

## Description of Additional Supplementary Files

**File name:** Supplementary Movie 1

**Description:** MOSD was placed onto the mice sciatic nerve and linearly elongated using a pair of tweezers with LED on.

**File name:** Supplementary Movie 2

**Description:** The MOSD was placed onto the mice sciatic nerve and linearly elongated with LED on 10 months after fabrication.

**File name:** Supplementary Movie 3

**Description:** Representative video of selective stimulation of the sciatic nerve by led1-2 of MOSD (light turned on at 20.4 mW for 20 msec with 2-sec intervals).

**File name:** Supplementary Movie 4

**Description:** Representative video of ankle joint movement by electrical stimulation (0.7 mA, 0.2 msec).

**File name:** Supplementary Movie 5

**Description:** Representative video of ankle joint movement by singlesite optogenetic stimulation (81.6 mW, 20 msec width-2sec interval).

**File name:** Supplementary Movie 6

**Description:** Representative video of upper limb movement elicited by different mini-LEDs of MOSD (20.4 mW, 20 msec width-2sec interval).

**File name:** Supplementary Movie 7

**Description:** Representative video of upper limb movement by electrical stimulation (0.8mA, 0.2 msec-on/ 1 sec-off).

**File name:** Supplementary Movie 8

**Description:** Representative video of upper limb movement by singlesite optogenetic stimulation (81.6 mW, 20 msec width-2sec interval).

**File name:** Supplementary Movie 9

**Description:** Representative video of upper limb movement elicited by LED 1-2 of MOSD (81.6 mW, 20 msec width-2sec interval) 3 weeks after the C7 sever, anastomosis and MOSD implant surgery