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Mathematical
modelling of the
cardiovascular system
Mathematical model
of cardiac electrical
activity has been

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recognized as one of the significant approaches capable of revealing diagnostic information about the heart.

(PDF) Mathematical modelling of human heart as a ...
Using a new mathematical model of heart cells, investigators have

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shown how activation of a critical enzyme, calmodulin kinase II (CaM kinase), disrupts the electrical activity of heart cells. By targeting this enzyme's activity, it may be possible to prevent or treat heart disease and associated electrical rhythm disturbances.

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[PDF] Mathematical
Modelling Of Cardiac Electrical
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Whole-Heart
Modelling; Organ in
the Body — The
Forward Problem of
Electrocardiology;
The Inverse Problem
of Electrocardiology;
Modelling Other
Cardiac Processes;
Readership: Final
year undergraduate

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bioengineering,
physiology and
applied mathematics
students and
academics who are
interested in the area
of cardiac
electrophysiology.

1 INTRODUCTION

IJSER

A model begins with a
mathematical
description of

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electrical events at the cellular level that give rise to cardiac action potentials. In particular, models incorporate formulations of transmembrane ionic currents along with the voltage, ionic concentrations, and ion channel kinetics responsible for the currents.

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Mathematical
Modeling of the
Cardiovascular
System and its ...
Mathematical and
numerical modeling of
the cardiovascular
system is a research
topic that has
attracted a
remarkable interest
from the mathematical
community be- cause

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of the intrinsic
Cardiac Electrical
mathematical difficulty
Activity and due to the
increasing impact of

Mathematical
modeling of the heart
- IEEE Conference ...
biventricular model of
the heart, and a
mathematical model
for the artificial
generation of
electrocardiogram

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(ECG) signals.

Physical models are suitable to simulate real physiological data based on proper experimental set up present. This paper introduces a new mathematical modelling of human heart as a hydroelectromechanical system (HEMS). This paper simulates

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The Cardiovascular
System: Mathematical
Modeling ...

J. ELECTROCARDIO
LOGY 20(3), 1987,
219-226 Mathematical
Modeling of Electrical
Activity of the Heart
BY ROBERT

PLONSEY, PH.D.
AND ROGER C.
BARR, PH.D.

SUMMARY This

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paper reviews the
literature on
mathematical models

of cardiac activation
and evaluates these
approaches against
an analytical
approach that
includes both
structure and
membrane properties.

Mathematical
modelling of human

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Mathematical
Modelling Of
heart as a ...
Cardiac Electrical
Activity

Modeling of the
Electrical Activity of
Cardiac Cells.

Abstract. We
introduce the Hodgkin-
Huxley (HH)
formulation describing
the flow of ionic
currents across the
membrane of a
cardiac cell, paying
particular attention to

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Modelling Of
the central concepts
of activation and
inactivation.

Mathematical
Modeling and
Simulation of
Ventricular ...
Mathematical
modelling of human
heart as a hydroelectr
omechanical system.
Different electrical
models of human

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Cardiac Electrical
Activity
heart, partial or
complete, with linear
or nonlinear models
have been developed.

Models of cardiac cell
- Scholarpedia

Mathematical
modeling of the heart

Abstract: This paper
presents a new
mathematical model
of the human heart.
Heart is the mother

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Activity

component of the cardiovascular system that consists of four chambers and it is responsible for collecting blood from different parts of the body and pumping the required blood throughout the body.

Mathematically
Modelling the
Electrical Activity of

Access Free Mathematical Modelling Of the Heart Cardiac Electrical Activity

In this model basic electrical components have been used to simulate the physiological functions of the human heart. The result is a simple electrical circuit consisting of main electrical parameters that are transformed from hydraulic models

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Modelling Of
and medical
physiological values.

Developed MATLAB
based mathematical
model will primarely
help to understand
the proper functioning
of an artificial heart
and its simulated
ECG signals.

Mathematical
modeling of electrical
activity of the heart ...

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Membrane Models.
The electrical activity of the heart originates in the ion channels, pumps, and exchangers in the membranes of myocytes and cells of the specific conduction system. The cells actively maintain a large difference in concentration of

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sodium, calcium, and potassium between their cytosol and the interstitium.

Mathematical Modelling Of Cardiac Electrical
modelling of cardiac electrical activities plays a vital role, revealing baseline diagnostic information

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about the functional status of heart. The models of cardiac electrophysiology are usually governed by differential equations [3, 4] consisting of systems of partial differential equations (PDEs) coupled to ordinary differential equations (ODEs).

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Modelling Of Human
Heart as a ...

Mathematical Models
Based on Transfer
Functions to Estimate
Tissue Temperature
During RF Cardiac
Ablation in Real Time.

... Having built the
mathematical model
based on a first-order
transfer function with
fixed applied voltage
and temperature non

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Activity
dependent on the
electrical and thermal
conductivity, in order
to assess the
accuracy of the ...

Mathematical
Modeling of the
Electrical Activity of ...
Modeling of the
Cardiac Pumping
Mechanism 3.1
Control mechanisms
in the cardiovascular

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Activity

system 3.2

Mathematical

modeling of the

cardiac pumping

mechanism 3.3

Electric analogue of

the heart model 4.

Electrical Circuit

Model of the Vascular

System 4.1

Segmental model 4.2

Lumped model 5.

Ventricular-Vascular

Integration 6.

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Mathematical Models Based on Transfer Functions to ...

Lumped parameter model is a very useful type of mathematical modelling where the physical system is made analogous to an electrical network. Lumped parameter model is represented graphically by a circuit

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Activity

diagram in which
vertices represent the
voltages and the
edges the current in
the circuit.

Mathematical
Modelling of Cardiac
Electrical Activity ...
In recent times,
mathematical model
of cardiac electrical
activity has been
recognized as one of

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Cardiac Electrical
Activity

the significant
approaches capable
of revealing

diagnostic information
about the heart.

However, an efficient
and accurate
mathematical
technique required for
this modelling is one
of the major problems
in the field of
biomedical research.

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Mathematical model
advances heart-
related research ...

Mathematical
modelling of the
cardiovascular system
177 Figure 1.

Schematic
representation of the
cardiovascular
system.

atherogenesis. But,
as shown by Zhao et
al. [7], also speci?c

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strain distribution in the vessel wall may contribute to the development of atherosclerosis.

MATHEMATICAL MODELING OF CARDIAC BLOOD FLOW IN HUMANS

The bidomain model is a mathematical model for the electrical properties of

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cardiac muscle that takes into account the anisotropy of both the intracellular and extracellular spaces.

It is formed of the bidomain equations.

The bidomain model was developed in the late 1970s. It is a generalization of one-dimensional cable theory. The bidomain model is a continuum

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Activity

model, meaning that it represents the average properties of many cells, rather than describing each cell individually.

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