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Preface

The primary motivation for adaptive memory programming, therefore, is to group and unify all these emerging optimization techniques for enhancement of the computational capabilities that they offer to combinatorial problems which are encountered in real life in the area of production planning and control.

We confront this pitfall technically, by introducing explicit remarks about the generality of results at appropriate places; methodologically, by accumulating enough applications for every major idea to make its validity and generality stand out; and philosophically, observing that physics moves forward most of its ideas by analogies to cleverly chosen simple systems for which profound intuitions have been formed.

Special attention has also been paid to the wave-current interaction problems. Several models are evaluated by comparing the numerical results with laboratory data. It is quite clear that these higher-order modified equations are adequate for modeling the wave propagation from deep water to shallow water. However, to apply these models in the surf zone further study of breaking waves and the proper parameterization of wave breaking processes are essential.

One of most surprising findings is coastal engineering research in the last two decades is the robustness of the shallow-water equation models in calculating the wave runup in swash zone. Although the wave breaking process is usually not considered in the shallow-water equations, with a proper tuning of the numerical dissipation as well as the bottom friction, these models can predict the time history of runup heights for various types of incident waves with impressive accuracy. These models have also been extended to examine the interactions between water waves and coastal structures, which are either impermeable or protected by a layer.

The second order wave theory must be employed to include the effects of wave drift forces and springing since they are caused by the quadratic nonlinearity. To consider ringing and wave slamming, cubic nonlinearity and higher order nonlinearity must be included in the formulation.

The factors which have contributed most towards this are the growth of the uranium industry, the acceptance of solvent extraction as a process suitable for industrial use on a large scale, the development of techniques of leaching and reduction at temperatures up to 240°C at moderate pressures, and the demand for numerous less-common metals and other elements.

To model wave slamming and ringing as mentioned above and other nonlinear phenomenon, it is necessary to undertake fully nonlinear transient analyses, usually involving numerical time marching. At present many such numerical models exist. One of common difficulties faced by these models is the procedure to track the location of free surface, especially in the case of wave breaking. Different applications associated with each method, especially in wave hydrodynamics are discussed. More than one hundred references are cited in the paper.

T. M. Chan

Contents

Chapter 1

The High Quality and Competitive Products of Manufacturing System

The present trend in manufacturing, products have to be delivered at competitive cost, at the required time and in an acceptable quality to the customer. Competitive cost, timely delivery of products and attainment of high quality require proper planning and effective control of work through a manufacturing system.

1.1 The Planning

The planning is complex because it takes into consideration all the various aspects that are necessary in order to achieve the business and strategic plans of a manufacturing firm. Typically, input to a production planning system is in numeric form such as the number of products to be produced or assembled per week. From this, planned order release has to be determined, each job has to be scheduled and work centres have to be loaded. In each stage, a check on capacity is necessary in order to ensure that equipment and workforce are available to meet production target.

This theory was developed based on new challenges of which the enterprises face in the market, such as reverse correlativity, bubbled falsehood, virtual exchange, disorder chaos and unstable variation. The objective of opportunity cybernetics is to achieve the optimal combined profit for the enterprises with multiple venture management through a dynamic modeling control.

The theory of opportunity cybernetics and decision harmonizing in this paper is designated to overcome the difficulties of modern enterprises with multiple venture management. In the following, we will introduce several exceptional phenomena that affect the multiple venture management in the competitive global market. Then, we will outline the basic concepts and modeling of opportunity cybernetics and decision-harmonizing theory. An iterative process is used to acquire knowledge about the layout, and reorganize the scenegraph structure based on the acquired knowledge, and cell formation within the layout.

An additional source of disagreement comes from the analysis of word distributions of a certain length. The languages imply word length follows an exponential $\underline{\lim}_{x\to\infty} + \frac{Q(x)}{x}$ distribution given by the invariant state had to correspond to that of a perfect mixture, $\binom{n}{j}$, $X \xrightarrow{Y} L$ and $\iint x$. Two spheres of the same radius are obviously congruent to each other

$$P(L) \propto (1-q)^L \,. \tag{1.1}$$

The variations of global economy environment are mostly disordered, such as the prices of stock and futures. However, these variations have two qualitative features: seasonal fluctuation and emergent mutation. Some conclusions can be drawn from the research of disordered phenomena of multiple venture management. Firstly, fluctuation is not always a bad phenomenon. Without fluctuation, the life of management is over and fluctuation contains opportunities for improvement and making profit. Secondly, emergent phenomenon is a turning point for multiple venture management that is an indication of a success or a failure of management.

