

Efficient Modeling of Continuum Robots: Combining Lie Group Kinematics with Evolutionary Algorithm

Documentation

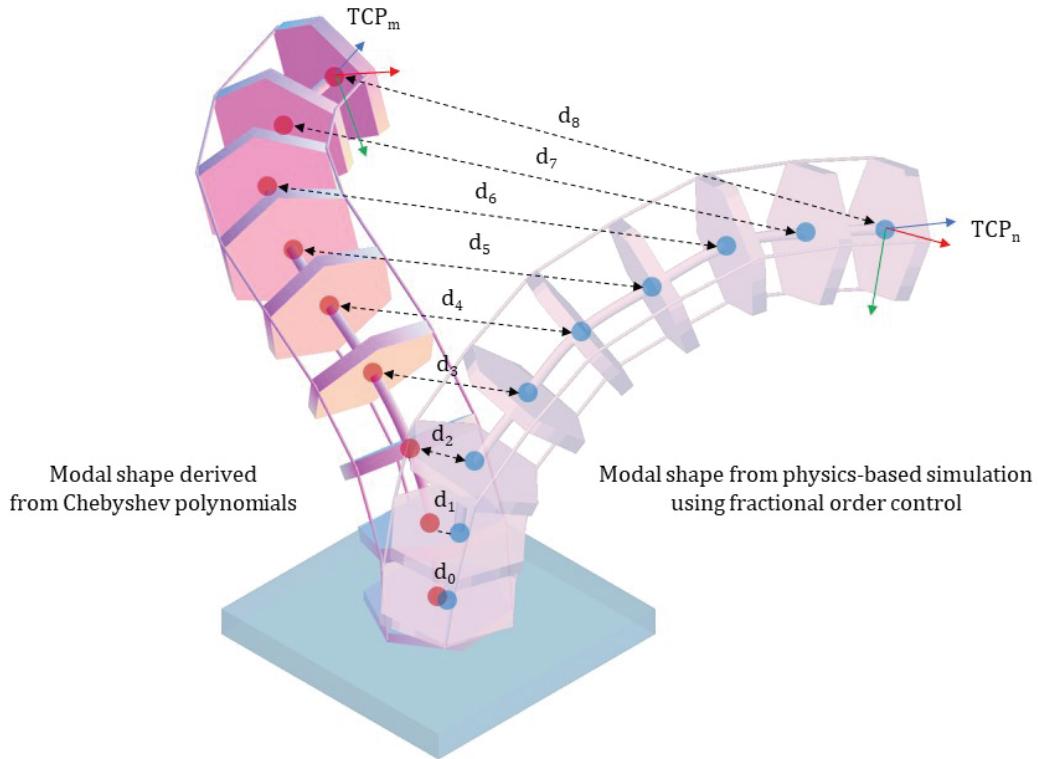
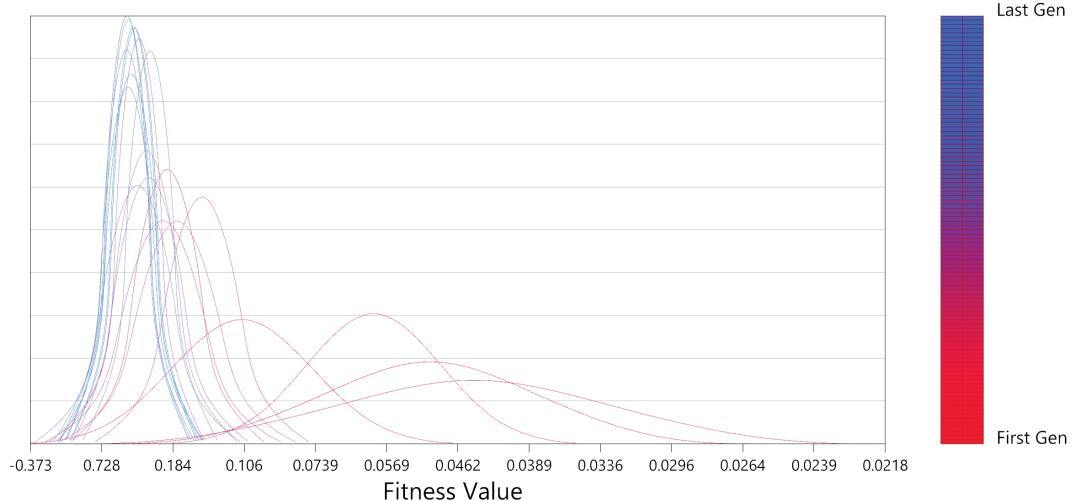


