

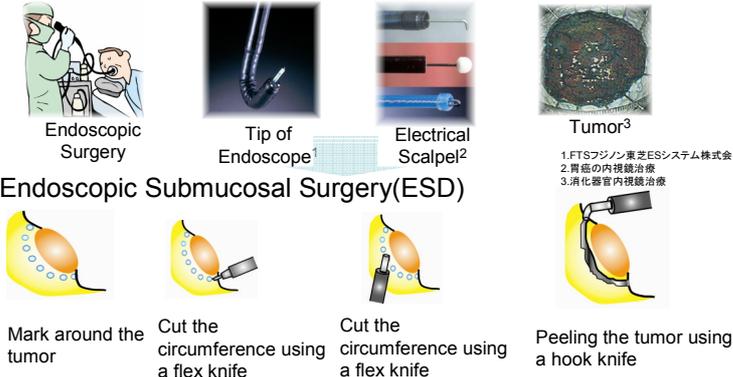
φ 1mm内視鏡用マイクロアームの駆動ワイヤをどう組み入れるか？

Abstract:

Endoscopic tool to manipulate and peel tumor skin in ESD (Endoscopic Submucosal Dissection) is proposed. This microarm will come out from the tip of an endoscope to help grip the skin and cut underneath. The arm is fabricated by photolithography and electroplating and assembled by stacking up the layer of electroplated parts (STAMP: Stacked Microassembly Process), thus mass-production with low cost is possible. The actuation of the arm is done by wire.

Background:

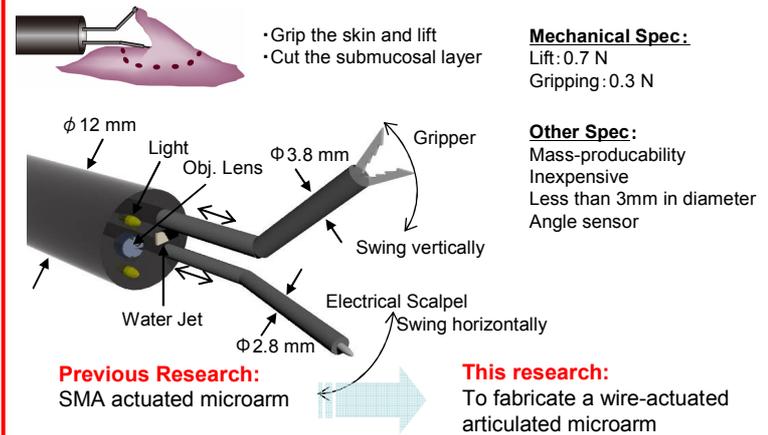
Problem of the present ESD surgery



Problems: Peeling procedure is very difficult and takes long time

Objective:

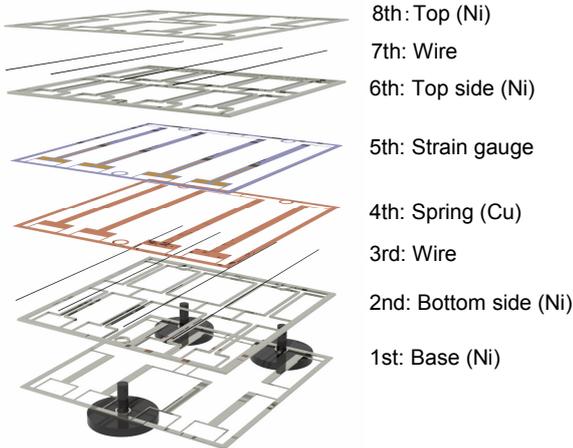
ESD tool to improve the surgery



Concept:

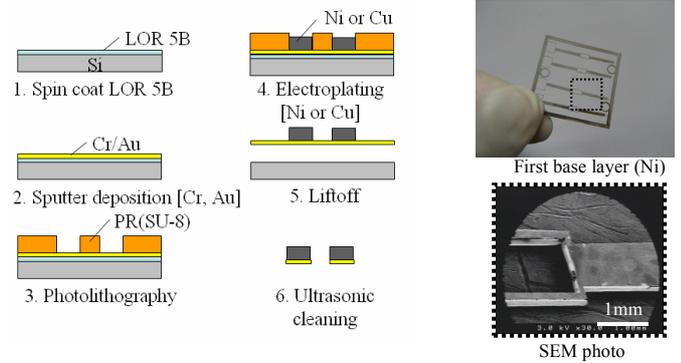
Easy assembly by STAMP

Stacked Microassembly Process (STAMP) enable the fast assembly of the microarm with angle sensor. Alignment is done by stacking the layer parts onto the pins.

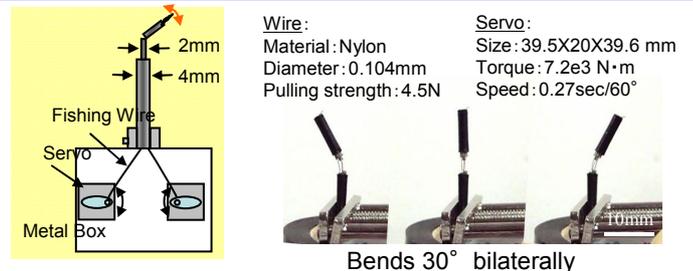


Fabrication and Experiment:

Fabrication of layer parts by photolithography and electroplating



Actuation using two servos



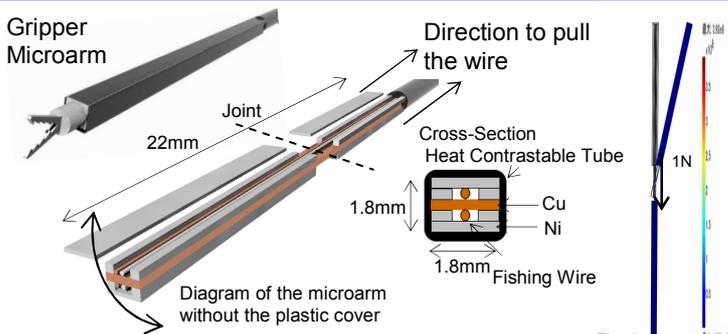
Conclusions:

- Proposed a tool to improve the process of peeling the tumor during the ESD surgery.
- Fabricated an articulated microarm for ESD using STAMP assembly.
- Actuated the arm using two servos and confirmed the arm bends 30° both ways.

Reference:

Daisaku AZUMA, Keisuke NARUMI, Fumihito ARAI, "Exoskeletal Mirorobots: Part 2 Fabrication of Microarms by Stacked Microassembly Process (STAMP)-", Proc. 2008 JEMS Conf. on Robotics and Mechatronics (Robomech2008), 2P2-F15, Nagano, 2008

Wire-actuated articulated microarm and its FEM



The structural aiagram and its cross-section. Two wires bends the arm bilaterally using a spring layer at the center.

FEM Analysis