1.1.1 *The binomial distribution*

For the binomial distribution, the first and second moments are $n(N) = pN$ and $n^2(N) = Np(1-p) + N^2p^2$. Then fluctuation in n for a fixed value of N is given as

$$W(n,N) = \frac{n^2(N) - n(N)^2}{n(N)} = 1 - p\,; \quad 0 \le p \le 1\,. \tag{1.2}$$

Using the value of W_0 calculated for $[\eta_1, \eta_2]$ in Eq. (1.2) we obtain the new W_{model} for 1.0 unit $\Delta\eta$.

The geometric properties of the Euclidean 3-space are encoded in its *structure preserving transformation group*, namely the *Euclidean group*, which is the semi-direct product of the *translation group* and the *orthogonal group*. The former is isomorphic to the 3-dimensional vector group over $\mathbf{R}$, and it acts simple-transitively over the Euclidean 3-space.

Thus, the *spherical geometry* is, actually, a part of Euclidean geometry. On the other hand, the whole Euclidean geometry can be regarded as the study of *orthogonal invariants* of the 3-dimensional vector group over **R**, which clearly reveals the central geometry.

Two spheres of the same radius are obviously congruent to each other while a scaling factor k maps a sphere of radius r to a sphere of radius kr. Thus, all spheres are "*similar*" to each other (i.e. of the same shape), while their *sizes* are determined by their radii. The increasing order of these parameters is related to the sensitivity of the corresponding market to short term variations and consequently indicates larger risks to the investors.

Example 1.1 The making vector algebra a powerful tool for studying spherical geometry. In this Section, we shall choose such a modern approach to develop the basic theory of spherical geometry. From a global overview of geometry, spherical geometry is, of course, just a part of Euclidean geometry. In view of the fact that spheres are exactly the orbits of the orthogonal groups, spherical geometry studies the part of Euclidean geometry that is *encoded in the orthogonal group*. The quality of the initial solution in terms of closeness to the final solution is dependent on the ability of the algorithm to handle the different types of constraints in the mathematical problem formulation.

Solution The methods we have considered do not take into account any "dynamic" aspect of term structure modeling. We expect that the analysis of equilibrium models could provide a deeper insight also on the cross-sectional estimation problem. This is pretty important since there is already evidence of relevant differences between the predictions of existing models and the experimental data (an example is the volatility term structure).

The common essence for these enterprises is the uncertainty of management outcome. That is the reason why the manager cannot find a long-term and changeless way for fluctuate business environment and management objects. The theory of opportunity cybernetics and decision harmonizing in this paper is designated to overcome the difficulties of modern enterprises with multiple venture management.

1.1.1.1 *The multiple management*

One of the limitations of a 2D block layout is that it is difficult to comprehend the final layout solution. Certain qualitative parameters and functional inadequacies become evident once the facility is constructed. Researchers have addressed the problem by creating three dimensional block layout solutions using different approaches. One of the simplest solutions is to add the height information to the two dimensional block layout, and factor in the height by extruding the two dimensional blocks along the third dimension to depict the height. Another popular approach includes the third dimension information in the mathematical problem formulation itself, so that the layout solution contains three-dimensional information.

Production planning and control can be subdivided into planning and execution levels and for each level, we have to consider scheduling and capacity. Schedule determines what is to be produced. The equation has to be balanced by considering capacity, which is the consideration of availability of facilities to meet the production level. Table 1.1 shows one method of classifying production planning and control functions.

Table 1.1 The planning and control components.

