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Autore	Tarantino Angelo Marcello
Titolo	Advances in Structural Mechanics Modeled with FEM
Pubbl/distr/stampa	Basel, Switzerland, : MDPI - Multidisciplinary Digital Publishing Institute, 2021
Descrizione fisica	1 electronic resource (266 p.)
Soggetti	Research & information: general Technology: general issues
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Sommario/riassunto	It is well known that many structural and physical problems cannot be solved by analytical approaches. These problems require the development of numerical methods to get approximate but accurate solutions. The minite element method (FEM) represents one of the most typical methodologies that can be used to achieve this aim, due to its simple implementation, easy adaptability, and very good accuracy. For these reasons, the FEM is a widespread technique which is employed in many engineering fields, such as civil, mechanical, and aerospace engineering. The large-scale deployment of powerful computers and the consequent recent improvement of the computational resources have provided the tools to develop numerical approaches that are able to solve more complex structural systems characterized by peculiar mechanical configurations. Laminated or multi-phase composites, structures made of innovative materials, and nanostructures are just some examples of applications that are commonly and accurately solved by the FEM. Analogously, the same numerical approaches can be employed to validate the results of experimental tests. The main aim of this Special Issue is to collect numerical investigations focused on the use of the finite element method

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Autore	Matthiopoulos Jason
Titolo	How to be a quantitative ecologist : the 'A to R' of green mathematics and statistics / / Jason Matthiopoulos
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Lingua di pubblicazione	Inglese
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Note generali	Bibliographic Level Mode of Issuance: Monograph
Nota di bibliografia	Includes bibliographical references and indexes.
Nota di contenuto	Intro -- How to be a Quantitative Ecologist -- The A to Rof green mathematics &amp -- statistics -- How I chose to write this book, and why you might choose to read it Preface -- 0. How to start a meaningful relationship with your computer Introduction to R -- 0.1 What is R? -- 0.2 Why use R for this book? -- 0.3 Computing with a scientific package like R -- 0.4 Installing and interacting with R -- 0.5 Style conventions -- 0.6 Valuable R accessories -- 0.7 Getting help -- 0.8 Basic R usage -- 0.9 Importing data from a spreadsheet -- 0.10 Storing data in data frames -- 0.11 Exporting data from R -- 0.12 Quitting R -- Further reading -- References -- 1. How to make mathematical statements Numbers, equations and functions -- 1.1 Qualitative and quantitative scales -- Habitat classifications -- 1.2 Numbers -- Observations of spatial abundance -- 1.3 Symbols --

Population size and carrying capacity -- 1.4 Logical operations -- 1.5 Algebraic operations -- Size matters in male garter snakes -- 1.6 Manipulating numbers -- 1.7 Manipulating units -- 1.8 Manipulating expressions -- Energy acquisition in voles -- 1.9 Polynomials -- The law of mass action in epidemiology -- 1.10 Equations -- 1.11 First order polynomial equations -- Population size and composition -- 1.12 Proportionality and scaling: a special kind of first order polynomial equation -- Simple mark-recapture -- Converting density to population size -- 1.13 Second and higher order polynomial equations -- Estimating the number of infected animals from the rate of infection -- 1.14 Systems of polynomial equations -- Deriving population structure from data on population size -- 1.15 Inequalities -- Minimum energetic requirements in voles -- 1.16 Coordinate systems -- Non-Cartesian map projections -- 1.17 Complex numbers -- 1.18 Relations and functions -- Food webs.
Mating systems in animals -- 1.19 The graph of a function -- Two aspects of vole energetics -- 1.20 First order polynomial functions -- Population stability in a time series -- Population stability and population change -- Visualising goodness-of-fit -- 1.21 Higher order polynomial functions -- 1.22 The relationship between equations and functions -- Extent of an epidemic when the transmission rate exceeds a critical value -- 1.23. Other useful functions -- 1.24 Inverse functions -- 1.25 Functions of more than one variable -- Two aspects of vole energetics -- Further reading -- References -- 2. How to describe regular shapes and patterns Geometry and trigonometry -- 2.1 Primitive elements -- 2.2 Axioms of Euclidean geometry -- Suicidal lemmings, parsimony, evidence and proof -- 2.3 Propositions -- Radio-tracking of terrestrial animals -- 2.4 Distance between two points -- Spatial autocorrelation in ecological variables -- 2.5 Areas and volumes -- Hexagonal territories -- 2.6 Measuring angles -- The bearing of a moving animal -- 2.7 The trigonometric circle -- The position of a seed following dispersal -- 2.8 Trigonometric functions -- 2.9 Polar coordinates -- Random walks -- 2.10 Graphs of trigonometric functions -- 2.11 Trigonometric identities -- A two-step random walk -- 2.12 Inverses of trigonometric functions -- Displacement during a random walk -- 2.13 Trigonometric equations -- VHF tracking for terrestrial animals -- 2.14 Modifying the basic trigonometric graphs -- Nocturnal flowering in dry climates -- 2.15 Superimposing trigonometric functions -- More realistic model of nocturnal flowering -- 2.16 Spectral analysis -- Dominant frequencies in density fluctuations of Norwegian lemming populations -- Spectral analysis of oceanographic covariates -- 2.17 Fractal geometry. Availability of coastal habitat -- Fractal dimension of the Koch curve -- Further reading -- References -- 3. How to change things, one step at a time Sequences, difference equations and logarithms -- 3.1 Sequences -- Reproductive output in social wasps -- Unrestricted population growth -- 3.2 Difference equations -- More realistic models of population growth -- 3.3 Higher order difference equations -- Delay-difference equations in a biennial plant -- 3.4 Initial conditions and parameters -- 3.5 Solutions of a difference equation -- 3.6 Equilibrium solutions -- Harvesting an unconstrained population -- Visualising the equilibria -- 3.7 Stable and unstable equilibria -- Parameter sensitivity and ineffective fishing quotas -- Stable and unstable equilibria in a density-dependent population -- 3.8 Investigating stability -- Cobweb plot for an unconstrained, harvested population -- Conditions for stability under unrestricted growth -- 3.9 Chaos -- Chaos in a model with density dependence -- 3.10 Exponential function -- Modelling bacterial loads in continuous time