Figure 1. Diagram of input dataset as fitness objectives

Evolutionary Algorithm		
Modal Shape from Chebyshev Polynomials		
Generation Size	-----	20
Generation Count	-----	10
Population Size	-----	200
Algorithm Parameters		
Crossover Probability	-----	90%
Mutation Probability	-----	n^{-1}
Crossover Distribution Index	-----	20
Mutation Distribution Index	-----	20
Random Seed	-----	1
Fitness Objective		
Minimise Deviation MSE	-----	Criteria 1
Minimise TCP Vector MSE	-----	Criteria 2

Figure 2. Fitness parameters of evolutionary algorithm

Standard Deviation Graph



Minimise Deviation MSE

Figure 3. Standard deviation graph of objective 1 (Minimise deviation MSE)

Fitness Values Graph

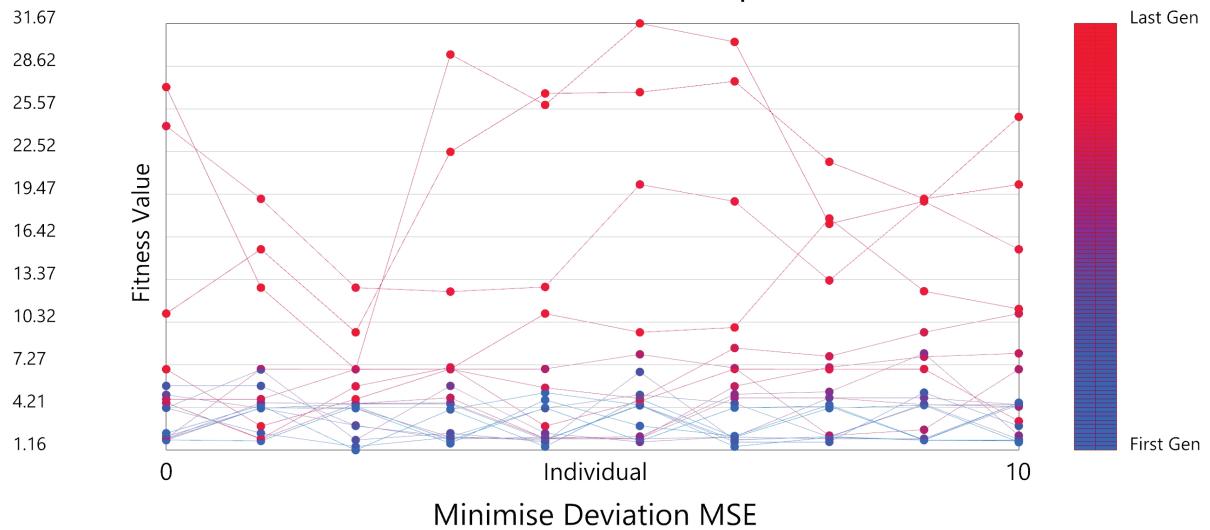


Figure 4. Fitness values graph of objective 1 (Minimise deviation MSE)