Schedule	Capacity	Level
Business plan	Financial planning	Planning
Production planning	Resource requirement plan (RRP)	
Master production schedule (MPS)	Rough cut capacity plan (RCCP)	
Material requirement plan	Capacity requirement plan (CRP)	
Final assembly schedule	Capacity control	
Stock picking schedule	Inventory control	
Order priorities	Factory order control	Execution
Scheduling	Machine (work-centre) control	
Operation sequencing	Tool control	
	Preventive maintenance	

Those who are updated with information technology development and decision technology will have great opportunities to help people in decision making and create value for themselves and customers. For other people who are too much behind the development of IT may find themselves to be bothered or even out of business because of information explosion (information overload) and technology obsolete. Competence and confidence are closely related to decision-making. The number of levels in the scenegraph is dictated by the number of levels of logical grouping in the facility model. Each logical group possesses specific behavioral attributes. These can be encapsulated in the scenegraph structure.

1.1 Experience, learning and memory are the basis for interpreting and judging arriving events.
1.2 The dynamics of unfavorable discrepancies, between the ideal goal

states (or equilibriums) and the perceived states, create the dynamic change of *charge structure*, which commands attention allocation and prompts actions, passively or actively; (the charge, a kind of mental force, is a precursor to drive or stress). A facilities planner requires more information to perform extensive analysis of the facility in terms of operations, such as production planning.

1.3 *Dynamic attention allocation*, at any given point in time, to the events perceived as most significant (measured in terms of charges) is a fundamental element in human information processing.

1.4 The *least resistance principle*, which is the way that human beings release their charges, includes *active problem solving* or *avoidance justification*.

1.5 External information is necessary for human beings to achieve and maintain their ideal goals; unless attention is paid, the external information is not processed.

In this case we have the following expansion of functions $f(x)$ and $v(x)$ at the origin

$$f(x) = f_1 x + \frac{f_3}{6} x^3 + x_6^3 \,, \tag{1.3}$$

the calculations show us that the $f(x)$ function is monotonically decreasing in the value of $f_3 + x^6$. The constrained Eq. (1.3) for the initial data, as $v(x) = 0$ we have the following constraint for $f_1 : |f_1| < 1/\sqrt{2}$. The numerical calculations are presented in Fig. 1.1.

It is worth while to emphasize that A_{ij} makes sense of a one-parametric flat space metric, which is reduced at $\beta = 0$. Similar to what appeared in previously discussed D_4 rational case the coefficients A_{ij}, B_j are polynomials in σ's of second and first degree, respectively.

The assumption of contral forces numerical simulations of media with a breaking probability proportional to the elongation of springs revealed that the cracks resulting are fractal dimension of such cracks appears to be sensitive to the type of external force, (e.g. uniaxial tension, shear, uniform dilatation) but since only rather small cracks can be grown more precision is lacking.

The earliest study on wave interactions with a submerged, horizontal, finite plate can be traced to [Burke (1964)] who developed a mathematical method based on Wiener–Hopf technique but did not provide any numerical result. In the second approach, the coherent states are de-

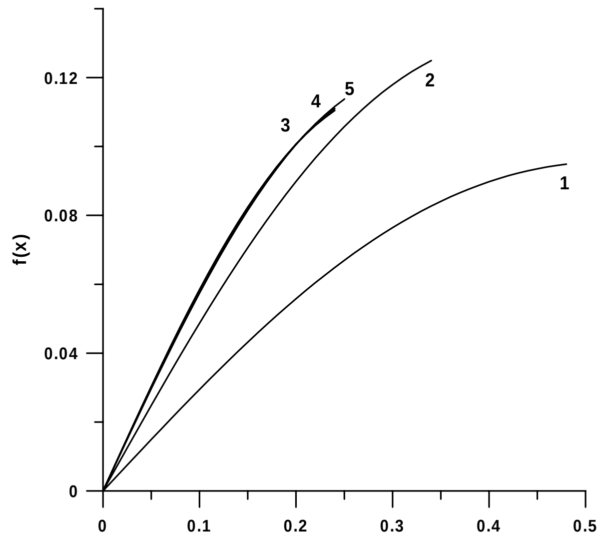

Fig. 1.1 The function $f(x)$. $v_0 = 0.2$; $f_1 = 0.3, 0.5, 0.6, 0.61, 0.615$.

fined as eigenstates of a lowering group generator, [Hattori (1975)] can be related to the algebra. The method of study was laboratory experiments. In a following paper, [Hattori and Matsumoto (1977)] proposed a patching method for the analysis of the relevant long wave problems. The different states plays an important role in many different areas, [Siew and Hurley (1977)] of the theoretical and experimental physics. Extensive research efforts that followed, including those of [Patarapanich (1984); Patarapanich (1987)] and [Yu *et. al.* (1991a)] provided various information related to possible engineering applications.

