Table S1. Parameters used in simulations

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| Model parameters | symbol | Physical value | Simulation value |
| Effective shear viscosity |  |  | 5/3 |
| Effective elastic constant |  |  | 0.02 |
| Interfacial tension  |  |  | 0.1 |
| Shape factor |  |  | 1.1 |
| Polymerization speed |  |  | 0.0003 |
| Average density of actin |  |  | 2 |
| Phenomenological amplitude |  |  | 0.1 |
| Mobility parameter |  |  | 0.1 |
| Rotational viscosity |  |  | 1 |
| Stability constant |  |  | 0.1 |
| Fluid mass density |  |  | 10 |
| Rotational viscosity of myosin |  |  | 5 |
| Reference substrate stiffness |  |  | 0.01 |
| Stiffness gradient |  |  | 0.0004 |
| Basal diffusion rate of NMIIA |  |  | 0.1 |
| Average concentration of NMIIA |  |  | 1 |
| Threshold of cell contractility |  |  | 0.001 |