-- A negative blue tit? Using exponential functions to constrain models -- 3.11 Logarithmic function -- Log-transforming population time series -- 3.12 Logarithmic equations -- Further reading -- References -- 4. How to change things, continuously Derivatives and their applications -- 4.1 Average rate of change -- Seasonal tree growth -- Tree growth -- 4.2 Instantaneous rate of change -- 4.3 Limits -- Methane concentration around termite mounds -- 4.4 The derivative of a function -- Plotting change in tree biomass -- Linear tree growth -- 4.5 Differentiating polynomials -- Spatial gradients -- 4.6 Differentiating other functions -- Consumption rates of specialist predators -- 4.7 The chain rule.
Diurnal rate of change in the attendance of insect pollinators -- 4.8 Higher order derivatives -- Spatial gradients -- 4.9 Derivatives of functions of many variables -- The slope of the sea-floor -- 4.10 Optimisation -- Maximum rate of disease transmission -- The marginal value theorem -- 4.11 Local stability for difference equations -- Unconstrained population growth -- Density dependence and proportional harvesting -- 4.12 Series expansions -- Further reading -- References -- 5. How to work with accumulated change Integrals and their applications -- 5.1 Antiderivatives -- Invasion fronts -- Diving in seals -- 5.2 Indefinite integrals -- Allometry -- 5.3 Three analytical methods of integration -- Stopping invasion fronts -- 5.4 Summation -- Metapopulations -- 5.5 Area under a curve -- Swimming speed in seals -- 5.6 Definite integrals -- Swimming speed in seals -- 5.7 Some properties of definite integrals -- Total reproductive output in social wasps -- Net change in number of birds at migratory stop-over -- Total number of arrivals and departures at migratory stop-over -- 5.8 Improper integrals -- Failing to stop invasion fronts -- 5.9 Differential equations -- A differential equation for a plant invasion front -- 5.10 Solving differential equations -- Exponential population growth in continuous time -- Constrained growth in continuous time -- 5.11 Stability analysis for differential equations -- Constrained growth in continuous time -- The Levins model for metapopulations -- Further reading -- References -- 6. How to keep stuff organised in tables Matrices and their applications -- 6.1 Matrices -- Plant community composition -- Inferring diet from fatty acid analysis -- 6.2 Matrix operations -- Movement in metapopulations -- 6.3 Geometric interpretation of vectors and square matrices.
Random walks as sequences of vectors -- 6.4 Solving systems of equations with matrices -- Plant community composition -- 6.5 Markov chains -- Redistribution between population patches -- 6.6 Eigenvalues and eigenvectors -- Growth in patchy populations -- Metapopulation growth -- 6.7 Leslie matrix models -- Stage-structured seal populations -- Equilibrium of linear Leslie model -- Stability in a linear Leslie model -- Stable age structure in a linear Leslie model -- 6.8 Analysis of linear dynamical systems -- A fragmented population in continuous time -- Phase-space for a two-patch metapopulation -- Stability analysis of a two-patch metapopulation -- 6.9 Analysis of nonlinear dynamical systems -- The Lotka-Volterra, predator-prey model -- Stability analysis of the Lotka-Volerra model -- Further reading -- References -- 7 How to visualise and summarise data Descriptive statistics -- 7.1 Overview of statistics -- 7.2 Statistical variables -- Activity budgets in honey bees -- 7.3 Populations and samples -- Production of gannet chicks -- 7.4 Single-variable samples -- 7.5 Frequency distributions -- Activity budgets in honey bees -- Activity budgets from different studies -- Visualising activity budgets -- Height of tree ferns -- Gannets on Bass rock --

7.6 Measures of centrality -- Chick rearing in red grouse -- Swimming speed in grey seals -- Median of chicks reared by red grouse -- 7.7 Measures of spread -- Gannet foraging -- 7.8 Skewness and kurtosis -- 7.9 Graphical summaries -- 7.10 Data sets with more than one variable -- 7.11 Association between qualitative variables -- Community recovery in abandoned fields -- 7.12 Association between quantitative variables -- Height and root depth of tree ferns -- 7.13 Joint frequency distributions -- Mosaics of abandoned fields. Joint distribution of tree height and root depth.