ECG Modeling for Simulation of Arrhythmias in Time-Varying Conditions: Default Parameter Values

The default value for the ECG simulator parameters that are introduced in the manuscript are listed here. Where not specified otherwise, the simulator parameters introduced in the previous version of the simulator are left unchanged. Parameters provided with ranges are uniformly distributed and a new paramter is sampled on a beat basis where not specified otherwise. Additionally, the probability of APB type, VPB type, and bigeminy over trigeminy (involving, respectively, $p_{\mathrm{APB}i}$, $p_{\mathrm{VPB}i}$ and p_{B}) is sampled at each transition of the Markov chain to the respective AT, VPB and BT states.

Atrial premature beats

Parameter	Value	Meaning
$\beta_{\mathrm{APB1,p}}$	[0.55, 0.95]	RR interval prematurity factor of APB with sinus node reset
$\beta_{\mathrm{APB2,p}}$	[0.55, 0.95]	RR interval prematurity factor of APB with delayed sinus node reset
$\beta_{\mathrm{APB2,f}}$	[1.10, 1.35]	RR interval compensatory pause factor of APB with delayed sinus node reset
$\beta_{\mathrm{APB3,p}}$	[0.55, 0.95]	RR interval prematurity factor of APB with compensatory pause
$\beta_{\mathrm{APB4,p}}$	[0.55, 0.65]	RR interval prematurity factor of interpolated APB
p_{APB1}	0.3	Probability of APB with sinus node reset
p_{APB2}	0.3	Probability of APB with delayed sinus node reset
p_{APB3}	0.3	Probability of APB with compensatory pause

p_{APB4}	0.1	Probability of interpolated APB

Atrial tachycardia

Parameter	Value	Meaning
p_{APB}	0.95	Probability of APBs in AT episode duration PMF
p_{AC}	0.040	Probability of atrial couplets in AT episode duration PMF
b_{AT}	1.00	Exponential decay in AT episode duration PMF for $l \geq 3$
$\beta_{\mathrm{AT,p}}$	[0.55, 0.95]	RR interval prematurity factor of AT episode, sampled only at AT episode onset
$\beta_{\mathrm{AT,f}}$	[0.70, 1.50]	RR interval compensatory pause factor for AT episode, sampled only at AT episode end
β_{AT}	[0.5, 0.91]	RR interval shortening factor for RR intervals inside the AT episode, sampled only at AT episode onset
Δd_{RR}	[-100, 100] ms	RR interval variability factor for RR intervals inside the AT episode

Ventricular premature beats

Parameter	Value	Meaning
$\beta_{\mathrm{VPB1,p}}$	[0.55, 0.9]	RR interval prematurity factor of VPB with full compensatory pause
$\beta_{\mathrm{VPB2,p}}$	[0.55, 0.9]	RR interval prematurity factor of VPB with noncompensatory pause
$\beta_{\mathrm{VPB3,p}}$	[0.55, 0.65]	RR interval prematurity factor of interpolated VPB
p_{VPB1}	0.47	Probability of VPB with full compensatory pause
p_{VPB2}	0.47	Probability of VPB with noncompensatory pause
p_{VPB3}	0.06	Probability of interpolated VPB

Bigeminy and trigeminy

Parameter	Value	Meaning
p_{B}	0.72	Probability of bigeminy over trigeminy
a_{BT}	0.84	Exponential amplitude factor in BT episode duration PMF
$\beta_{\mathrm{BT,p}}$	[0.55, 0.9]	RR interval prematurity factor of ventricular beat during bigeminy or trigeminy
$\beta_{\mathrm{BT,f}}$	[1.1, 1.3]	RR interval compensatory pause factor of ventricular beat during bigeminy or trigeminy

Atrial fibrillation

Parameter	Value	Meaning
b_{AF}	0.012	Exponential decay in AF episode duration PMF

Muscular noise

Parameter	Value	Meaning
ν	[0.99, 0.9995]	Filter parameter which models the standard deviation of the muscular noise $w(n)$
σ_w^2	10 μV	Variance of variation of the simulated muscular noise $x_{\sigma_w}(n)$
$m_{\sigma_w}(n)$	20 μV	The muscular noise intensity
$\sigma_{w,min}$	0 μV	Minimum value of the muscolar noise standard deviation $w(n)$

Motion artifacts

Parameter	Value	Meaning
N	2000 ms	Length of the impulse response $h(n)$
α_1	[0.7, 99]	Coefficient of the exponentially increasing part of the impulse response
α_2	[0.7, 99]	Coefficient of the exponentially decreasing part of the impulse response
K	[500, 1500] ms	Impulse response turning point

Respiratory cycle

Parameter	Value	Meaning
γ_{in} (γ_{ex})	3	Inspiration/expiration steepness during the respiratory cycle
δ_{in}	[1.8 2.2] s	Inspiration approximate duration
δ_{ex}	[6.3 7.7] s	Expiration approximate duration
$\alpha_{o,p}$	[0.9 1.1]	Amplitude of the template respiratory cycle
T_r	10 s	Template respiratory cycle duration
ξ_o	5 degrees	Angular signal $\varphi(t)$ maximum variation