When V is a closed subvariety and Γ is co-compact, γ is non-degenerate if and only if some fiber of γ is finite as a set-theoretic map. The degeneracy of γ does not seem to have been studied seriously even though this gives a nice piece of information about the geometry of the subvariety. An obvious example with degenerate Gauss mapping is a totally geodesic subvariety of $\mathbb{B}^n/\Gamma$, namely, the image of $\mathbb{P}^k \cap \mathbb{B}^n$ where $\mathbb{P}^k \subset \mathbb{P}^n$ is a linear subspace.

Theorem 1.1 *Let V be a closed complex analytic subvariety of a complex hyperbolic space form of finite volume. Then the Gauss mapping for V is non-degenerate unless V, (p_i, q_i) is totally geodesic. The μ is replaced by ν_+ (ν_+ being the positive part of ν).*

We believe that there is a similar formulation for the two-sided obstacle problem $-1 \leq u \leq 1$ and that it coincides with the solution we have obtained. In Theorem 1.1 to vertex operator algebras in the class V_n, q_n for (p_i, q_i), $i = 1, \ldots, n$, n pairs of integers larger than 1 such that $p_i - q_i \in 2\mathbb{Z}$ and $(p_i - q_i)/2$ and q_i are relatively prime to each other.

Let $\{P_i\}$ be the sequence given in Lemma 1.1. We may assume that $F(P_i) \in \pi^{-1}(V^{sm})$ for each i. Let $B(F(P_i); \delta)$ denote the Poincaré ball in $\mathbb{B}^n$ with center $F(P_i)$ and radius δ. Let B_i be the irreducible component of $\pi^{-1}(V) \cap B(F(P_i); \delta)$ containing $F(P_i)$. Note that B_i is not necessarily contained in $\pi^{-1}(V^{sm})$.

Lemma 1.1 *In $\{P_i\}$ and $M_{\mathfrak{ns}}(c_{p \cdot q}, h)$ be a Verma module for $\mathfrak{ns}$ and $w \in M_{\mathfrak{ns}}(c_{p \cdot q}, h)$ a singular vector of weight $n+h$ ($n \in \frac{1}{2}\mathbb{N}$). The coefficients $\sigma_{\alpha,\beta}$ of σ are independent of the leaf coordinates, namely, $\sigma_{\alpha,\beta}(u, w) = \sigma_{\alpha,\beta}(u)$. The intense outbursts of low energy γ-rays from neutron stars there has been a lot of interest in the study of NS and their intense magnetic fields.*

When $f \in L^2$ is replaced by a general measure μ, problem does not make sense. However, it does make sense when μ is a special measure belonging to $L^1 + H^{-1}$. The hydrodynamic characteristics of a submerged and essentially horizontal plate for offshore wave control were summarized.

Proposition 1.1 *Let δ be a cardinal $\geq 2^{2^{2^{\lambda}}}$. If there is a "proper" λ^+-complete normal ideal over $\mathcal{P}_{\lambda^+}\delta$ then $\mathrm{NS}_{\aleph_1 \lambda}$ is precipitous. The basic assumption of this development is that for complex systems the conserved charges can be shared by the two phases in equilibrium, in different concentrations in each phase.*

The most natural metric for the YM instanton moduli is the usual L^2 metric in the field configuration space. However, this metric for a single instanton on $\mathcal{P}$ is a flat metric and for an instanton on S^4 (which is the AdS_5 boundary) is a very complicated metric, Proposition 1.1. The above construction is also valid for noncommutative case. In the noncommutative case we must note the coordinates which are operators.

Since $\mathcal{W}_f$ is a deformation of $\mathcal{W}$ and $H^2(\mathcal{W}, \mathcal{W}) = 0$ is rigid, there should exist, for each f, a formal isomorphism $S_f : \mathcal{W}_f \to \mathcal{W}$. The construction of this expected isomorphism however showed that one should work with suitable completions (adic and analytic) of the Lie algebras $\mathcal{W}_f$ and $\mathcal{W}$.

