

INVENTOR GUIDANCE NOTES

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SCOPE: This Inventor Guidance Notes provides information for scientists working in the area of Software/Algorithms and explains what can and what cannot be patented.	DATE: 29th December 2011
TABLE OF CONTENTS: A. Summary B. Relevant legal extracts C. Interpretation of the law and explanations D. Examples and cases E. References	REVIEWER: Nitin S Tewari V. Premnath

A. SUMMARY:

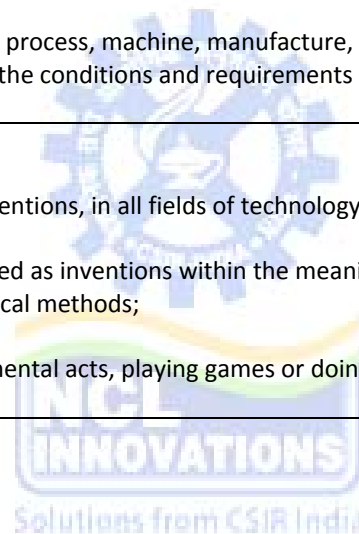
DETAILS	INDIA	USA	EUROPE
The Law	The Patent Act, 1970	United States Code Title 35 – Patents	European Patent Convention
Criterion For Patentability of software/algorithm based inventions	Novelty, Non-obviousness, Industrial Application, proven technical application/ software intrinsic to or embedded in hardware	Novelty, non-obviousness and industrial application, invention should have useful, concrete and tangible result.	Novelty, Non-obviousness, Industrial Application, application sufficiently technical in nature.
Computer program/ Software	Not Patentable per se. But Patentable if the software: 1.Has a proven technical application [IN 227390] 2.Is embedded in hardware [IN227663]	Patentable if 'useful'. Inventions need not be of a technical nature, but must fulfil the "usefulness" criterion. [US7110848]	Not Patentable as such. But patentable if the software makes a considerable technical contribution to the invention. [EP2084535]
Computer program encoded on a computer readable medium [CD/DVD/Floppy etc]	Not patentable as such. But may be granted as one of the claims in an invention with proven technical application. [IN223889]	Patentable. Commonly known as Beauregard claims. [US6728315]	Beauregard claims allowed. Patentable if encoded software has a "technical effect." [EP1579689]
Mathematical Methods/Algorithms	Not Patentable per se but its application is patentable if applied to solve a technical problem. [IN224863]	Not patentable as such. Application of the algorithm may be patentable if the usefulness criterion is fulfilled. [US4344142]	Not Patentable. May be incorporated in a patentable invention to achieve a technical application. [EP2394572]
Business Methods	Not Patentable.	Patentable. [US5960411]	Not Patentable.
Data Structures / Graphical User Interface	Patentable [IN220099, IN245514]	Patentable [US6961664, US6941317]	Patentable [EP1739656, EP1049089]
Software patents relevant to NCL's area of research:	IN 214400 An Apparatus For The Identification And/or Separation Of Complex Composite Signals Into Its Deterministic And Noise Components [NCL] IN 227390 Volume Measurement In 3d Datasets[For Tumour Measurements] IN227663 Device, Method And System For Monitoring Pressure In Body Cavities IN181392 Automatic Reading Lactometer Reading Indicator.	US 7660709 Bioinformatics research and analysis system and methods associated therewith US7920994 Method for the evolutionary design of biochemical reaction networks US6490573 Neural network for modelling ecological and biological systems US 6826513 Method And Apparatus For Online Identification Of Safe Operation And Advance Detection Of Unsafe Operation Of A System Or Process [NCL]	EP1552472 Methods and systems to identify operational reaction pathways GB2434225 Random Forest Modelling Of Cellular Phenotypes EP1600864 Modelling tool for chemical processes
Example: A software patent on motion estimation granted to APPLE Computers ,Inc in IN, US & EP claims:	IN 223889 Titled: A method of performing motion estimation in a digital video system claims: -A method of performing motion estimation in a digital video system.. -A computer readable medium storing a set of instructions... -A method for decoding a bitstream... -A bitstream comprising of... -A method for computing a motion vector, the method comprising... -A computer readable medium storing a set of instructions, which when executed by one or more processors, causes... -A method for decoding video picture.. -For a stream comprising first, second, and third video pictures, comprising...	US6728315 Titled: Method and apparatus for variable accuracy inter-picture timing specification for digital video encoding with reduced requirements for division operations claims: - -A method of performing motion estimation in a digital video system, said method comprising.... - A computer readable medium, said computer readable medium comprising a set of computer instructions for performing motion estimation, said set of computer instructions implementing a set of steps comprising...	EP1579689 titled Method and apparatus for variable accuracy inter-picture timing specification for digital video encoding with reduced requirements for division operations claims : - -A method of performing motion estimation in a digital video system, said method comprising... -A computer readable medium, said computer readable medium comprising.....

[Note: The Copyright Law of each country protects Computer program/ software per se as literary works]

[Note: Refer Section D of this document for the corresponding claims of above mentioned patents of each country]

B. RELEVANT LEGAL EXTRACTS:

COUNTRY & LAW:	LEGAL EXCERPTS:
India: The Patent Act, 1970	S 3 Non Patentable Inventions: (c) the mere discovery of a scientific principle or the formulation of an abstract theory (k) a mathematical or business method or a computer program per se or algorithms (m) a mere scheme or rule or method of performing mental act or method of playing game; (n) a presentation of information;
USA: 35 U.S.C.	101 Inventions patentable. Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
Europe: EPC	Article 52 Patentable inventions (1) European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application. (2) The following in particular shall not be regarded as inventions within the meaning of paragraph 1: (a) discoveries, scientific theories and mathematical methods; (b) aesthetic creations; (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers; (d) presentations of information



C. INTERPRETATION OF THE LAW & EXPLANATION:

INDIA:

The Patents Act 1970 prohibits patenting of mathematical or business methods, algorithms and computer programme/software per se. (Sec 3 k)

However if the computer program is 'sufficiently technical in nature' i.e. if the computer program possesses a technical application to the industry, it may be patentable provided it satisfies the basic criteria of Novelty, Non-Obviousness & Utility. Software based patent, with proven technical application have been granted in India.

For Eg: IN 227390 titled VOLUME MEASUREMENT IN 3D DATASETS presents, an automated method, corresponding device and computer software, which analyze a volume of interest around a singled out tumour, and which, by virtue of a 3D distance transform and a region drawing scheme, automatically segment a tumour out of a given volume.

This invention clearly solves a technical problem and provides a technical solution for the measurement of the tumour volume and was hence granted a patent by the Indian Patent Office.

Software which is intrinsic to or "embedded" in the hardware is patentable as per the Patents Amendment Ordinance, 2004. An invention consisting of hardware along with software or computer program in order to perform the function of the hardware may be considered patentable.

For Eg: IN227663 titled DEVICE, METHOD AND SYSTEM FOR MONITORING PRESSURE IN BODY CAVITIES relates to a portable apparatus for monitoring, sampling and storing pressure and software for analysis of pressures. The invention includes an algorithm for analysis and presentations of pressures and software for performing the analysis. The computer software may be integrated in the portable apparatus and in a variety of systems.

Embedding software in hardware easily overcomes the hurdle of non-patentability of 'computer programs per se' [Sec 3k]. Even then, it is important that the software sought to be protected is not merely a new version or an improvement over an existing code.

Algorithms/ Mathematical formulae as such are not-patentable in India; however their technical application to solve a given problem may well be patentable.

For Eg: IN 224863 titled A METHOD OF OPTIMISING ALLOCATION OF RESOURCES FOR A RESOURCE ALLOCATION PROBLEM talks of a heuristic search method which can be carried out to optimize a solution for a modelled problem. The Patent claims a method comprising of constructing a heuristic searching algorithm from a plurality of heuristic searching parts and applying the constructed heuristic search algorithm to the constructed model in order to optimise a solution for the modelled problem.

