

Novel neurotechnologies

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Novel neurotechnologies

‘Intervening in the brain’

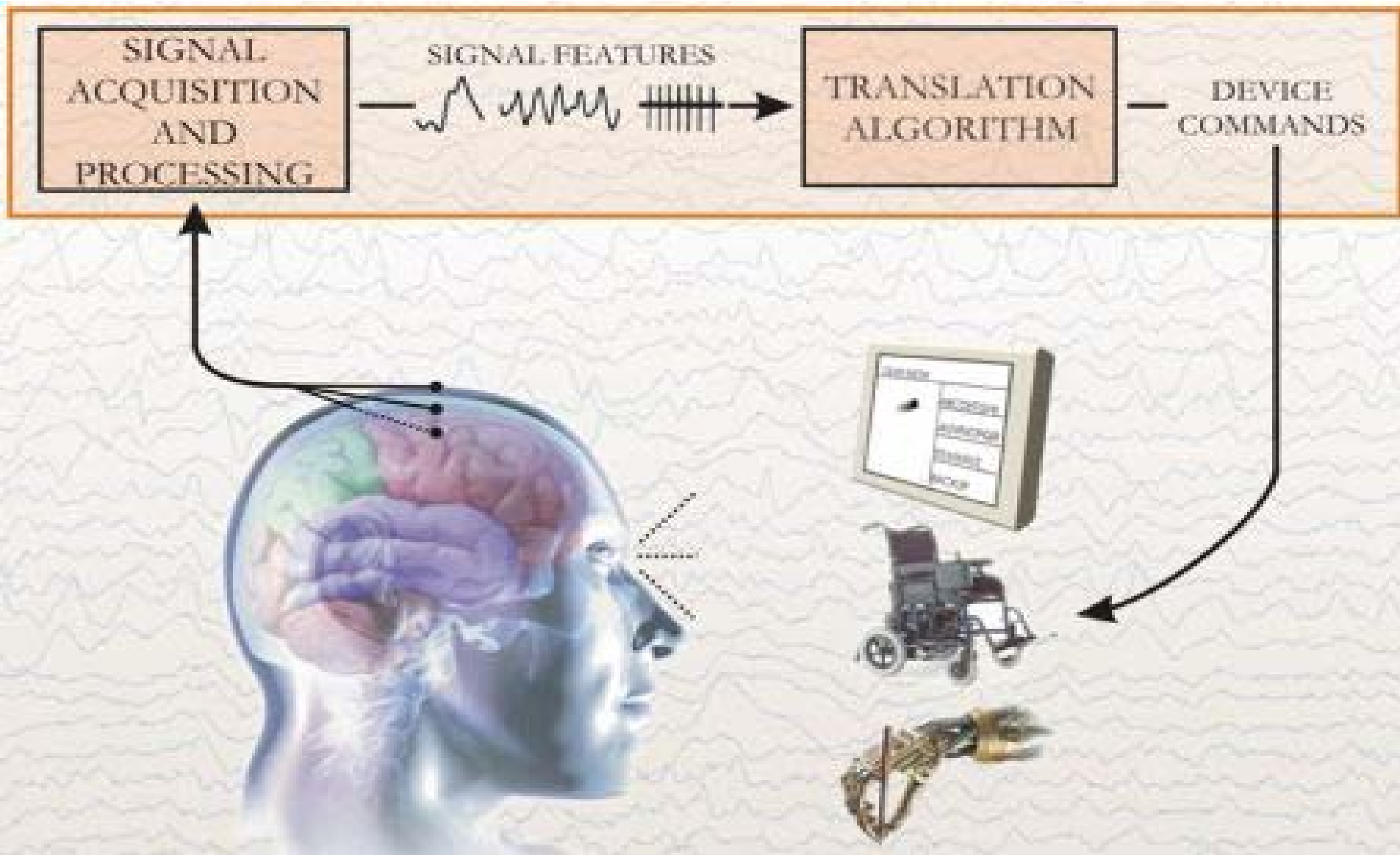
- Three types of novel technologies:
 - Neurostimulation (DBS, TMS)
 - Brain-computer interfaces
 - Neural stem cells



Neurostimulation

- **Deep brain stimulation (DBS)**
 - Currently used to treat Parkinson's disease, epilepsy, stroke and severe obsessive compulsive disorders
- **Transcranial magnetic stimulation (TMS)**
 - Depression, or to enhance cognitive functions such as attention, understanding, perception
 - Interest in non-medical applications such as enhancement of problem-solving and memory

Brain-computer interface



Brain-computer interface

- System for measuring and analysing brain signals and translating them into outputs
- Possible medical uses include helping 'Locked-in syndrome' patients communicate
- Non-medical uses of BCIs such as computer games and military applications are also being investigated

Neural stem cells

- Neural stem cells replace cells that are lost in disease or enhance the growth of new neurons
- Stem cell injection is being investigated as a means of treating neurodegenerative conditions such as Alzheimer's disease, Parkinson's disease and Huntington's disease

Terms of reference

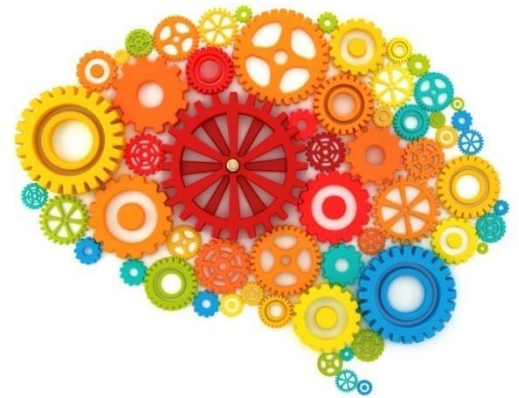
- To identify and consider the ethical, legal and social issues that arise from the use of novel neurotechnologies to intervene in the human brain in both clinical practice and non-medical settings
- To explore ethical issues from the communication and representation of neuroscientific research to intervene in the brain in the media and by researchers
- To draft a report and make recommendations for research, policy, governance and public engagement

External consultation

- Open consultation: 70 responses
- Fact finding meetings with:
 - Clinicians
 - Industry
 - Military
 - Investment
 - Patients
 - Regulators

Report overview

- Current understanding and practice
- Ethical framework
- Regulation and Governance
- Non-therapeutic interventions
- Economic drivers of innovation
- Communication



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www.nuffieldbioethics.org/neurotechnology

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