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Selective Peripheral Nerve Interfaces

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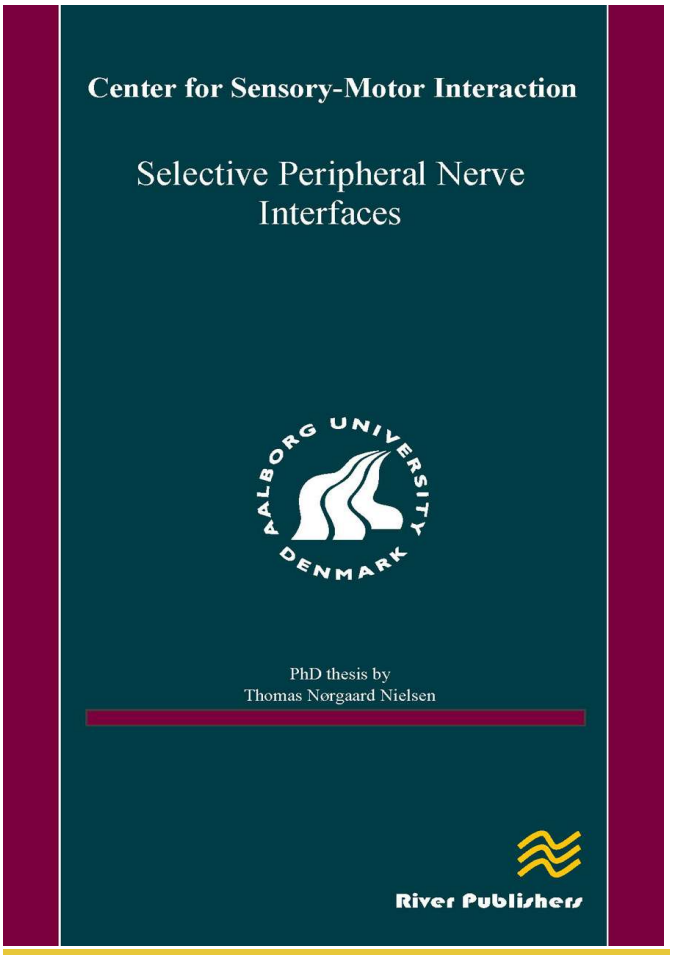
The ability to stimulate sub-areas of a nerve selectively is highly desirable since it has the potential of simplifying surgery to implanting one cuff on a large nerve instead of many cuffs on smaller nerves or muscles, or alternatively can improve function where surgical access to the smaller nerves is limited. In this study stimulation was performed with a four channel multipolar cuff electrode implanted on the sciatic nerve of nine rabbits to compare the extensively researched longitudinal tripolar configuration with the transverse tripolar configuration, which has received less interest. The performance of these configurations was evaluated in terms of selectivity in recruitment of the three branches of the sciatic nerve. The results showed that the transverse configuration was able to selectively activate the sciatic nerve branches to a functionally relevant level in more cases than the longitudinal configuration (20/27 vs. 11/27 branches) and overall achieved a higher mean selectivity (0.79±0.13 vs. 0.61±0.09, mean±standard deviation). The transverse configuration was most successful at recruiting the small cutaneous and medium sized peroneal branches, and less successful at recruiting the large tibial nerve.



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