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Assessment of Neural Outgrowth on Piezoelectric Polymer

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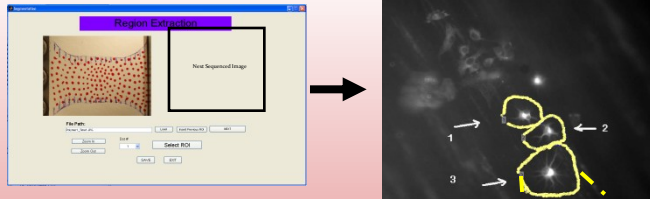
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Abstract

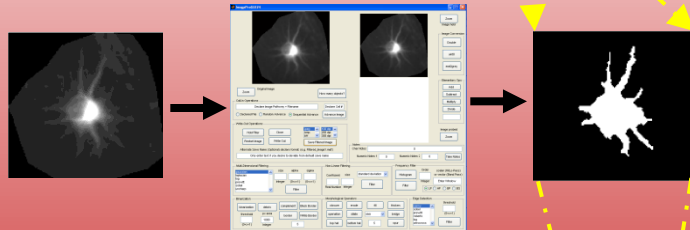
The fabrication of piezoelectric films from powder was accomplished using high pressure and temperature in melpress. Rat spinal cord neurons were cultured onto these films under controlled mechanical stress. At the 5th day cultures were fixed and stained with MAP2, and fluorescent images were processed and analyzed using custom image processing software.

Method 2 – Image Processing

1) Region Segmentation



2) Image Filtering



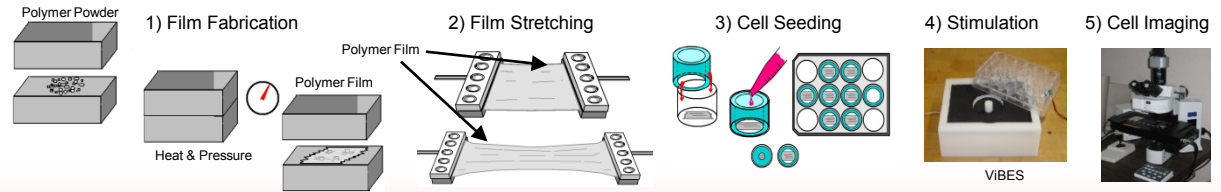
3) Image Stitching



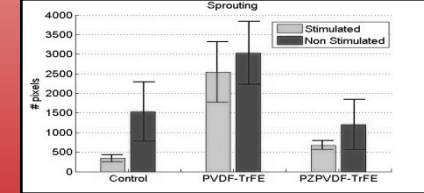
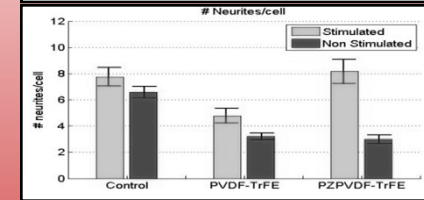
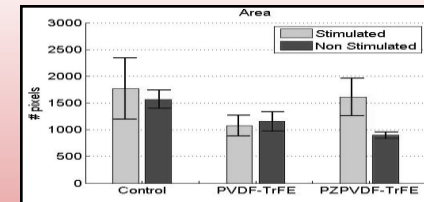
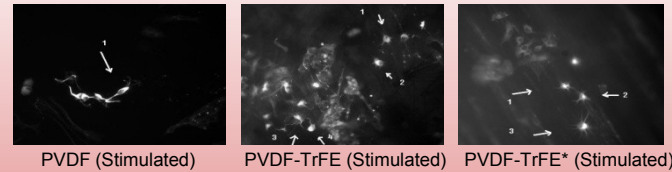
4) Feature Extraction

Eccentricity Area # of Neurites Dendritic Field

Method 1 – Polymer Film Fabrication & Cell Seeding



Results



	Un-stimulated				Stimulated			
	Area (px)	ϵ	# Neur	N	Area (px)	ϵ	# Neur	N
PVDF	788	0.61	6.6	24	1768	0.79	7.7	4
PVDF-TrFE	1157	0.86	3.2	15	1074	0.77	4.8	9
PVDF-TrFE*	898	0.79	3.0	3	1610	0.62	8.2	6

Preliminary results: rat spinal cord neurons on various piezoelectric substrata. Films stimulated by an external platform for 2 hours every 12 hours. ϵ =eccentricity, # Neur=number of neurites, N= sample size. *=Polarized to 150MV/m. Control: empty well coated with poly(D-lysine).

Discussion

- Validation of Methods
- Preliminary Results show:
 - ✓ Most dendritic field in PVDF-TrFE (decreased by polarization)
 - ✓ Most neurites in polarized PVDF-TrFE
 - ✓ Largest cell area in control and polarized PVDF-TrFE

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