⁴In another example, in *Vicom/Computer-related invention* [1987] 1 OJEP 14 (T208/84) the invention concerned a mathematical method for manipulating data representing an image, leading to an enhanced digital image. Claims to a method of digitally filtering data performed on a conventional general purpose computer were rejected, since those claims were held to define an abstract concept not distinguished from a mathematical method. However, claims to a method of image processing which used the mathematical method to operate on numbers representing an image can be allowed.

The reasoning was that the image processing performed was a technical (i.e. non-excluded) process which related to technical quality of the image and that a claim directed to a technical process in which the method used does not seek protection for the mathematical method as such. Therefore the allowable claims as such went beyond a mathematical method.

⁴The claims relating to software programme product are nothing but computer programme *per se* simply expressed on a computer readable storage medium and are not patentable as such. However it may be granted as a part of the claims wherein the invention is software based with a proven technical application.

For Eg.: A claim for a computer readable medium storing the set of instructions has been granted to Apple Computers Inc. in patent no IN223889 titled A METHOD OF PERFORMING MOTION ESTIMATION IN A DIGITAL VIDEO SYSTEM. Claim no 53 is 'A computer readable medium storing a set of instructions, which when executed by one or more processors, causes the one or more processors to perform the steps of...'

Data Structures and GUIs have been granted patents in India.

For Eg: IN 220099 titled A MICROPROCESSOR CONTROLLED INTUITIVE GESTURE-BASED GRAPHICAL USER INTERFACED ELECTRONIC COMMUNICATION DEVICE &

IN24514 titled DATA STRUCTURE FOR DATA STREAMING SYSTEM

USA:

Software-related inventions and applications of mathematical algorithms are patentable in the US provided they produce useful, concrete and tangible results. [in addition to the basic criteria of novelty, non-obviousness and industrial application]

US Patent law doesn't require the invention to be of a 'technical' nature as such but the invention must fulfil a 'Usefulness' criterion. Thus methods of performing computer-aided human activities can also be granted patents. Such patents are called 'Business Method patents' and are widely accepted in US Patent regime. For Eg: US5960411 : Amazon.com- Patent for 1 click online shopping

In USA, patenting of inventive software/computer program encoded on a computer readable medium such as a CD-ROM or a floppy Disc is patentable. In such type of claims,(commonly known as Beauregard type Patent claims) certain pure software is protectable, provided it is encoded on a computer-readable medium.

A typical Beauregard claim would read like:

A computer-readable medium having computer-executable instructions for performing a method comprising:

- maintaining a DB identifying real property buyers and the corresponding real property interests;
- scanning ... an electronic listing service...
- controlling a printer to print a report.

Invention related to Data structures & Graphical User Interface (GUI) is also patentable in the US. [US6728315]

A typical data structure claim would be as follows:

A computer-readable medium having stored there on a data structure comprising:

- a first field containing data representing a desired real property characteristic of interest to a buyer;
- a second field containing data representing a second real property characteristic; and
- a third field containing data representing an interest correlation derived from the first field and the second field.

Eg. US6961664 titled METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS PROVIDES NOVEL METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY MODELLING.

A typical GUI claim would be : [US7856603]

An apparatus comprising:

- a display screen;
- a symbol generator that generates for display on the display screen a set of first graphical symbols in a 3 by 3 matrix arrangement; wherein
- a selector for selection of graphical symbols on the display screen,.....; and
- a controller, connected to the symbol generator and the selector,.....

Eg. US6941317 titled 'GRAPHICAL USER INTERFACE FOR DISPLAY AND ANALYSIS OF BIOLOGICAL SEQUENCE DATA' provides a computer research tool for searching and displaying biological data. Specifically, the invention provides a computer research tool for performing computerized research of biological data from various databases and for providing a novel graphical user interface that significantly enhances biological data representation, progressive querying and cross-navigation of windows and databases.

Mathematical methods/ Algorithms are not patentable as such because they are abstract concepts. But the applications of such methods/algorithms may be patentable.

For Eg: US4344142 titled Direct digital control of rubber moulding presses provides a process for curing rubber which is digitally controlled by means of a mathematical equation.

EUROPE:

In Europe software/ computer programs are as such not patentable. However if the invention is "*sufficiently technical in nature*"; patent can be granted for the same.

Beauregard claims i.e claims for inventive software/computer program encoded on a computer readable medium such as a CD-ROM or a floppy Disc are patentable provided that the encoded software has a

“technical effect.”

Graphical user Interface and Data structures with technical applications are patentable in EP.

Eg. EP1739656B1 Speech recognition method and speech recognition apparatus provides an interactive process using speech recognition together with a graphical user interface comprising a plurality of settable graphical user interface items; the recognition rate is improved by reducing recognition target vocabulary.

EP1049089B1 Data structure for control information on rewriteable data storage media.

Business methods are excluded from patentability.

According to the guidelines issued by the EPC, a computer program that improves the working of a general purpose computer, e.g. by organizing its memory in a manner so as to increase its speed, would be patentable as it has a technical effect.

Mathematical methods are clearly not patentable. But the technical applications of mathematical methods/algorithms may be granted patents in EP.

Eg. EP2394572 titled ‘Apparatus for detecting and discriminating breathing patterns from respiratory signals’ employs an algorithm for diagnosis of sleep disorders employing a classifier algorithm to manipulate the epoch.



D. EXAMPLES AND CASES:

INDIA:			
A Compilation Table of Granted Patents and their Claims:			
Patent No:	Title:	Types of Claims granted:	Independent Claims:
IN214400	An Apparatus For The Identification And/or Separation Of Complex Composite Signals Into Its Deterministic And Noise Components [NCL's Patent]	1.Product Claim- Apparatus	1. An apparatus for identification and/or separation of composite signals obtained from an instrument/equipment recording the variations in a system property as sequential or time-series data from the said instruments/equipments selected from medical diagnostic and scanning equipment, seismographic instruments, tomography, image analyzers, molecular spectroscopy, chemical reactors/reactions, into its deterministic (true signal) and noisy parts which comprises, (a) source means for obtaining the signal to be identified and/or separated from suitable sensors appropriately located in an apparatus/equipment; (b) means for digitizing the said composite signal, obtained as sequential or time-series data relating to a variation in a system property, (c) computing means for subjecting the said digitized data obtained from step (b) above to wavelet transform to obtain a scalogram in terms of wavelet coefficients; (d) computing means for organizing the said resulting wavelet coefficients in each of the scales to form new sets of data; (e) computing means for taking each of the above said data sets and carry out their wavelet transform to obtain another scalogram in terms of wavelet coefficients; (f) computing means for implementing steps ctf e. recursively with testing for the constancy in the power distribution, the said power distribution being the ratio of the power in a particular scale with respect to the total power in all the scales of that scalogram for two consecutive recursive scalograms and thereby identifying the recursive wavelet scales contributing to noise in the signal; (g) computing means for eliminating the above said wavelet coefficients in the recursive wavelet scales contributing to noise by setting them to zero; (h) computing means for inverting above said the wavelet coefficients by inverse recursive wavelet transformation and thereby determining the deterministic signal component, the said signal component being the true signal in digitized form separated from the noise component. (i) means for converting the above said digitized deterministic signal component to an analog signal using D to A converter
IN227390	Volume Measurement In 3d Datasets[For Tumour Measurements]	1. Process Claim for A method of determining 6.Product Claim for a device 10. Product Claim for a computer program to achieve a technical output.	1. A method for determining a volume of an object from three-dimensional volume data including graphic information units, comprising: determining a volume of interest including the object; determining thresholds of the graphic information units in the volume of interest; performing a distance transform on the basis of the thresholds for determining a distance map consisting of voxels; providing a seed point in the distance map, which seed point is on the object; determining a number of core-voxels and a number of front-voxels by using the seed point; and determining the volume of the object on the basis of the number of core-voxels and the number of front-voxels. 6. Image processing device, comprising: a memory for storing three-dimensional volume data; and an image processor for determining a volume of an object from the three-dimensional volume data which includes graphic information units, which image processor is adapted to perform the following operation: determining a volume of interest including the object; determining thresholds of the graphic information units in the volume of interest; performing a distance transform on the basis of the thresholds for determining a distance map consisting of voxels; providing a seed point in the distance map, which seed point is on the object; determining a number of core-voxels and a number of front-voxels by using the seed point; and determining the volume of the object on the basis of the number of core-voxels and the number of front-voxels. 10. Computer program comprising computer code means for performing the following operation for determining a volume of an object form three-dimensional volume data including graphic information units when the computer code means is executed on a computerized image processing device: determining a volume of interest including the object; determining thresholds of the graphic information units in the volume of interest; performing a distance transform on the basis of the thresholds for determining a distance map consisting of voxels; providing a seed point in the distance map, which seed point is on the object; determining a number of core-voxels and a number of front-voxels by using the

