1 Average segregation time

As mentioned earlier, the segregation time of $n\%$ is defined as the number of generations until at least $n\%$ of the population on a board lives in homogenous groups. Where person i is said to live homogenous. If for any neighbour j of i, we have $\text{Type}(j) = \text{Type}(i)$.
This gives immediate rise to questions concerning the relation between the choice of n and the average segregation time at $n\%$. Furthermore, it is unclear if segregation at $n\%$ is guaranteed before a board reaches an equilibrium and what the effect is of the happiness boundary on the existence of a segregation time.

To research any of the given questions, we will first have to formalise our choices of board as well as the questions proposed.

1.1 Background Theory

Prior to starting any test or properly formalising our research questions, we note that segratation at $n\%$ does not necessarily have to happen: If we consider $n = 100$ on the standard board with happiness $1/3$. We will nearly never have complete segregation before the board reaches an equilibrium. Therefore one might instead consider the average fraction of segregation at equilibrium,for any given happiness fraction.

Furthermore, the average segregation time as function of the segregation fraction should theoretically be a strictly increasing function since for any given board we have:

$$\begin{aligned} n\% \text{ lives in homogenous groups after } k\text{generations } &\Rightarrow \\ n-1\% \text{ lives in homogenous groups after } k \text{ generations} & \end{aligned}$$

Having noted these facts, we can now properly formalise the research questions.

1.2 Formalisations

The boards that will be analysed are the standard setup and an a larger 4-Type board specified below:

Table 1: My caption

	Standard Board	4-Type Board
Number of types:	2	4
Length:	8	10
Width:	8	10
Happiness:	1	1
Population per type:	20	16

The 4-Type board is constructed to maintain the same ratio of inhabited and uninhabited spots. The choice of happiness is 1 unlike the usual $\frac{1}{3}$. This guarantees that for any $n \leq 100$, segregation at $n\%$ takes place prior to the board reaching an equilibrium. Which leads to defining the research questions:

1. ***What is the relation between the average segregation time and n.***
2. What is the average segregated fraction of the population after a board reaches equilibrium for given choices of happiness.

To establish results regarding the first question, we consider different setups in testing.(NOG TOEVOEGEN).