Mean Values Trendline

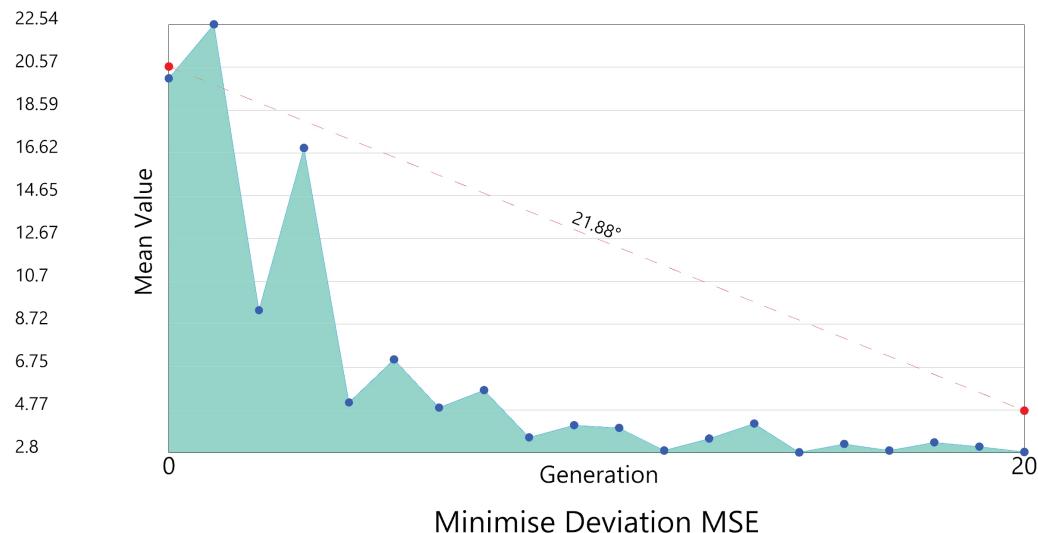
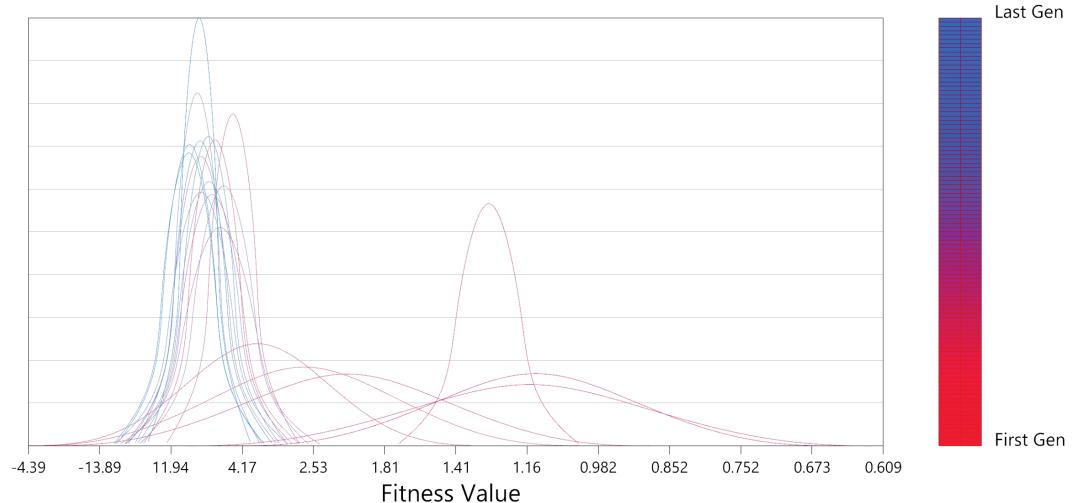


Figure 5. Mean values trendline of objective 1 (Minimise deviation MSE)