			seed point; and determining the volume of the object on the basis of the number of core-voxels and the number of front-voxels.
IN227663	Device, Method And System For Monitoring Pressure In Body Cavities	Process Claim for a method of analysis.	A method for analysing pressure signals comprising pressure related digital data with a time reference, derived from pressure measurements on or in a body of a human being or animal, said method comprising the steps of: identifying from said digital data features related to single pressure waves in said pressure signals, said identifying step including determination of a minimum pressure value related to diastolic minimum value and a maximum pressure value related to systolic maximum value, and determining at least one parameter of the single wave parameters elected from the group of: pressure amplitude = $\Delta P = [(maximum\ pressure\ value) - (minimum\ pressure\ value)]$, latency (ΔT), rise time or rise time coefficient = $\Delta P/\Delta T$, and wavelength of the single wave, and comprising the further step of: determining numbers of said single pressure waves occurring during a given time sequence, wherein said determining of numbers includes: determining numbers of single pressure waves with pre-selected values of one or more of said single pressure wave parameters during said given time sequence, and further includes determining numbers of single pressure waves with pre-selected combinations of two or more of said single pressure wave parameters during said given time sequence.
IN181392	Automatic Reading Lactometer Reading Indicator.	Product Claim for an automatic device with a supporting software for its functioning.	An Automatic corrected lactometer reading indicator to determine the correct specific gravity of liquids more specifically milk, without any additional diluents, chemicals ; the said indicator comprising:(a)..... (e) The said measuring head connected to a microprocessor based electronic control unit along with appropriate firmware and software to control the various controls of the unit.
IN224863	A Method Of Optimising Allocation Of Resources For A Resource Allocation Problem	1.Process Claim 2. Process Claim 3. Process Claim for a method of constructing a heuristic searching algorithm.	1.A method of optimising allocation of resources for a resource allocation problem, the problem being defined by problem variables, problem expressions, problem constraints and an objective function to be optimised in accordance with a predetermined optimisation criterion, wherein the problem variables are representative of at least some of resources to be allocated, temporal parameters associated with allocation of the resources, tasks to be performed, costs associated with allocation of resources, capabilities of the resources and capacity of the resources, wherein the problem expressions are representative of relationships between the problem variables, wherein the problem constraints are representative of constraints placed upon the problem variables, and wherein said problem variables, problem expressions, problem constraints and objective function are stored on a memory, the method being carried out by a data processor and comprising the steps of: (i) building a model of said resource allocation problem in accordance with said problem variables, problem expressions, problem constraints, and objective function and storing said model in said memory, (ii) generating a solution to the modelled problem and storing said solution in said memory, the solution comprising a set of values representative of at least some of the problem variables, (iii) applying a change to the generated solution by modifying one or more values in the set, (iv) identifying problem expressions directly and/or indirectly dependent on the modified values, (v) of the dependent problem expressions identified at step (iv), (a) selecting an identified problem expression from the dependent problem expressions identified at step (iv), (b) evaluating whether one or more inputs to the selected problem expression has changed, (c) if the or each input has not changed, marking the selected problem expression, and all problem expressions dependent on the said selected problem expression as unchanged, (d) selecting the next problem expression identified at step (iv), and (e) («) repeating steps (b) - (d) until there are no further problem expressions to be selected; (vi) generating a further solution to the modelled problem in accordance with the modified one or more values in the set applied in step (iii) and the problem expressions identified in step (iv); (viii) determining whether the generated further solution better satisfies the objective function and if so, setting the generated further solution as the solution to be modified in step (iii);

			<p>(vii) repeating steps (iii) to (vi) until a predetermined number of solutions have been generated;</p> <p>(ix) outputting the solution which best satisfies the objective function as a solution to the modelled problem.</p> <p>6. A method of constructing a model of a problem that involves a plurality of variables, the problem being definable by predetermined conditions, constraints and objectives, the method being carried out by a data processor and comprising the step of: defining a plurality of expressions as corresponding one or more declarative statements, wherein at least some of the expressions are dependent on at least one of said variables and describe at least in part the conditions, constraints and objectives of said problem.</p> <p>8. A method of optimising a model of a problem constructed according to claim 6 or claim 7, comprising the step of constructing a heuristic searching algorithm from a plurality of heuristic searching parts and applying the constructed heuristic search algorithm to the constructed model in order to optimise a solution for the modelled problem.</p>
IN220099	A MICROPROCESSOR CONTROLLED INTUITIVE GESTURE-BASED GRAPHICAL USER INTERFACED ELECTRONIC COMMUNICATION DEVICE	1. Product claim for a graphical user interfaced electronic communication device	<p>1. A microprocessor-controlled intuitive gesture-based graphical user interfaced electronic communication device comprising:</p> <p>(A) gesture-based graphical user interface enabled touch-sensitive screen for displaying at least one gesture-supported screen object; and</p> <p>(B) receiving the user input corresponding to a selection of the said screen object and evaluating the said user input corresponding to gesture selection; and</p> <p>(C) providing at least one user feedback acknowledging the said gesture selection; and determining if the said user input is said function call; and if the user input is the said function call performing a function; and if the user input is not the said function call, returning to the step of automatically presenting on the screen a said directional palette (step C) 1)).</p>
IN245514	DATA STRUCTURE FOR DATA STREAMING SYSTEM	<p>1. Product Claim for a data structure.</p> <p>8. Product claim for a computer readable medium on which the data structure has been encoded.</p>	<p>1. A data structure for storing a data source for a streaming system, the data source including a plurality of encoded data streams, each of the plurality of data streams being an independent representation of data from the data source encoded at a different resolution to the other of the plurality of data streams, the data structure comprising a header (600-680), a stream data structure (700) for each of the encoded data streams and one or more packets (800) of the encoded data streams, the header (600-680) being linked to one of the stream data structures (700), wherein each stream data structure (700) includes a header (705,740, 750), a link (710) to a next stream data structure and a link (720) to a first packet of the encoded data stream.</p> <p>8. A data structure according to any of claims 1 to 7 encoded on a computer readable medium.</p>

USA:

A Compilation Table of Granted Patents and their Claims:

