

# 37 Eliminating spiral wave and spatiotemporal chaos in cardiac tissues

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## 1. Motivation

Ventricular tachycardia /fibrillation (VT/VF) is the major cause of sudden cardiac death. Increasing evidence suggests that spiral waves are a major form of reentry arrhythmias. The transition from VT to VF may correspond to spiral wave breakup

## 2 Method

Cardiac memory effect, which exhibits the time-delayed coupling of membrane voltage, is introduced into Luo-Rudy phase I cardiac model.

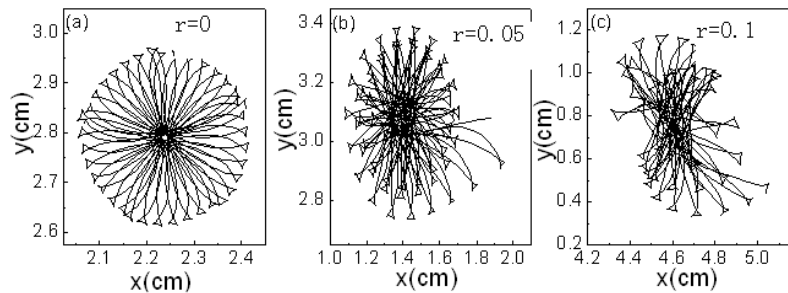
$$\frac{dV}{dt} = -\frac{1.0}{C_m} (I_{Na} + I_{si} + I_K + I_{K1} + I_{Kp} + I_b) + D\nabla^2 V + F(t)$$

Memory term  $F(t) = rD\{\nabla V(t - \tau) + \kappa[V(t - \tau) - V(t)]\}$

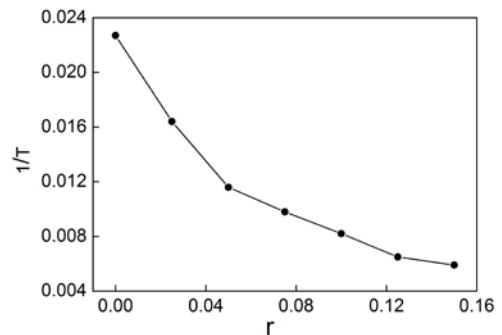
Memory strength  $r$ , Delay time  $\tau$

## 3 Results

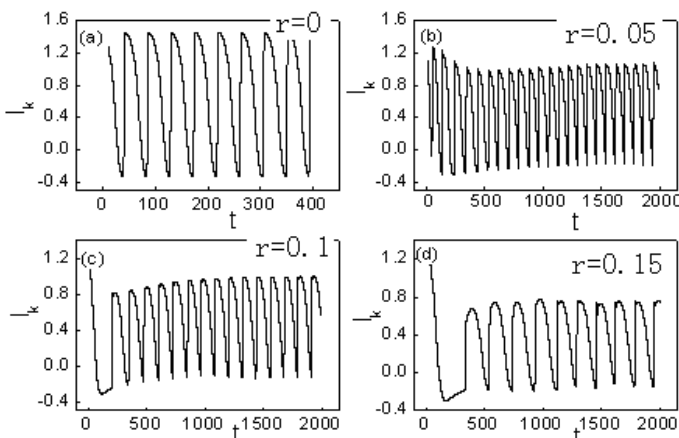
1) Irregular meandering of spiral waves



2) The decrease of spiral wave frequency.



3) The time-dependent potassium ion current is excessively suppressed by cardiac memory.



4) Spiral wave and spatiotemporal chaos are eliminated by cardiac memory

## 4 Remaining question

The experimental implementation