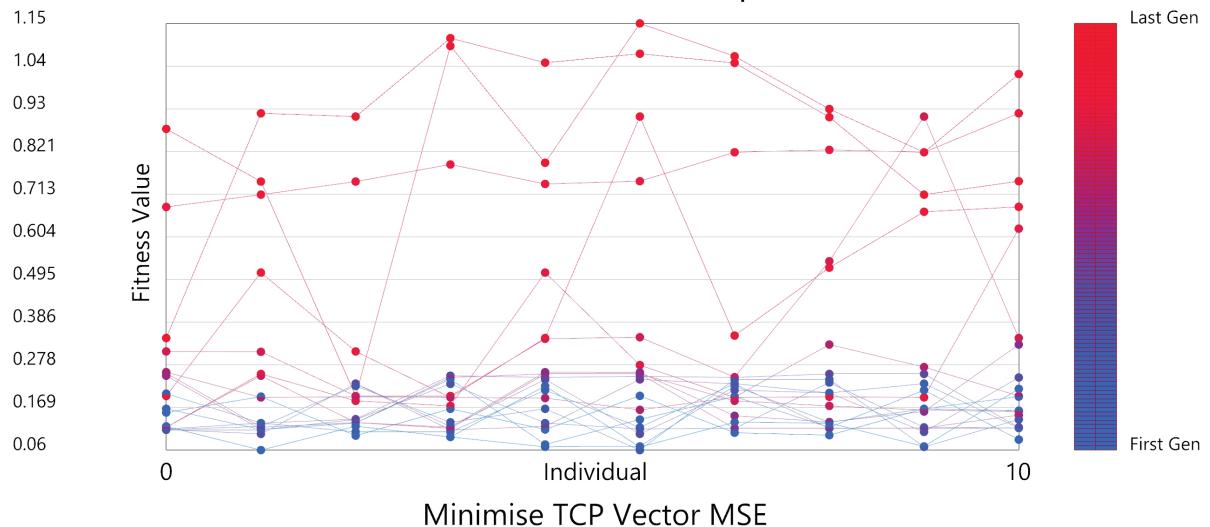
Standard Deviation Graph



Minimise TCP Vector MSE

Figure 3. Standard deviation graph of objective 2 (Minimise TCP vector MSE)

Fitness Values Graph



Minimise TCP Vector MSE

Figure 4. Fitness values graph of objective 2 (Minimise TCP vector MSE)

Mean Values Trendline

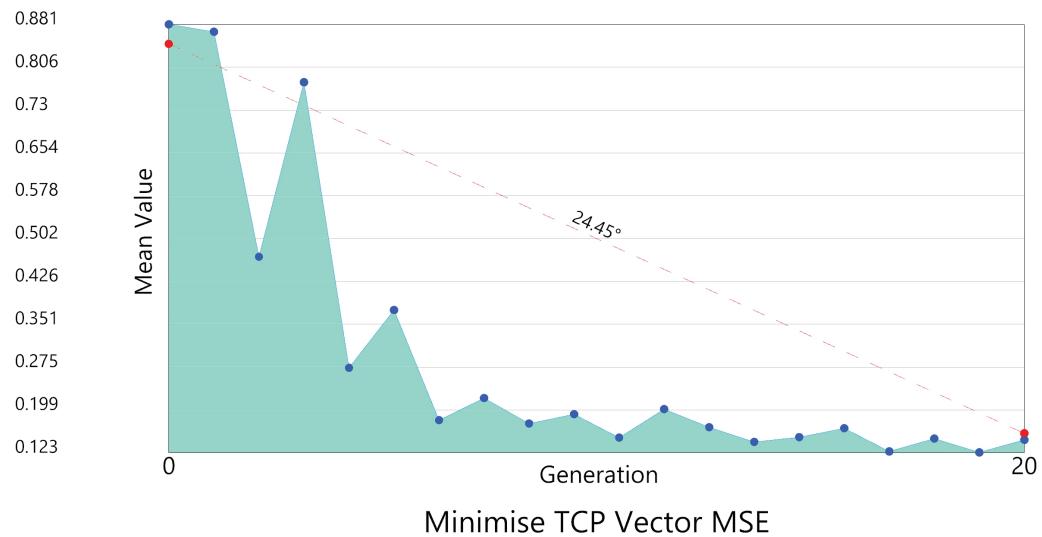


Figure 5. Mean values trendline of objective 2 (Minimise TCP vector MSE)