Patent No:	Title:	Types of Claims:	Independent Claims:
US5960411	Method and system for placing a purchase	6. Business Method claim 9. Process claim for a server	6. A client system for ordering an item comprising: an identifier that identifies a customer; a display component for displaying information identifying the item; a single-action ordering component that in response to performance of only a single action, sends a request to a server system to order the identified

	order via a communications network	system	<p>item, the request including the identifier so that the server system can locate additional information needed to complete the order and so that the server system can fulfill the generated order to complete purchase of the item; and</p> <p>a shopping cart ordering component that in response to performance of an add-to-shopping-cart action, sends a request to the server system to add the item to a shopping cart.</p> <p>9. A server system for generating an order comprising: a shopping cart ordering component; and a single-action ordering component including: a data storage medium storing information for a plurality of users; a receiving component for receiving requests to order an item, a request including an indication of one of the plurality of users, the request being sent in response to only a single action being performed; and an order placement component that retrieves from the data storage medium information for the indicated user and that uses the retrieved information to place an order for the indicated user for the item; and an order fulfillment component that completes a purchase of the item in accordance with the order placed by the single-action ordering component.</p>
US7660709	Bioinformatics research and analysis system and methods associated therewith	<p>1.Process claim for genotype analysis</p> <p>3. Product claim for a system for performing biomedical research.</p>	<p>1. A method for determining genotype analysis for an application of specific drug treatments for identified genes using at least one database comprising the steps of: identifying at least one condition-specific genomic, proteomic or metabolic profile; identifying a statistically significant discriminator; accessing a global network defining known biological molecular processes; identifying a set of condition-specific nodes in the global network; calculating at least one shortest network path from a first node (j) to every other condition-specific node wherever a path exists in the global network; counting the number of condition specific nodes connected to the first node (j) by the shortest path containing a second node (i); determining a pre-calculated table of the shortest network paths from every node in the global network of interactions to all other nodes wherever such directed paths exist; counting the total number of nodes that are connected to the first node (j) by a shortest paths containing the second node (i) in the global network; calculating a probability score using a hypergeometric distribution with parameters determined by the number of nodes in the global network and number of condition specific nodes and number of nodes connected to the first node (j) by the shortest network paths containing the second node (i); utilizing the probability score for providing connectivity among genes or proteins of interest to assess role of nodes in the application of specific drug treatments; and wherein the hypergeometric distribution is $p_{ij} = \frac{\binom{K}{ij} \binom{N-K}{N-ij}}{\binom{N}{N}} = \frac{\binom{N-K}{N-ij} \binom{K}{ij}}{\binom{N}{N}} = \frac{N!}{(N-ij)! ij!} \frac{K!}{(K-ij)! ij!} \frac{(N-K)!}{(N-ij-K+ij)!}$ such that P_{Kij} is the probability of determining the shortest path network of nodes i and j; K is a set of experimentally-derived nodes of interest; and N is the total number of network nodes; and outputting a result to a user of the applicable drugs with the genomic or proteomic profiles, wherein all steps are performed on a processor.</p> <p>3. A system for performing biomedical research comprising: a first database for classifying molecular-based samples from various subjects; a second database utilizing a plurality of predetermined tables of shortest network paths for a network of identified biological processes; and a processor for determining at least one statistically-significant discriminator using a computational distribution for scoring nodes in a network built from a set of experimentally-derived condition-specific genomic or proteomic profiles to identify applicable drugs with the genomic or proteomic profiles using the computational distribution $p_{ij} = \frac{\binom{K}{ij} \binom{N-K}{N-ij}}{\binom{N}{N}} = \frac{\binom{N-K}{N-ij} \binom{K}{ij}}{\binom{N}{N}} = \frac{N!}{(N-ij)! ij!} \frac{K!}{(K-ij)! ij!} \frac{(N-K)!}{(N-ij-K+ij)!}$ such that P_{Kij} is the probability of determining the shortest path network of nodes i and j; K is a set of experimentally-derived nodes of interest; and N is the total number of network nodes; and such that P_{ij} is the probability of determining the shortest path network of nodes i and j; K is a set of</p>

			experimentally derived nodes of interest; and N is the total number of network nodes; and wherein a result is displayed to a user of the applicable drugs with the genomic or proteomic profiles.
US7734420	Methods and systems to identify operational reaction pathways	1. Process claim for software-aided reaction pathway identification.	1. A method of identifying an operational reaction pathway of a biosystem, wherein the steps of said method are performed on a suitably programmed computer programmed to execute the steps comprising: (a) providing a set of systemic reaction pathways through a reaction network representing said biosystem; (b) providing a set of phenomenological reaction pathways of said biosystem; (c) comparing said set of systemic reaction pathways with said set of phenomenological reaction pathways; and (d) Providing an output to a user of the selection of a pathway common to said set of systemic reaction pathways and said phenomenological reaction pathways of said biosystem, wherein said pathway common to said sets is an operational reaction pathway of said biosystem.
US7920994	Method for the evolutionary design of biochemical reaction networks	1. Software aided Process claim for biochemical reaction network.	1. A method for achieving an optimal function of a biochemical reaction network in an eukaryotic cell comprising: (a) calculating optimal properties of a biochemical reaction network by applying a computational optimization method to a list of reactions representing said biochemical reaction network; (b) altering said list of reactions in the biochemical reaction network and re-computing the optimal properties; (c) repeating (b) until a desired optimal function is reached; (d) constructing an eukaryotic cell having the genetic makeup containing the biochemical reactions which result from (c); (e) placing the eukaryotic cell constructed under (d) in culture under a specified environment to obtain a population of eukaryotic cells; and (f) Cultivating the eukaryotic cells as in step (e) for a sufficient period of time and under conditions to allow the cells to evolve to the desired optimal function determined under (c), wherein the biochemical reaction network comprises a comprehensive biochemical reaction network.
US7769576	Method and apparatus for integrated modelling, simulation and analysis of	1. Process claim for an electronic device implemented simulation system for chemical reactions. 18. Product claim for computer readable storage medium.	1. An electronic device-implemented method for simulating a system that comprises a plurality of chemical reactions, the method comprising: stochastically simulating the system, using the electronic device, by: determining, using the electronic device, a reaction occurrence time for a first chemical reaction using a first probability distribution associated with the first chemical reaction, wherein the first chemical reaction is a non-mass action chemical reaction in which a reaction rate is not proportional to a product of reactant quantities of reactants involved in the non-mass action chemical reaction, and determining, using the electronic device, a reaction time for a second chemical reaction using a second probability distribution associated with the second chemical reaction; and storing the reaction occurrence time for the first chemical reaction and the reaction time for the second chemical reaction in a memory associated with the electronic device. 18. A tangible computer-readable storage medium storing instructions for simulating a system that comprises a plurality of chemical reactions that, when executed by a processor, cause the processor to: stochastically simulate the system by: determining a reaction time for a first chemical reaction using a first probability distribution associated with the first chemical reaction, wherein the first chemical reaction is a non-mass action chemical reaction in which a reaction rate is not proportional to a product of reactant quantities of reactants involved in the non-mass action chemical reaction, and determining a reaction time for a second chemical reaction using a second probability distribution associated with the second chemical reaction; and store the reaction time for the first chemical reaction and the reaction time for the second chemical reaction in a memory.
US6490573	Neural network for modelling ecological and biological systems	1. Process claim for computational modelling of ecological/biological systems. 17. Process claim for operating the neural network	1. A method of operating a neural network for modelling ecological and biological systems having a plurality of hidden layer neurons, said method comprising the following steps: (a) distributing network inputs to said hidden layer neurons as driving independent variables; (b) said hidden layer neurons performing a user-specified regression model using the neuron weights as the dependent variable; (c) said regression model at each step evaluates whether the fit of the model to the data has improved from the previous step, and calculating the loss function; (d) said loss function is estimated using least squares estimation procedure aimed at minimizing the sum of squared deviations of the observed values for the independent variable from those predicted by the model stated as:

