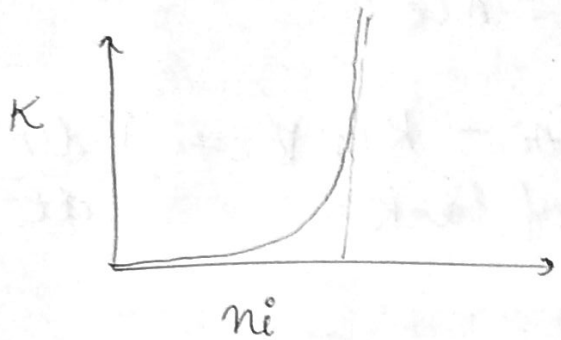
k will depend upon relative capacity of compartment

as $N_i \rightarrow N_{max}$ {max passengers in the given compartment}

$k \longrightarrow k_0$ {max value of k}

K { 0 if $n_i < n_{max}$; k if $n_i > n_{max}$



$$\sum_{j=1}^{n} F_{i,j} + f(i,i+1) + f(i,i-1) = \frac{dn_i}{dt}$$

$$\hookrightarrow \sum_{j=1}^{n} F_{i,j} + K(n_{i+1} - n_i) + K(n_{i-1} - n_i) = \frac{dn_i}{dt}$$

$$\hookrightarrow \sum_{j=1}^{n} F_{i,j} + K(n_{i+1} + n_{i-1} - 2n_i) = \frac{dn_i}{dt}$$

$\sum_{j=1}^{n} F_{i,j}$: n (unknown)

$K(n_{i+1} + n_{i-1} - 2n_i)$: 4 unknowns

Assuming we have all passengers info about boarding the trains or {passengers chart} we can eliminate the (n) unknowns

so only K, n_{i+1}, n_{i-1}, n_i are the remains unknowns

If we unsteady state.

4 unknown 1 mass balance

$4 - 1 = 3$ (DOF)