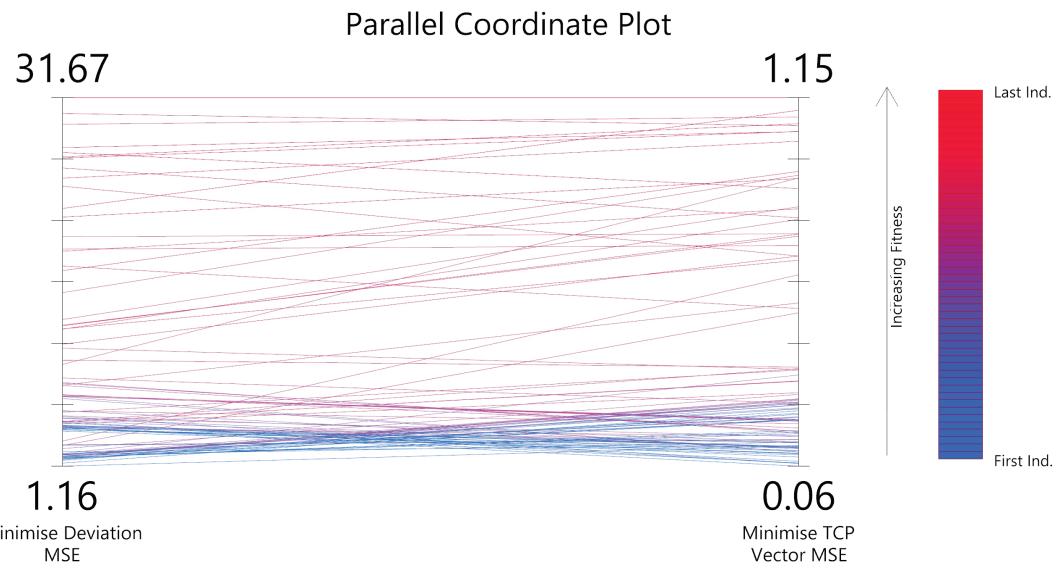


Figure 6. Parallel coordinate plot of fitness objective 1 (left) and 2 (right)