		<p>19. Process claim for operating the neural network</p>	<p>Loss(PredObs)**2 wherein Pred and Obs indicate predicted and observed values respectively; (e) said loss function can also be estimated using weighted least squares stated as: $Loss(ObsPred)2*(1/x2)$; (f) said loss function using a user-specified minimization algorithm; (g) said minimization algorithm using a Simplex procedure such that when a minimum appears to have been found, the Simplex will again be expanded to a larger size to see whether the respective minimum is a local minimum; (h) said loss function minimization algorithm using a quasi-Newton method; (i) said quasi-Newton method at each step of the iteration will evaluate the function at different points to estimate the first-order derivatives and second-order derivatives; (j) said minimization algorithm using the Hooke-Jeeves pattern moves; (k) said Hooke-Jeeves pattern moves at each iteration first defines a pattern of points by moving each parameter one by one, so as to optimize the current loss function; (l) said Hooke-Jeeves pattern to be tried if both the quasi-Newton and Simplex methods fail to produce reasonable estimates; (m) said minimization algorithm using Rosenbrock pattern search or method of rotating coordinates; (n) said Rosenbrock pattern search involving rotating the parameter space and aligning one axis with ridge and all other axes remaining orthogonal to this axis; (o) said detectable ridges pointing towards a minimum of function; (p) said Rosenbrock pattern search method to be tried if other methods fail to provide a reasonable estimate; otherwise (q) said Rosenbrock pattern search method terminates early when there are several constraint boundaries that intersect, leading to a discontinuity in the ridges; (r) said algorithms performed by each neuron of the hidden and output layers; (s) said output neuron(s) performs a test of the appropriateness of the overall model using the plot of the observed versus predicted (target) values.</p> <p>17. A method of operating a neural network for ecological and biological system modeling having a plurality of hidden layer neurons said method comprising the following steps: (a) distributing network inputs as driving independent variables; (b) said independent variables comprising ecosystem parameters selected on the basis of biological or physical relationships; (c) said independent variables providing input to first layer of hidden neurons; (d) said neurons comprising processes within the elements of the ecological and biological systems; (e) said ecological and biological systems comprising bacteria, zooplankton, phytoplankton and hydrogeological features; (f) said processes within the ecological and biological systems comprising neuron weights; (g) said neuron weights having established biological relationship with neuron output; (h) said output of the first layer neurons being fed as input to the second layer of hidden neurons; (i) said second layer neurons generating input either to plurality of other hidden neuron layers or to the output neuron layer; (j) said output neuron layer generating the total output of the network.</p> <p>19. A method of operating a neural network for ecological and biological system modeling having a plurality of hidden layer neurons said method comprising: a plurality of network inputs and at least one network output, said plurality of neurons, each receiving a plurality of inputs applied to the network, reproduces the network using a current model, and compares the output values with given target values, said current regression model "hierarchially relates" such that the current model is identical to the previous model with the exception of an addition or deletion of one or more driving or independent variables to the previous model and using the comparison between the goodness of fit for the two models or difference to set the learning rules without need for repetitive training and yielding a global minimum for each given set of input variables.</p>
US7110848	Computer program	1.Product claim for a computer	<p>1. A computer program product embodied on a computer readable medium containing instructions to perform a method that generates an NC program from a CAD drawing for a sheet metal processing CAD/CAM system, the computer program product comprising:</p>

	product	program product embodied on a computer readable medium	division and tool assignment means for searching for the shape of an arc, the shape of an inner processing arc, and the shape of an oblique line from sheet metal processing graphics of a CAD drawing, and converting them to divided processing shapes enclosed by orthogonal lines, which are then defined as material slug shapes; rectangular division and tool assignment means for dividing a remnant rectangular shape obtained based on the generated material slug shapes into rectangles and subjecting them to a tool assignment process; NC program generation means for generating an NC program from tool assignment data; and output means for outputting control commands based on the generated NC program.
US4344142	Direct digital control of rubber moulding presses	1. Process claim for an algorithm-aided rubber-moulding procedure.	1. A method of operating a rubber-moulding press for precision moulded compounds with the aid of a digital computer, comprising: providing said computer with a data base for said press including at least, natural logarithm conversion data (1n), the activation energy constant (C) unique to each batch of said compound being moulded, and a constant (x) dependent upon the geometry of the particular mould of the press, initiating an interval timer in said computer upon the closure of the press for monitoring the elapsed time of said closure, constantly determining the temperature (Z) of the mould at a location closely adjacent to the mould cavity in the press during moulding, constantly providing the computer with the temperature (Z), repetitively performing in the computer, at frequent intervals during each cure, integrations to calculate from the series of temperature determinations the Arrhenius equation for reaction time during the cure, which is $1n v=CZ+x$ where v is the total required cure time, repetitively comparing in the computer at frequent intervals during the cure each said calculation of the total required cure time calculated with the Arrhenius equation and said elapsed time, and opening the press automatically when a said comparison indicates completion of curing.
US6961664	Methods of populating data structures for use in evolutionary simulations	Process claim	1. A method of identifying molecules for production, wherein the molecules are represented by concatenated strings, said method comprising: i) encoding two or more biological molecules into a data structure of initial character strings to provide a collection of two or more different initial character strings wherein each of said biological molecules comprises at least about 10 subunits; ii) selecting at least two substrings from said initial character strings; iii) concatenating said substrings to form one or more product strings about the same length as one or more of the initial character strings; iv) adding the product strings to a data structure to populate a data structure of product strings; v) determining sequence identities of at least one of the product strings relative to at least one initial character string; and vi) selecting one or more product biological molecules for production, wherein the one or more product biological molecules correspond to one or more of the product strings having greater than 30% sequence identity with the at least one initial character string. 30. A computer program product on a computer readable media comprising computer code that: i) encodes two or more biological molecules into initial character strings to provide a collection of two or more different initial character strings wherein each of said biological molecules comprises at least about ten subunits; ii) selects at least two substrings from said initial character strings; iii) concatenates said substrings to form one or more product strings about the same length as one or more of the initial character strings; iv) adds the product strings to a data structure to populate a data structure of product strings; v) determines sequence identities of at least one of the product strings relative to at least one initial character string; and vi) selects one or more product biological molecules for production, wherein the one or more product biological molecules correspond to one or more of the product strings having greater than 30% sequence identity with the at least one initial character string.
US6941317	Graphical user interface for display and analysis of biological	Process claim embodying a GUI	1. A method of navigating a biological database in computer storage, the biological database including at least one catalog containing an organized body of related biological data, the method comprising the acts of: selecting at least one catalog; searching the catalog by entering search criteria into a computer and thereby display on the computer a list of search results including at least one module representing a region of a protein sequence; selecting a first module of interest from the list of search results; displaying on the computer a family of all protein sequences in the database having the first module of interest, each protein sequence also being

	sequence data		<p>associated with a graphical representation of all modules of the protein sequence; and displaying a multiple sequence alignment for the family of protein sequences in a separate display area, the multiple sequence alignment presenting an amino-acid-by-amino-acid relationship between protein sequences in the same family.</p> <p>34. A method of performing a computerized protein sequence analysis to detect similarities in the composition of different proteins, the method comprising:</p> <p>accessing a biological database in computer storage, the biological database incorporating data of at least one pre-existing database and having pre-computed families described by a probabilistic sequence;</p> <p>navigating the biological database with a graphical user interface to query the database for a list of search results;</p> <p>displaying the list of search results including at least one module representing a region of a protein sequence; and</p> <p>navigating the biological database with the graphical user interface to select one or more of the modules for representation on a computer as a family; wherein multiple families are presented in separate display areas.</p>
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EUROPE:

A Compilation Table of Granted Patents and their Claims:

