

Contents

Introduction	1
0.1 Objectives	2
0.2 Figure notation and abbreviations	3
1 Framework	4
1.1 Pattern formation	4
1.2 Bifurcations	6
1.2.1 Saddle-node bifurcation	6
1.2.2 Supercritical bifurcation	7
1.2.3 Subcritical bifurcation	8
1.3 Front propagation	9
1.3.1 Equation Fisher-Kolmogorov-Petrovsky-Piskunov	10
1.3.2 Pulled and pushed fronts	13
1.4 Variational and non-variational systems	15
1.5 Fredholm alternative	16
1.6 Liquid crystals	17
1.7 Fréedericksz transition	19
1.8 Liquid Crystal Light Valve with optical feedback	20
1.8.1 Experimental setup	20
1.8.2 Theoretical description	23
1.8.3 Fréedericksz transition on the LCLV with optical feedback	25
1.9 Dye-doped liquid crystal cell	27
1.9.1 Experimental setup	27
1.9.2 Theoretical model	29
2 Dissipative structures induced by photoisomerization in a dye-doped nematic liquid crystal layer (Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 376, 2135 (2018))	31
2.1 Outlooks	33
3 Front propagation into an unstable state in a forced medium: Experiments and theory (Physical Review E 98, 050201 (2018))	44
3.1 Complementary experimental findings	47
3.1.1 Intensity characterization as a function of spatial light modulator grayscale	47
3.1.2 Modification of the modulation wavelength	48
3.2 Outlooks	50

4	Extended stable equilibrium invaded by an unstable one (Submitted to Scientific Reports in May, 2019.)	56
4.1	Stability analysis of concentric rings (Supplementary material of manuscript <i>Extended stable equilibrium invaded by an unstable one</i>)	59
4.2	Outlooks	64
5	Front propagation transition induced by diffraction in a liquid crystal light valve (Optics Express 27, 12391 (2019))	74
5.1	Outlooks	76
6	Experimental difficulties and outlooks	85
	Conclusion	86
	Bibliography	87