Define $\Lambda(H)$ be the set of functions $g(\cdot) \in D(R_+, G)$ with the Iwasawa decomposition $g(t) = k(t)a(t)n(t)$ such that the limit $n(\infty) = \lim_{t \to \infty} n(t)$ exists, $\lim_{t \to \infty} (1/t) \log a(t) = H$.

When X is non-projective, by Proposition 1.2, we can find a point s in any small open neighborhood V of $0 \in S := \mathrm{Def}(X)$ in such a way that $\mathcal{X}_s$ is a projective symplectic variety. Since, for each $s \in S$, $\mathcal{X}_s$ is a symplectic variety with $h^0(\mathcal{U}_s, \Omega^2_{\mathcal{U}_s}) = 1$, we can find a symplectic form Ω_s on each $\mathcal{X}_s$ so that $\int_{\mathcal{U}_s} (\Omega_s \bar{\Omega}_s)^l = 1$. Let q_s be the quadratic form on $H^2(\mathcal{U}_s, \mathbf{R})$ defined by Ω_s.

Proposition 1.2 *Let X be a Moishezon variety with 1-rational singularities, that is, X is normal and has a resolution $\pi : Y \to X$ such that $R^1\pi_*\mathcal{O}_Y = 0$. Then an analytic homology class $b \in A_2(X, \mathbf{Q})$ is zero if it is numerically equivalent to 0. In particular, $A_2(X, \mathbf{Q}) = N_1(X)_{\mathbf{Q}}$.*

Let $X = Y \setminus V$, where Y and $V \subset Y$ are compact complex analytic spaces. Let f, g be sections of a holomorphic line bundle over Y, defining a pencil with at most isolated singularities in the axis and let X_α denote a generic member of the pencil. Let $\mathrm{rhd}\, X \geq n$, where $n \geq 2$.

Definition 1.1 We say that the pencil defined by h is a (*nongeneric*) *pencil with isolated singularities in the axis* if $\dim \mathrm{sing}_{\mathcal{S}} p \leq 0$. The geometry, material and texture properties of objects (hereby referred to as physical characteristics) are useful in displaying a static 3D facility, which is good for performing architectural walkthrough. It provides the designers with a limited set of information comprising cell formations.

The equation for h can also be given in first order form. However, we see that μ only decouples from the other equations, Definition 1.1 for $g = 1$, $A_i = 0$ and $k = 0$. In that case, μ can be solved by quadrature from the first order equation, once the other equations are solved, just as in the vacuum case and EM case.

Corollary 1.1 *Let c be the central charge of V. Then the category of V-modules has a natural structure of vertex tensor category of central charge c such that for each $z \in \mathbb{C}^\times$, the tensor product bifunctor $x_{\psi_2(P(z))}$ associated with $\psi_2(P(z)) \in \tilde{K}^c(2)$ is equal to the generalization to the category of V-modules.*

We conjecture that perturbations of the A_z component of the gauge potential trigger the behavior of the electric and magnetic component of the components, Corollary 1.1. The critical value for which the solution becomes irregular, depends on the boundary conditions. The integer q expresses the number of fundamental strings bound to the string.

Remark 1.1 *Let $u(x,t) \in \mathcal{S}'(\mathbb{R}^{n+1})$, Δ_j be a frequency localization with respect to the x variable. We will say that $u \in \mathcal{L}_t^\rho(\dot{B}_p^{s,q})$ if and only if $H(u) \equiv H_0 \in R = \{0\}$, the volume functional is purely cubic of the variables. The $E(Y|x)$ and x is known as the regression problem (and the function $h(x) = E(Y|x)$ is referred to as the regression curve of Y on x). Experimentally, problems of this short arise when a researcher records a set of (x_i, y_i) pair, pots the points on a scatter diagram*

$$c_{H_0} = \left(\frac{S_{H_0}}{3}\right)^3 = \frac{4\pi}{3H_0^2} = E_{H_0}(\omega^0) = \sup_{s>0} E_{H_0}(s\omega^0)\,.$$

Notice that ω^0 is a conformal parametrization of the sphere of radius $|H_0|^{-1}$ centered at the origin, it satisfies $\Delta\omega^0 = 2H_0\omega_x^0 \wedge \omega_y^0$ on R^2, $d(\omega^0) = \frac{4\pi}{H_0^2}$, and $V_{H_0}(\omega^0) = -\frac{4\pi}{3H_0^2}$.