Patent No:	Title:	Types of claims:	Independent Claims:
EP1552472	Methods and systems to identify operational reaction pathways	Process claims	<p>1.A method of identifying an operational reaction pathway of a biosystem, comprising: (a) providing a set of systemic reaction pathways through a reaction network representing said biosystem, (b) providing a set of phenomenological reaction pathways of said biosystem, (c) comparing said set of systemic reaction pathways with said set of phenomenological reaction pathways, wherein a pathway common to said sets is an operational reaction pathway of said biosystem.</p> <p>29. A method of reconciling biosystem data sets, comprising: (a) providing a first reaction network reconstructed from legacy data comprising a plurality of hierarchical reaction categories; (b) providing a second reaction network obtained from empirical data, and (c) determining a consistency measure between said hierarchical reaction categories in said first reaction network and elements in said second reaction network, wherein a high degree of said consistency measure for said hierarchical reaction categories indicates the validity of said first reaction network or a subcomponent thereof.</p> <p>39. A method of determining the effect of a genetic polymorphism on whole cell function, comprising: (a) generating a reaction network representing a biosystem with a genetic polymorphism-mediated pathology; (b) applying a biochemical or physiological condition stressing a physiological state of said reaction network, and (c) determining a sensitivity to said applied biochemical or physiological condition in said stressed physiological state compared to a reaction network representing a normal biosystem, wherein said sensitivity is indicative of a phenotypic consequence of said genetic polymorphism-mediated pathology.</p> <p>42. A method of diagnosing a genetic polymorphism-mediated pathology, comprising: (a) applying a biochemical or physiological condition stressing a physiological state of a reaction network representing a biosystem with a genetic polymorphism-mediated pathology, said applied biochemical or physiological condition correlating with said genetic polymorphism-mediated pathology, and (b) measuring one or more biochemical or physiological indicators of said pathology within said reaction network, wherein a change in said one or more biochemical or physiological indicators in said stressed state compared to an unstressed physiological state indicates the presence of a genetic polymorphism corresponding to said pathology.</p>
EP1600864	Modelling tool for chemical processes	Process claims	<p>1.Method of amending an interaction complex (12) in a computer displayed graphical model (7) of a biochemical process, said graphical model corresponding to a mathematical representation (6) in which said interaction complex (12) is associated with a flow rate (r) between at least two entity variables (s1, p2) in the process, characterized by receiving input from a user indicating an amendment of the interaction complex by addition of an interaction object (18) to the interaction complex, said interaction object being associated with an additional entity variable (s2) and having at least one terminal point (20), graphically connecting said terminal point (20) to the interaction complex (12), and displaying an updated interaction complex, and in the mathematical representation (6), associating the updated interaction complex (12) with one single flow rate (r), dependent on said at least two entity variables (s1, p1) and said additional entity variable (s2) .</p> <p>11. System for amending an interaction complex (12) in a computer displayed graphical model (7) of a biochemical process, said graphical model</p>

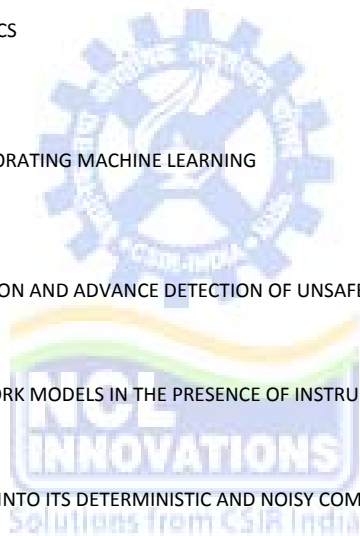
			<p>corresponding to a mathematical representation (6) in which said interaction complex (12) is associated with a flow rate (r) between at least two entity variables (s1, p2) in the process, characterized by means for receiving input from a user indicating an amendment of the interaction complex by addition of an interaction object (18) to the interaction complex, said interaction object being associated with an additional entity variable (s2) and having at least one terminal point (20), means for graphically connecting said terminal point (20) to the interaction complex (12), and displaying an updated interaction complex, and means for, in the mathematical representation (6), associating the updated interaction complex (12) with one single flow rate (r), dependent on said at least two entity variables (s1, p1) and said additional entity variable (s2) .</p>
EP1739656	Speech recognition method and speech recognition apparatus	<p>1. Process claim 13. Product claim for a control program 15. Product claim for An information processing apparatus</p>	<p>1. An information processing method which sets data to each of a plurality of settable graphical user interface items, comprising: detecting a settable graphical user interface item not displayed on a display screen (S201, S202); selecting a speech recognition grammar corresponding to the item detected in the detecting step (S204); recognizing received speech information using the speech recognition grammar selected in the selecting step (S208); and, setting data to the detected item using the recognition result of the recognizing step. 13. A control program which, when loaded into a computer and executed, implements an information processing method as claimed in any one of claims 1 to 7. 15. An information processing apparatus which sets data to each of a plurality of settable graphical user interface items (802), comprising: a detecting unit (102) configured to detect a settable graphical user interface item not displayed on a display screen (101); a selecting unit (103) configured to select speech recognition grammar corresponding to the item detected by the detecting unit; a recognizing unit (107) configured to recognize received speech information using the speech recognition grammar (601) selected by the selecting unit; and, a setting unit configured to set data to the detected item using the recognition result of the recognizing unit.</p>
EP1049089	Data structure for control information on rewriteable data storage media.	<p>1. Process claim 5. Product claim for a data storage medium/data structure.</p>	<p>1. A method of providing control information to a drive by a data storage medium (100), the method comprising the following steps: reading, by the drive, a control data structure (108, 110, 200, 300) on the data storage medium; extracting (400), by the drive, from the control data structure, an identification (202, 302) of the control data structure; and when the identification of the control data structure is recognized by the drive, then extracting (404), from the control data structure, control information (208, 308-320) that is specific to the identification. 5. A data storage medium (100), the data storage medium having control data stored in the form of a data structure (108, 110, 200) the data structure comprising: a data area (208) that includes information for control of access to regions of the data storage medium, wherein a region is less than the entire data storage medium; and a header (202-206), the header further comprising a set of bits (204), each bit corresponding to a form of control for access to the entire data storage medium.</p>
EP2084535	BIOINFORMATIC APPROACH TO DISEASE DIAGNOSIS	<p>Process claim for an algorithm-aided invention</p>	<p>1. A method for constructing a multivariate predictive model for diagnosing a disease for which a plurality of test methods are individually inadequate, said method comprising: (a) performing a panel of laboratory tests for diagnosing said disease on a test population comprising a statistically significant sample of individuals with at least one objective sign of disease and a statistically significant control sample of healthy individuals or persons with cross-reacting medical conditions; (b) generating a score function from a linear combination of said test panel results, said linear combination expressed as $[\beta] Y$, wherein D is the disease; F_1, \dots, Y_k is a set of K diagnostic tests for D; Y is a vector of diagnostic test results (Y_1, \dots, Y_k); $D' = \text{not } D$; $[\beta]$ is a vector of coefficients $\{[\beta]_{i_1}, \dots, [\beta]_{i_n}\}$ for Y; and Y^T is the transpose of $[\beta]$; (c) performing a receiver operating characteristic (ROC) regression or alternative regression technique of the score function, wherein the test panel is selected and $[\beta]$ coefficients are calculated simultaneously to maximize the area under the curve (AUC) of the empiric ROC as approximated by: $i \text{ EUR } D_j \text{ EUR } H$ wherein f is a sigmoid function, N = the number of study subjects, $n_{<D>}$ in the number of patients with disease D, $n_{<H>}$ is the number of healthy controls, $n_{<D>} + n_{<H>} = N$; $i = 1, \dots, n_{<D>}$, $i \text{ EUR } D$ are patients with disease; $j = 1, \dots, n_{<H>}$, $j \text{ EUR } H$ are healthy controls; (d) calculating for each individual the pre-test odds of disease; generating a diagnostic likelihood ratio of disease by determining the frequency of each individual's test score in said diseased population relative to said control population; and multiplying said pretest odds by said likelihood ratio to determine the post-test odds of disease for each individual;</p>

