

Objective: to extend the range of battery-less implants to include therapeutic functions

What is this about: an alternative technique to energize implants, providing energy directly from a wireless source

Biomedical implants...

such as pacemakers use mainly batteries as a primary energy source...



pacemakers



batteries

...but they are bulky (burden to a patient)



and have to be recharged or replaced



Diagnostics vs. therapeutics

Energy harvesting is an attractive alternative to batteries, however, only the diagnostic medicine can benefit as the harvested energy is enough for sensing and monitoring only.



Solution: wireless power delivery (in particular, via ultrasound)...



...it provides enough energy for actuation in

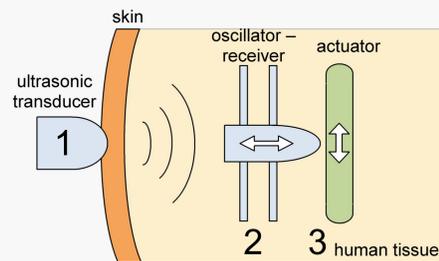


therapeutic implants

I propose

How does it work?

1. An ultrasonic transducer (piezo disk) is attached to the skin and radiates inside the body
2. A specially designed oscillator receives ultrasound waves and starts vibrating
3. An oscillator converts its vibrations into a stepwise motion of an actuator



The actuator is tuned for a certain application... e.g. for implant adjustment it is slider, for drug release – carousel etc.

PEANUT – Personal Actuator N-ergized by Ultrasonic Transfer

What is in there?



Where can I use it?

implant mechanical adjustment (e.g. eye lens)



electrical stimulation



valve operation (release medication)

Innovation

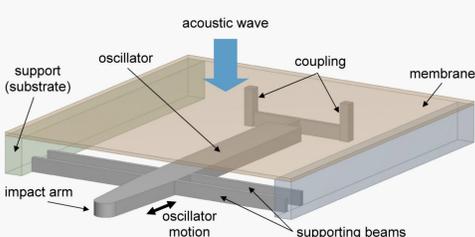
Competitive advantage:

1. No accumulation / storage of electrical energy >> more efficient
2. Purely mechanical device >> small and simple
3. Use of ultrasound >> can be implanted deeply inside the body
4. No interference with external sources >> reliable

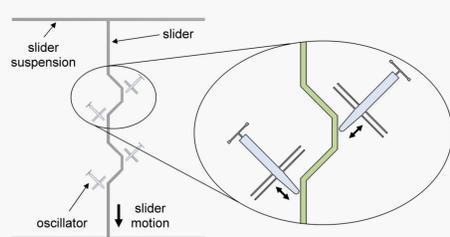
Challenges:

1. Small, more affected by misalignment >> reduced energy input
2. Complex fabrication >> variability of design parameters

More details



acoustic wave coupling

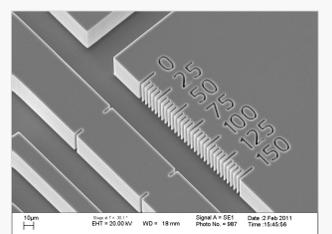
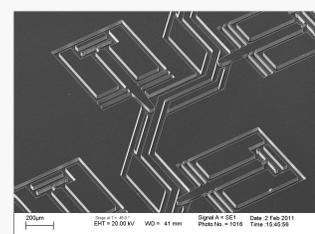


oblique impact and actuator

How to fabricate it?



me



and my device