Ninth Workshop Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2018
Turin, Italy, February 7-9, 2018

DISCRETE AND HYBRID MODELLING OF CELL AGGREGATES

Luigi Preziosi

[1] Dip. Scienze Matematiche - Politecnico di Torino

luigi.preziosi@polito.it

Biological systems are formed by different cell phenotypes, characterized by specific biophysical properties and behavior. Further, cells are able to undergo differentiation or phenotypic transitions upon internal or external stimuli. Keeping this in mind, we here present a modelling approach, which is able to describe cells either as pointwise particles or as distributed masses, according to their biological determinants. Further, the proposed approach is equipped by suitable rules to obtain a coherent switch between the two mathematical representations of cell aggregates. The resulting simulation framework then includes cell migratory dynamics and duplication/apoptotic processes. Biologically relevant numerical realizations are finally presented: they deal with the growth of selected phenotypes of a tumor spheroid and the formation of the zebra fish posterior lateral line. Both phenomena mainly rely on cell phenotypic transition and differentiated behavior thereby constituting cell systems suitable to assess the advantages of the proposed model.

 ISBN: 978-989-98750-4-3