			<p>(e) converting a set of posttest odds into posttest probabilities for each methodology and creating an ROC curve for each methodology by altering its respective post-test probability cutoff value;</p> <p>(f) comparing the ROC areas generated by one or more regression techniques to determine an optimal methodology, comprising the tests to be included in an optimum test panel and the weight to be assigned each test score alone or in combination;</p> <p>(g) dichotomizing the optimal methodology by finding that point on the final ROC graph tangent to a line with a slope of $(1-p) \cdot C/p \cdot B$, where p is the population prevalence of disease, B is the regret associated with failing to treat patients with disease and C is the regret associated with treating a patient without disease; thereby generating a posttest probability cutoff value; and</p> <p>(h) displaying the optimum test panel for disease diagnosis, the weight each individual test score is to be assigned alone or in combination, and the cutoff value against which positive or negative diagnoses are to be made.</p> <p>19. A computer based method for diagnosing a disease for which a plurality of test methods are individually inadequate, said method comprising combining weighted scores from a panel of laboratory test results, comparing the combined weighted results to a cutoff value and displaying a diagnosis based on said comparison to said cutoff value, wherein said laboratory tests, the weighting assigned thereto and cutoff value above which individuals tested have said disease are determined by the method of Claim 1.</p>
GB2434225	Random forest modelling of cellular phenotypes	<p>1. Process claim for a computer program-aided invention.</p> <p>13. Product claim for a computer program product</p>	<p>I. A method for classifying a test population of cells based on one or more dependent variables, comprising: receiving a training set comprising values for independent and dependent variables associated with populations of cells; clustering the training set such that clusters of the populations of cells are produced, each cluster having values for independent and dependent variables for its cell populations; randomly selecting clusters of cell populations from the training set to construct multiple bootstrap samples; generating a random forest model for each bootstrap sample; and classifying the test population using an ensemble of the random forest models</p> <p>13. A computer program product comprising a machine readable medium on which is provided program instructions for classifying a test population of cells based on one or more dependent variables, the program instructions comprising: (a) code for receiving a training set comprising values for independent and dependent variables associated with populations of cells; (b) code for clustering the training set such that clusters of the populations of cells are produced, each cluster having values for independent and dependent variables for its cell populations; (c) code for randomly selecting clusters of cell populations from the training set to construct multiple bootstrap samples of the size of the training set; (d) code for generating a random forest model for each bootstrap sample; and (e) code for classifying the test population using an ensemble of the random forest models.</p>
EP2394572	Apparatus for detecting and discriminating breathing patterns from respiratory signals	<p>1. Process Claim for diagnosis of sleep disorders employing a classifier algorithm to manipulate the epoch.</p> <p>8,34,40,46. Process claims.</p>	<p>1. A method for diagnosing the presence of sleep disorders comprising pre-processing a signal representative of a patient's respiration to filter out noise and zero the baseline, splitting the signal into equal length epochs, . . . extracting from each epoch one or more primary features from the signal that act as a compressed representation of signal events, apply statistics to the primary feature(s) to produce one or more secondary - features which represent the entire epoch, grouping each secondary feature with one or more other features that is extracted from the entire epoch to form an epoch pattern, manipulate the epoch pattern with a classifier algorithm to produce a probability for each possible class that the signal may be representative of, assign the epoch to the class with the highest probability, report the class and the strength of the probability as an indication of the underlying disease state.</p> <p>8. A method for diagnosing the presence of sleep disorders comprising recording a signal representative of respiration from a patient using a logging device which includes a data-acquisition system and a memory, processing the respiratory signal either on-board by the recording device or offline using a computer, dividing the signal into n epochs of equal length, recording events consisting of an hypopnoea followed by an hyperpnoea, detecting for each event the beginning and end points, calculating event lengths, and processing each hyperpnoea to derive shape features.</p> <p>34. A method for detecting the presence or absence of Cheyne-Stokes breathing in a patient comprising the steps of:</p> <p>(i) Determining a signal indicative of at least one respiratory parameter of the patient;</p> <p>(ii) Analyzing the signal to detect at least one region of hyperpnoea;</p> <p>(iii) Upon detection, determining the duration of said at least one hyperpnoea; and</p> <p>(iv) Determining that Cheyne-Stokes breathing is present when said duration exceeds a threshold.</p> <p>40. A method of detecting the presence or absence of Cheyne-Stokes breathing in a patient comprising the steps of:</p> <p>(i) Determining a signal indicative of at least one respiratory parameter of the patient;</p> <p>(ii) Analyzing the signal to detect at least one region of an hyperpnoea following an hypopnea;</p> <p>(iii) Upon detection, analyzing the rate of increase of signal in the region from the hypopnea to the hyperpnoea;</p> <p>(iv) Where the rate of increase is a slow increase, concluding that Cheyne-Stokes breathing is present and where the rate of increase is a sudden increase, concluding that Cheyne-Stokes breathing is absent.</p>

			<p>46. A method of detecting the presence or absence of Cheyne-Stokes breathing in a patient comprising the steps of:</p> <p>(i) Determining a signal indicative of at least one respiratory parameter of the patient;</p> <p>(ii) Determining a spectrogram of said signal;</p> <p>(iii) Determining that Cheyne-Stokes breathing is present if the spectrogram indicates the signal has a peak.</p> <p>49. A method of detecting the presence or absence of Cheyne-Stokes breathing in a patient comprising the steps of:</p> <p>(i) Determining a signal indicative of at least one respiratory parameter of the patient;</p> <p>(ii) Detecting at least, one region of hyperpnoea;</p> <p>(iii) Determining the morphology of said at least one region of hyperpnoea;</p> <p>(iv) Determining that Cheyne-Stokes breathing is present where said at least one region has a "Sydney Harbor bridge" shape.</p>
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Compilation of NCL's Software/Mathematical Algorithm related Patents/Applications:

1. AUTOMATIC HARVESTING OF MOLECULAR INFORMATION RASTER GRAPHICS
KARTHIKEYAN M
2420DEL2011
Provisional application filed
2. NADI TARANGINI: AYURVEDIC PULSE-BASED DIAGNOSTIC SYSTEM INCORPORATING MACHINE LEARNING
BHAT ASHOK
IN 1675DEL2007 / US 12/733153
Complete specification filed
3. METHOD AND APPARATUS FOR ONLINE IDENTIFICATION OF SAFE OPERATION AND ADVANCE DETECTION OF UNSAFE OPERATION OF A SYSTEM OR PROCESS
US 6826513
Granted
4. A METHOD FOR IMPROVED PERFORMANCE OF ARTIFICIAL NEURAL NETWORK MODELS IN THE PRESENCE OF INSTRUMENTAL NOISE AND MEASUREMENT ERRORS
2614DELNP2004
Complete specification filed
5. IDENTIFICATION AND/OR SEPARATION OF COMPLEX COMPOSITE SIGNALS INTO ITS DETERMINISTIC AND NOISY COMPONENTS
US 6208951
Granted
6. AN APPARATUS FOR THE IDENTIFICATION AND/OR SEPARATION OF COMPLEX COMPOSITE SIGNALS INTO ITS DETERMINISTIC AND NOISY COMPONENTS
IN 214400
Granted



[Data Source: IPMS, <http://172.16.14.200/ipms/>]

Compilation of Patent Applications' Filed in the area of Software based Biological/ chemical modelling in last few years in US:

