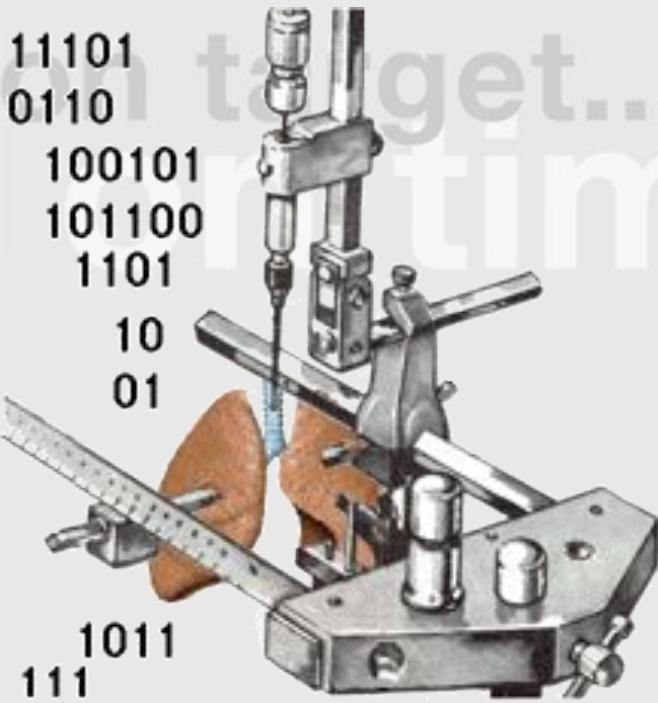




IntelliSoft

Imitation of Biological Processes

Medical Simulations and Analysis



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Imitator - Introduction

- Human body simulation software, developed in the Vinnitsa State Medical University (Ukraine)
 - Modeling of all the internal biological processes
 - From internal parts (organs) down to a cell level
 - Customizable biochemical model of each organ
 - Interrelation between organs
 - Influence of the environment and other initial conditions



The concept of simulation

- Step-by-step simulation of each organ.
- Mathematical model of organs are based on biochemical and fermentative equations.
- Initial conditions and parameters of organs allow simulating of a given case (disease).
- Average values of parameters are provided in the application database.
- Parameters are updated either by a user, or by the simulation engine.
- A change of any parameter (direct or indirect) cause the "chain updates" of other parameters.



Scope (internal processes)

- Interlocking model of main organs, providing a simulations of core processes:
 - metabolism (e.g. biochemical transformations of food, hormones; synthesis of all proteins)
 - blood circulation
 - breathing
- Drug influence on each organ





Scope (external factors)

- Environment
 - temperature, partial pressure, oxygen pressure, carbon dioxide pressure, nitrogen pressure, air humidity, sun UV, regions time zones
- Nourishment
 - food products and ingredients (proteins, fats, carbohydrates, electrolytes, aminoacids, fatty acids, cellulose, collagen, casein etc.), diets, sugar substitutes used in diabetes etc
- Energy expenditures
 - manual labor



Implementation

- Advanced graphics user interface (GUI) based on visual models.
- Customizable mathematical models.
- Database-driven system.

The screenshot displays several windows from the Imitator software:

- Alveola [mixing of gases and "a trap of air"]**: Shows ventilation data for dead and active spaces.

Ventilation of dead space	
Oxygen	183 ml/min
Carbonic gas	44 ml/min
Nitrogen	885 ml/min
Argon	10 ml/min

Ventilation of active space	
Oxygen	461 ml/min
Carbonic gas	30 ml/min
Nitrogen	1881 ml/min
Argon	21 ml/min
- Glomulus**: Shows a cross-section of a kidney with a circled 'pH' label.
- Pass entocyt**: Shows a table of parameters.

Parameter	Value	Unit
Saturation Hb Up to	34	%
Contact Hb With O2	0.362	sec
Saturation Hb. O2	57	%
Hb "has taken"	214.9	ml O2/min
Was dissolved in plasma	5.6	ml O2/min
Hb "has given back"	11.1	ml O2/min
Растворенный в плазме	25.9	ml CO2/min
Was dissolved in plasma	19.6	ml N2/min
In total in blood O2	11.1	ml/100ml
- Speed**: A graph showing a pulse-like signal.
- Active region - ventriculus**: Shows electrical charge data.

Parameter	Value	Unit
The sum a charge	-25670	Me
Charge of the current cral	-44.7	Me
Number of the current cral	71	
- Microscopic view**: Shows a cross-section of a capillary with labels for 'Muc', 'Субинтима', 'Alveolock', 'Соединит. ткань', 'Эндотелиок', and 'Plasma'. It also includes a 'Diameter capillary' label.



How it works

- Lunch the software
- Create (or load) a profile
 - set up the environment (temperature, weather etc)
 - edit individual properties (weight, sex, age etc)
 - define a pathology or disease (optional)
 - select food or drugs (optional)
- Run simulation
 - 24 hour simulation takes few seconds
- Observe the result
(new values of parameters)



Applications

- Modeling biological processes
- Modeling human diseases
- Modeling the effect of drugs and the environment on an organism
- Modeling medical equipments (e.g. anaesthesia machine is included)
 - built-in medical hardware and software
- Industries:
 - Education
 - Health care
 - Research and Development



Availability

- Working system is available for
 - Windows platform
 - Web-based access
- English and Russian versions
- Commercial product can be developed in a matter of a month to meet the specific customer requirements



More Information

- Imitator web site
 - <http://www.simanest.org/medsim/>
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