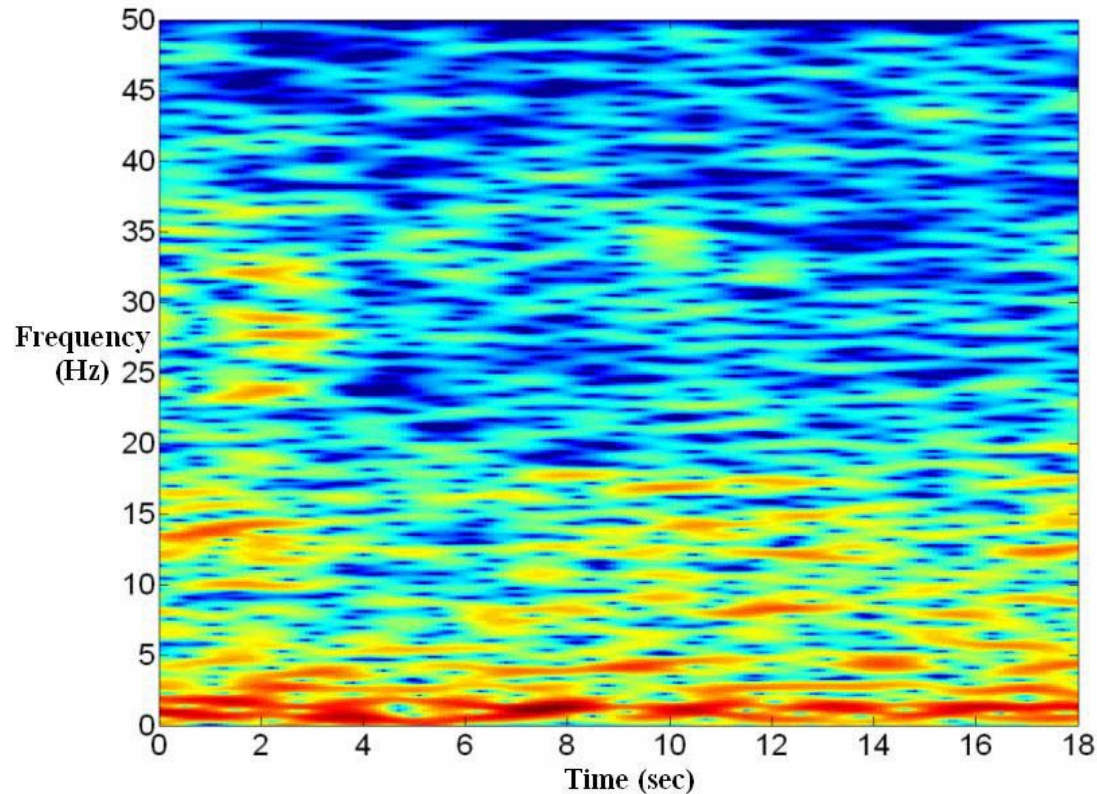
Developing a Demand Driven Stimulator



STFT spectrogram of sub-thalamic nucleus LFPs and forearm extensor surface EMGs during the onset of resting tremor



Developing a Demand Driven Stimulator



STFT spectrogram of globus pallidus LFPs and forearm extensor surface EMGs during the onset of resting tremor



The Future?



Thank you