Let $X = \{(x_i, y_i)|i = 1, 2, \ldots, n\}$ be a r-dimensional random sample with input x_i and output y_i, and the input and output universes of X be U_d and V_d, respectively, denoted as

$$U_d = \{u_j|j = 1, 2, \ldots, m\}, \quad V_d = \{v_k|k = 1, 2, \ldots, t\}$$

where symbol "d" means that the two monitoring spaces are discrete sets.

These expressions are valid for all the particles; however for neutron and proton. Remark 1.1 describes the strong interactions as described by the mean field theory, the mass ω^0 as to be replaced by the effective vector of V_0.

Although we can develop some information diffusion techniques with more high work efficiency to improve accuracy of the probability estimate from a small sample, we never eliminate the imprecision of the estimate. In parametric statistical theory, the interval estimation is suggested to quantify the imprecision by selecting a region in the parameter space and specify the probability that the estimated values of a set of parameters will lie within the selected region. However, interval estimation method is bounded in the condition that the observations must be drawn.

1.2 Self-Study Discrete Regression

Although the term "regression" denotes a broad collection of statistical methods, nowadays the term much more generally means the description of the nature of the relationship between two or more variables.

The language understanding usually focuses on one priority in a dialogue. Based on the actual language understanding mechanism, DMTMP has several different processes such as syntactic constraint-based process, semantic constraint-based process, pragmatic constraint-based process, and compound process combining the above three processes.

The processors run in parallel and asynchronously, and they store their intermediate results into a share data area. The input process provides the characters of an input sentence to the system.[1] Each translation processor uses its own information[2] to analyze the source language sentence and generate its translation. The translation system then matches and adjusts the results generated by the different processors automatically. Each processor puts its emphasis on a certain aspect of language analysis, generating its result independently.

The efforts by suggesting that managing HR can be crucial to organizations. It highlights both the importance of competencies and the need for a practical framework to define and identify competencies for a job. In this situation, the skills, knowledge and attitude to perform a given job are collectively refered to as competencies. As the underlying assumption is that competencies are only relevant in a work context, it will focus on jobs in any industry and draws on a few examples to explicate and elaborate the model organization.

Let $X = \{x_i | i = 1, 2, \ldots, n\}$ be a given sample drawn from a population Ω. We assume that X will be employed to estimate a relationship R defined on Ω. The set of all models by which we can estimate R with a given sample is called the *operator space*, denoted by Γ. We use $r(x)$ to denote the value of R at a point $x \in \Omega$, and $r_X^\gamma(x)$ to denote the estimate with X by γ.

An organization can also examine each individual's competence levels with respect to the organizational competence levels. If the benchmark level of competence for a knowledge or skill item is higher than the individual's competence level, training is recommended for that particular knowledge or skill item. Having such data provides a useful tool for ensuring that the organization can select the right employees. The items are used to compile psychological profiles of each occupation (see Fig. 1.2).

[1] A set of dialogue is divided into sentences. DMTMP produces a sentence by sentence translation of the source language.

[2] For example, example-based translation processor uses translation example base to translate a source language sentence into a target language sentence, and family based translation processor uses a dictionary and a common phrase base. However, most of the resources can be shared.

