Transitions probability matrix for the aberration state HMM

Consistent with the model in hapLOH [1], all aberrant states are equal *a priori*, while different from the non-aberrant (normal) state. This is in contrast to GPHMM [2], which treats the normal and aberrant states equally. We use 3 parameters to describe the transition probability matrix (TPM). Let $p_0$ be the probability that next state is any aberrant state given that the current state is the normal, $p_1$ be the probability that next state is a different state (normal or another aberrant state) given that the current state is an aberrant state, and $p_2$ be the probability that next state is another aberrant state, given that the current is aberrant state and a transition occurs. The probabilities $(p_0, p_1, p_2)$ then induce the following TPM:

\[
\begin{pmatrix}
1 - p_0 & \frac{p_0}{N} & \cdots & \frac{p_0}{N} \\
p_1(1 - p_2) & 1 - p_1 & \cdots & \frac{p_1}{N}p_2 \\
\vdots & \vdots & \ddots & \vdots \\
p_1(1 - p_2) & \frac{p_1}{N}p_2 & \cdots & 1 - p_1
\end{pmatrix}
\]

where $N$ (up to 20 in our implementation; see main text) is the number of aberrant states. The three parameters $(p_0, p_1, p_2)$ can be optionally estimated by keeping track of the probabilities $p^{(i)}(l_m, l_{m+1}|g, b, r)$ at the $i^{th}$ iteration in the usual way. We also use $(p_0, p_1, p_2)$ to compute the stationary distributions for the starts of HMMs.

References