Application No:	Title:	Abstract:	Principle Claims:
12/664,444 Filing date: 20 Jun 2008	METHOD, SYSTEM AND COMPUTER SIMULATION ENVIRONMENT FOR TESTING OF MONITORING AND CONTROL STRATEGIES IN DIABETES	A simulation environment for in silico testing of monitoring methods, open-loop and closed-loop treatment strategies in type 1 diabetes. Some exemplary principal components of the simulation environment comprise, but not limited thereto, the following: 1) a "population" of in silico "subjects" with type 1 diabetes in three age groups; 2) a simulator of CGM sensor errors; 3) a simulator of insulin pumps and discrete insulin delivery; 4) an interface allowing the input of user-specified treatment scenarios; and 5) a set of standardized outcome measures and graphs evaluating the quality of the tested treatment strategies. These components can be used separately or in combination for the preclinical evaluation of open-loop or closed-loop control treatments of diabetes.	<p>1. A computer method for testing of monitoring and/or treatment strategies for diabetes using a computer simulation environment.</p> <p>2. The method of claim 1, wherein said testing method comprises: representation of the human metabolic system, wherein said representation of the human metabolic system comprises: applying a mathematical model of the human metabolic system; and providing a plurality of instances of a simulated subject, creating a simulated population.</p> <p>12. A computer simulation system environment for testing of monitoring and/or treatment strategies for diabetes.</p> <p>13. The system of claim 12, wherein said computer simulation system environment comprises: a representation module of the human metabolic system, wherein said representation module comprises a processor configured to: apply a mathematical model means of the human metabolic system, and provide a plurality of instances of simulated subjects comprising a simulated population.</p> <p>23. A computer program product comprising a computer useable medium having computer program logic for enabling at least one processor in a computer system for testing of monitoring and/or treatment strategies for diabetes using a computer simulation environment, said testing method of said computer program logic comprising: representation of the human metabolic system, wherein said representation of the human metabolic system comprises: applying a mathematical model of the human metabolic system; and providing a plurality of instances of a simulated subject, creating a simulated population.</p>
12/222813 Filing date: 18 Aug 2008	BIO-EXPRESSION SYSTEM WITH MODULE FOR CREATING THE STANDARD DROSOPHILA BRAIN MODEL AND ITS COORDINATE SYSTEM	A method of generating standard brain model from a bioexpression system includes performing steps of registration to input standard surface and individual surface into affine registration; recording a transformation parameters from the affine registration; performing steps of inputting a individual neuropil and transform parameters into an affine transformation; applying the data of the affine transformation to transform individual neuropil to achieve transformed individual neuropil; and performing a step of affine registration to register a standard neuropil to the transformed individual neuropil to achieve a resulting transformation, wherein the resulting transformation can be output as a position and orientation of standard neuropil within the standard surface.	<p>1. A method for generating standard brain model from a bio-expression system comprising: determining a global coordinate to present entire said standard brain model; determining a local coordinate to present a sub-structure of said standard brain model; and determining characteristics of said local coordinate with respect to said global coordinate.</p> <p>16. A bio-expression system comprising: a process system used to process data; an average model generating module embedded in said computing system, wherein while an input of two-dimensional individual model sections is fed into said process system, said average model generating module is responsive to said input of two-dimensional individual model sections and is capable of processing an individual model construction and model-averaging procedure, thereby generating an average model from all the input datasets; a database including a bio-expression sub-database, cellular network sub-database and bio-fine structure sub-database, wherein said database is coupled to said process system to store at least said average model; and a module for creating standard brain model and coordinate system.</p>
12/462,783	INTELLIGENT	The intelligent medical device (IMD) system	1. A system for operation of a medical device for therapeutics, comprising:

<p>Filing date: 7 Aug 2009</p>	<p>MEDICAL DEVICE SYSTEM DYNAMICS FOR BIOLOGICAL NETWORK REGULATION</p>	<p>coordinates the dynamics of hardware and software components in a self-organizing autonomous system. The IMD system uses advanced modeling and metaheuristics to solve complex optimization problems involving the customization of medical therapies. The system uses evolvable hardware and reprogrammable features to coordinate the diagnostic and therapeutic functions of the IMDs.</p>	<p>a therapeutic module consisting of at least two layers; an analytical module consisting of a system-on-a-chip (SoC); a set of compartments for storage of chemicals and biologicals; a set of electrical interconnects; a set of microfluidic components, including tubes, valves and gates; at least one integrated circuit; wherein the layers of components are connected by the electrical interconnects; wherein the process is controlled by the integrated circuit; wherein the analytical module uses the SoC to model solutions to pathology optimization problems and transfers the data to the therapeutic module; wherein the medical device components include a set of compartments for combining chemicals and biologicals on at least one of a set of layers; wherein the medical device compartments are capable of transforming their configurations; wherein the medical device components are activated after obtaining data from a medical device model for therapeutic recommendations; wherein the medical device components on one layer transform their configuration by folding gates down to remove partitions and folding gates up to add partitions to create newly configured compartments; wherein the medical device flushes fluids from its compartments before the transformation process is initiated; wherein the medical device places chemicals and biologicals into the newly configured compartments on one layer of the device; wherein the medical device components are coordinated to release specific chemicals and biologicals from newly configured compartments on at least one of a set of layers through the microfluidic components in specific measured doses according to the model recommendations; wherein the chemicals and biologicals are combined in a chamber of the medical device module in one of a set of layers; wherein the resulting therapeutic combination is transmitted to a cell site in a patient; wherein the feedback is obtained about the remedy and the analytical module updates the model and sends solution options to the pathology to the therapeutic module; wherein the therapeutic module reconfigures to solve the pathology and combines a new set of chemicals and biologicals according to the revised model in a chamber on one of its layers; and wherein the resulting revised therapeutic combination is transmitted to a cell site in a patient until the pathology is solved.</p>
<p>13/019,036 Filing date: 1 Feb 2011</p>	<p>METHOD OF RATIONAL-BASED DRUG DESIGN USING OSTEOCALCIN</p>	<p>The invention relates to a method of identifying a compound that affects osteocalcin activity, comprising obtaining a 3D structure of osteocalcin or a fragment thereof, designing a compound to interact with, or mimic, the 3D structure of osteocalcin or fragment thereof, obtaining the compound, and determining whether the compound affects osteocalcin activity.</p>	<p>1. A computer-implemented method of identifying a compound that reduces osteocalcin activity, comprising providing a computer program for execution on a computer, wherein the computer program, when executing on the computer, generates a 3D structure comprising i) amino acids 13-34 of SEQ ID NO: 5 of osteocalcin and ii) the structural coordinates in Table 3 corresponding to amino acids 13-34 of SEQ ID NO: 5; designing a compound to mimic the 3D structure; obtaining or synthesizing the compound and determining the ability of the compound to compete with osteocalcin for binding to hydroxyapatite in an assay, wherein reduced binding of osteocalcin to hydroxyapatite in the presence of the compound in the assay indicates that the compound reduces osteocalcin activity.</p>
<p>13/168,654 Filing date:</p>	<p>METHODS, SYSTEMS, AND SOFTWARE FOR</p>	<p>The present invention generally relates to methods of rapidly and efficiently searching biologically-related data space. More</p>	<p>1. A method for identifying nucleotides for variation in nucleic acids encoding a protein variant library, said method comprising: (a) receiving data characterizing a training set of a protein variant library, wherein the data comprises activity and a</p>

24 Jun 2011	IDENTIFYING FUNCTIONAL BIOMOLECULES	specifically, the invention includes methods of identifying bio-molecules with desired properties, or which are most suitable for acquiring such properties, from complex bio-molecule libraries or sets of such libraries. The invention also provides methods of modeling sequence-activity relationships. As many of the methods are computer-implemented, the invention additionally provides digital systems and software for performing these methods.	<p>nucleotide sequence for each protein variant in the training set;</p> <p>(b) from the data, developing a sequence activity model for predicting activity from multiple independent variables, each specifying the presence or absence of a specific nucleotide in a sequence;</p> <p>(c) using the sequence activity model to identify one or more nucleotides that are to be varied or fixed in order to impact the desired activity; and</p> <p>(d) Generating a new protein variant library containing one or more new protein variants having amino acid sequences encoded by nucleic acids in which the identified nucleotides are varied or fixed in order as identified in (c).</p> <p>21. A computer program product comprising a non-transitory machine readable medium storing program code for identifying nucleotides for variation in nucleic acids encoding a protein variant library, said program code comprising:</p> <p>(a) code for receiving data characterizing a training set of a protein variant library, wherein the data comprises activity and a nucleotide sequence for each protein variant in the training set;</p> <p>(b) code for using the data to develop a sequence activity model for predicting activity from multiple independent variables, each specifying the presence or absence of a specific nucleotide in a sequence;</p> <p>(c) code for using the sequence activity model to identify one or more nucleotides that are to be varied or fixed in order to impact the desired activity; and</p> <p>(d) code for defining a new protein variant library containing one or more new protein variants having amino acid sequences encoded by nucleic acids in which the identified nucleotides are varied or fixed in order by executing the code in (c).</p>
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Note: This IGN was finalized in the current form on 29th Dec 2011. This is intended as a working document. Readers are requested to provide comments/suggestions & point to errors (if any) so as to help improve this document. Comments may be sent to sv.kanitkar@ncl.res.in