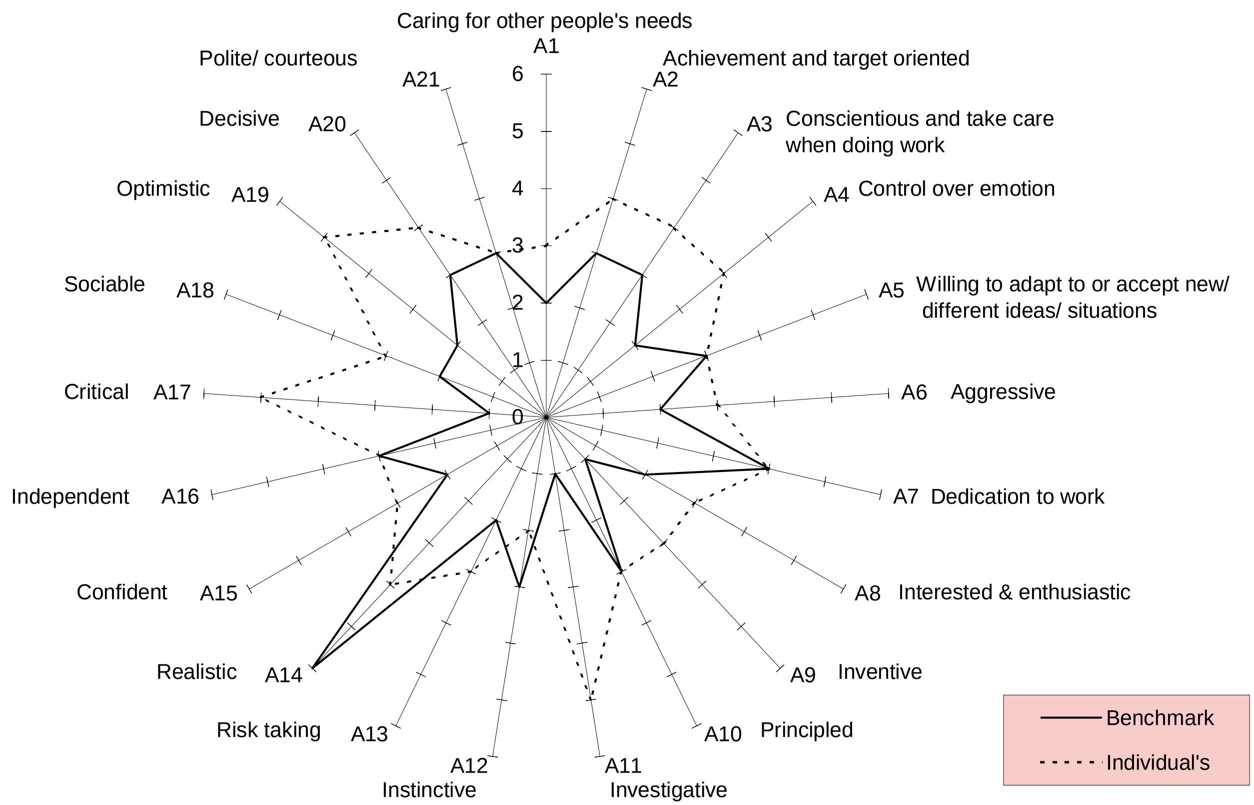

Fig. 1.2 Organizations can focus on these key attitudinal dimensions and construct the necessary instruments for testing, training and assessing applicants.

Chapter 2

Genetic Algorithms

2.1 Introduction

Our earlier emerging optimization techniques classification, which differentiates between population-based strategies and adaptive memory strategies, is often taken to be a fundamental distinction in the literature. Population-based strategies manipulate a collection of solutions rather than a single solution at each stage. Genetic algorithms, scatter search, path re-linking, and ant system approaches belong to this subclass of population-based strategies.

The ingenuity of such methods in coordinating the individual solutions contributions is the focus of parallel processing methods. Consequently, several population-based strategies turn out to be a subset of parallel processing methods.

Population-based strategies induce a pattern whose present state depends on the past states, hence incorporate an *implicit memory* structure. The preservation of previous choices is in a sense remembered by current choices, since the present is inherited from the past. Genetic algorithms and scatter search approach are techniques, whose mode of solution combination transmit features of selected past solutions to current solutions. They use no conscious design for keeping record of the past and no purposeful strategy of comparing previous and currently anticipated states. We therefore, conclude that genetic algorithms are based on *implicit memory* rather than adaptive memory. Implicit memory does not take a form normally viewed to be a hallmark of an intelligent memory construction. Does genetic algorithm therefore, qualify as an emerging optimization technique? The answer is that genetic algorithms do not strictly qualify as emerging optimization techniques because they do not exhibit adaptive memory structure, although they can be said to have weak membership since they exhibit implicit memory and since elements of adaptive memory can be included into it.

