

The amoebot model (Derakhshandeh et al., SPAA 2014) is a well-studied model for programmable matter – a substance that can be programmed to change its physical properties. In the geometric variant of this model, the substance (called the amoebot structure) consists of simple particles (called amoebots) that are placed on the infinite triangular grid graph and are capable of local movements through expansions and contractions. Inspired by the muscular system, Feldmann et al. (JCB 2022) have proposed to extend the model by joint movements that allow amoebots to push and pull each other. Utilizing such joint movements, they were able to demonstrate a rapid shape transformation between a line of amoebots and a parallelogram of amoebots.

In this talk, we elaborate on the details of the joint movement extension and explore the potential of the extension for rapid shape transformation between arbitrary amoebot structures. For that, we compare the extension to other programmable matter models, e.g., nubot model, crystalline robots, hexagonal metamorphic robots, and catoms. We show that an amoebot structure is able to simulate shape formation algorithms that were designed for those models.