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Using a form-finding model to analyze the effect of actin bundles on the stiffness of a cytoskeleton network

Key words: Cytoskeleton network, Form-finding model, Elastic modulus, Actin bundles

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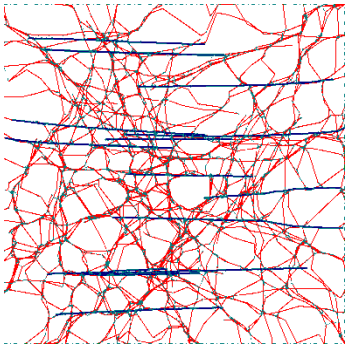
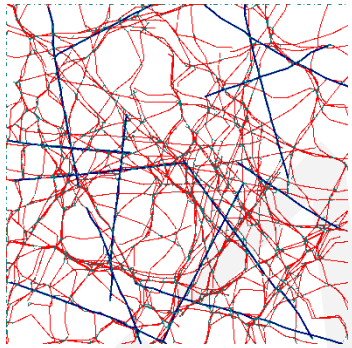
Research Summary

This paper mainly investigated the stiffness of cytoskeleton networks consisting of actin filaments and bundles using a computational model based on form-finding analysis.

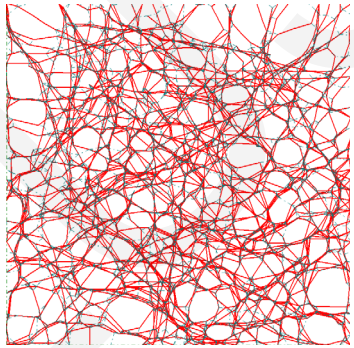
Three aspects that affect the stiffness of cytoskeleton networks have been studied:



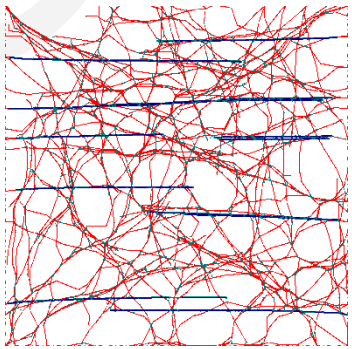
(a) Bundles in parallel



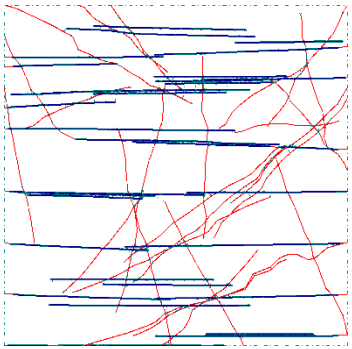
(b) Bundles in disorder



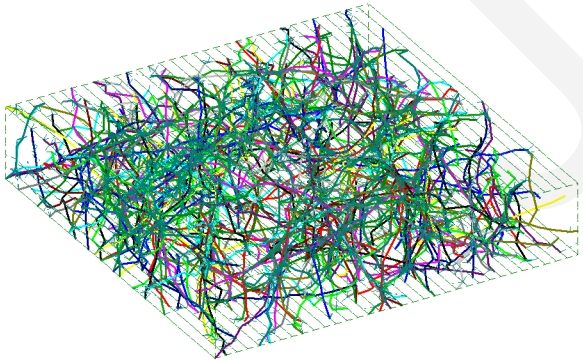
(a) 0%



(b) 40%



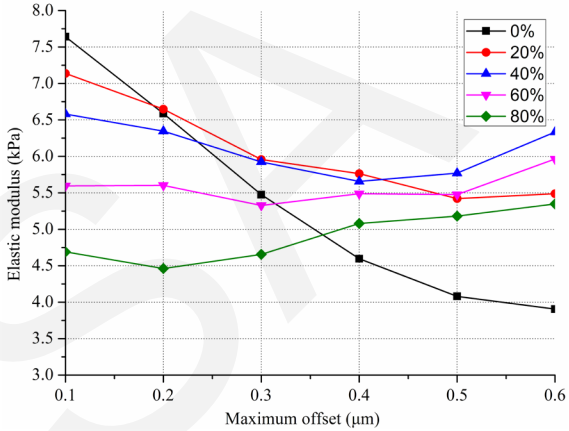
(c) 90%



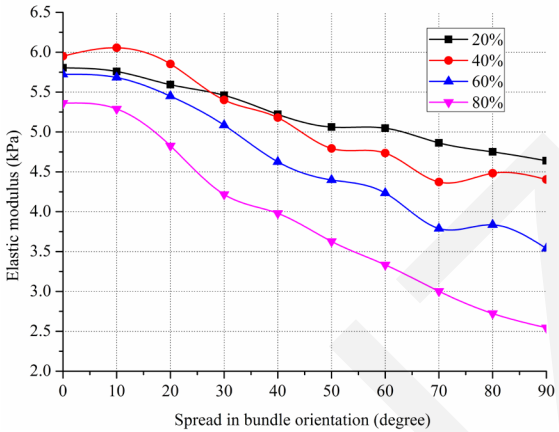
A 3D form-finding model

- **The spread in bundle orientation**
- **Filament undulations**
- **Relative density of bundles**

main conclusions



- **Filament** undulations can soften the network by increasing the amount of bending-dominated deformations in the model.



- **Parallel** bundles along the stretching direction can significantly enhance the network stiffness, while bundles distributed randomly make no contribution to the stiffness.

- **with** a constant amount of actin filament material, the stiffest network contains both actin filaments and bundles.