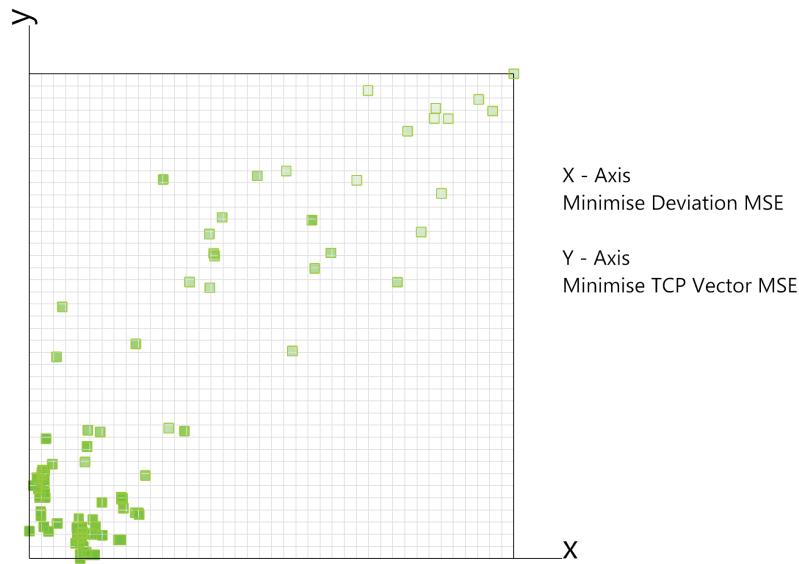


Figure 7. Objective space distribution graph

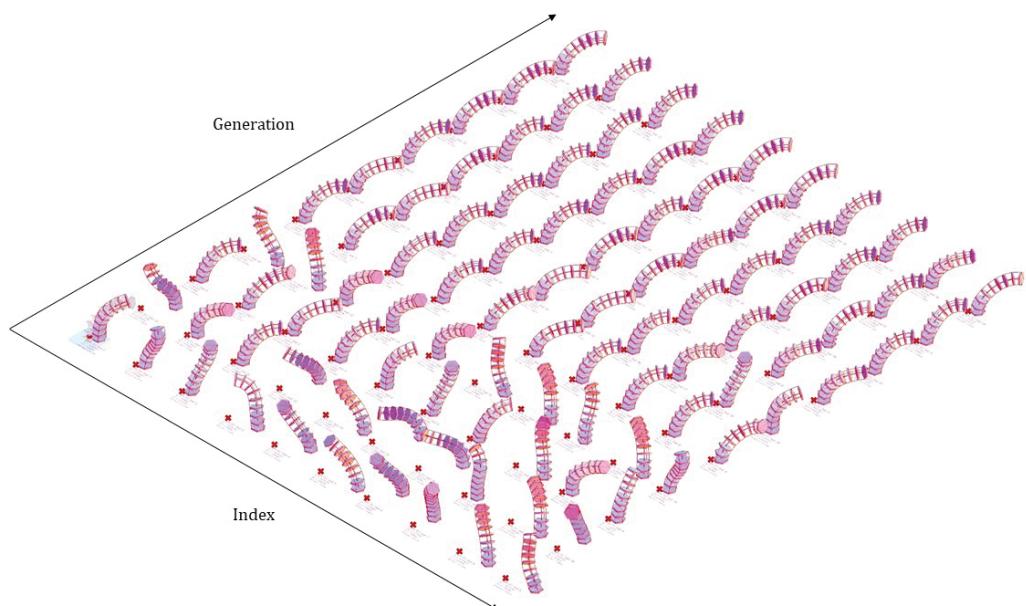


Figure 8. Phenotype (individuals from each generation)

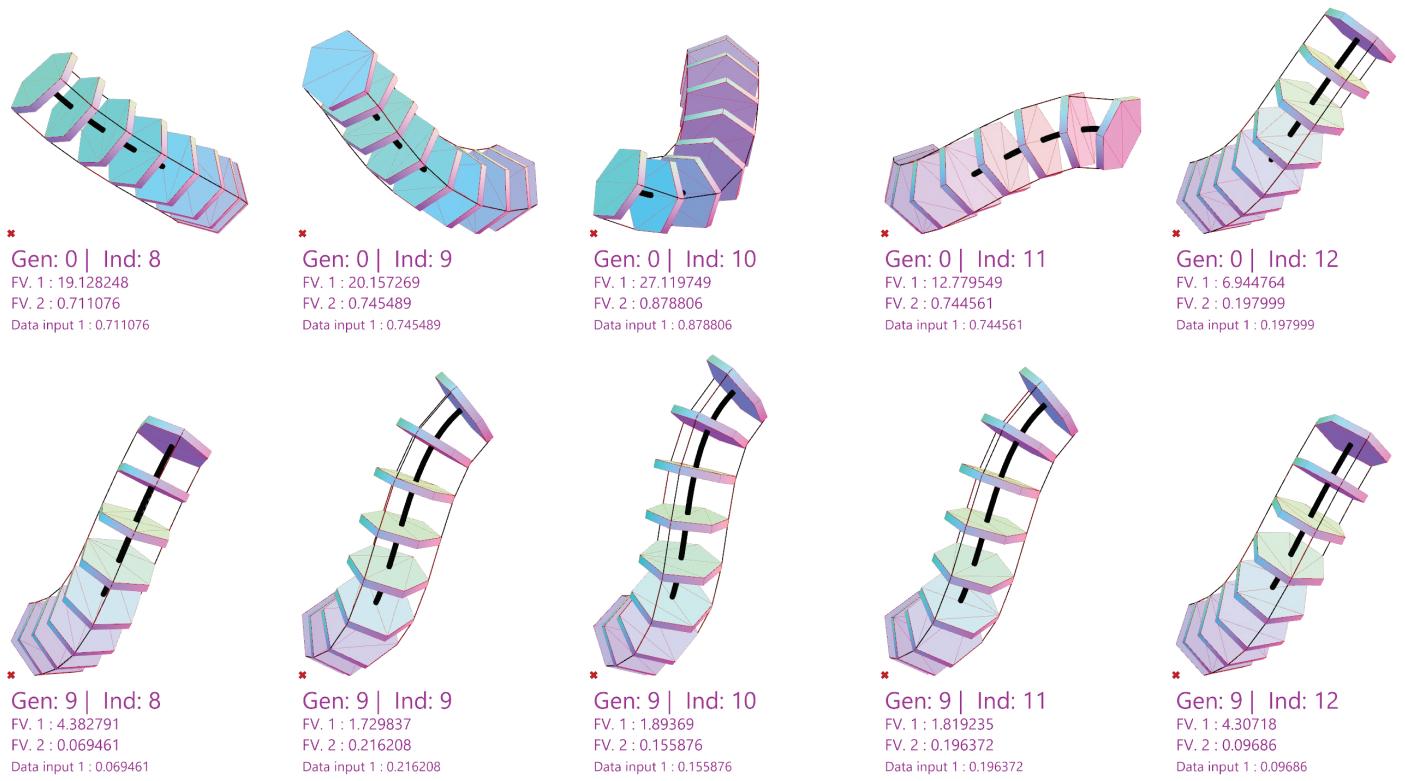


Figure 9. Randomly selected individuals from Generation 0 (the first generation) and 9 (the last generation)

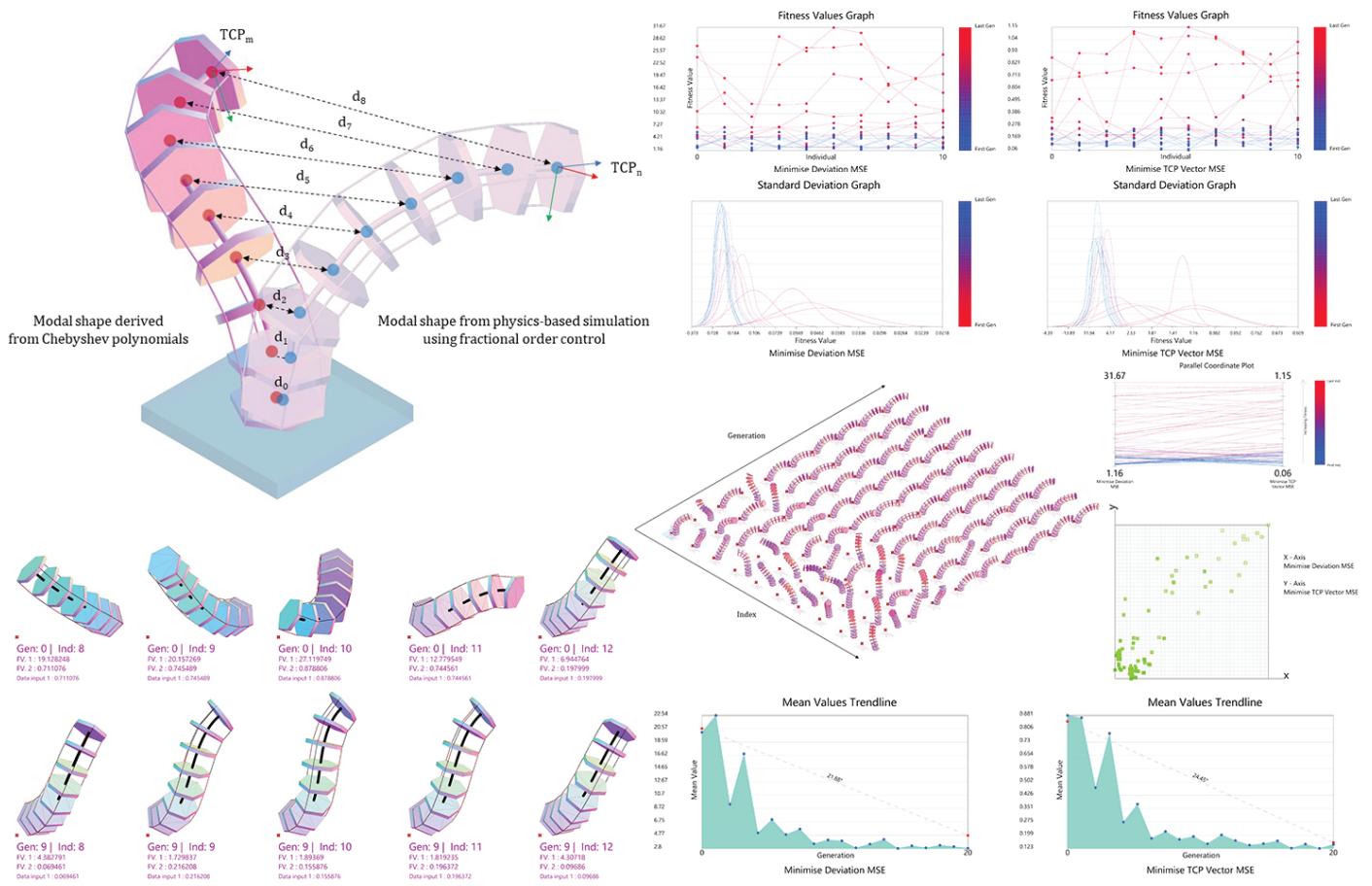


Figure 10. Overall image