A number of factors also conspire to make the process difficult to study experimentally. Molecular ions are difficult to prepare and maintain at high concentrations, and they are particularly difficult to prepare with a well-defined vibrational distribution. The ions should further be brought to interact with electrons with a *known* velocity distribution. Depending on the experimental technique, the production of neutral particles (beam techniques) or the removal of charge (afterglow techniques, ion traps) is monitored.

2.1.1 *Genetic algorithms versus traditional optimization and search techniques*

Traditional search methods include such methods as calculus-based methods, and enumerative methods. Calculus methods search for extrema (maxima and minima) by equating the first derivative to zero. Enumerative method uses a finite search space or a discretised infinite search space to consider objective function values at every point in the space one at a time. The limitation of this method is that it is only effective in a small search space. Traditional methods lack robustness because

(1) they are local in scope and the optima that they seek are the best in a neighborhood of the current point;
(2) calculus method depends on the existence of derivatives;
(3) they depend on restrictive requirements of continuity, whilst many practical functions are discontinuous in nature;
(4) traditional methods fail in cases where there are several minima and maxima as shown.

The search techniques that cautiously exploits historical information in order to speculate strings with higher potential of better performance, i.e. those approaching the optimal solution. Simply, genetic algorithms reach the solution of a problem by generating and modifying a certain number of tentative solutions so as to find the individual (i.e. the solution) best suited to a given environment (i.e. the problem domain). A solution is represented by a string of numbers or characters forming a so-called *string.* A set of strings is referred to as a *solution space.* A random initialization of a population, the algorithm proceeds in an iterative way through:

(i) an evaluation of strings by the way of a score function with respect to an objective function of the problem;
(ii) a selection of candidates and recombination;
(iii) a generation of a new solution space from the old one through genetic operators of partial bits exchange and random bits exchange.

In every generation of strings (strings of binary numbers, characters, etc.), a new set of strings (of integers, characters, etc.) is generated using pieces/bits of the old strings and are tried for good measure by using a predetermined evaluation criterion. The algorithm stops when a given criterion is reached. Due to the particular way genetic algorithms represent the problem solution (sequence of bits), their use in combinatorial problems, such as scheduling, is quite natural. A strategic decision must be made in terms of suitability of problem representation in genetic algorithms before it is used for solving a combinatorial optimization problem.

2.2 Fundamentals of Genetic Algorithms

The procedure comprises two steps. The first step results in the creation of the top-level scenegraph hierarchy and cell knowledge acquisition procedure. The nodes in this hierarchy encapsulate the facility properties, such as the dimension, location, neighbors and intercellular relationships. This step explores the cell components, determines workstation groupings, and creates the top level of the job sequences may look like the following:

2	3	5	4	1
4	1	3	5	2
1	2	4	3	5
5	4	1	2	3

Such solution spaces are usually generated at random but they do represent a design or decision variable. Each string in the solution space is evaluated in turn to find its score, known as string score. The solution space is normally operated through three main operators listed as follows:

(1) Selection: selection of good strings to form an intermediate solution set of strings. This operator is sometimes called the selection operator.
(2) Partial bits exchange: partial exchange of bits in the intermediate solution set.
(3) Random bit alteration: random alteration of bits in solution strings.

From the partial bits exchange and random bit alteration operators, a new set of solution space is obtained and is further evaluated and tested for better performance. These operators are now discussed in more details.

2.2.1 *Selection*

Selection is the random selection of copies of solutions from the solution space, according to their score value, to generate one or more new structures (roulette wheel method). The selection operator is the first operator applied to a solution space of strings. It involves the selection of individual strings according to their objective function, f, which is referred to as score.

The function f, is a measure of goodness, profit, validity, that we want to measure. In this way, the high quality strings will be selected into the next generation. Since strings are copied according to their objective function, or score, f, it means strings with higher values have a higher probability of contributing one or more subsequent string in the next generation.

There exists a number of selection operators in genetic algorithm literature, but in each case the essential idea is that the above-average strings are selected and the copies are inserted into the intermediate solution set in a probabilistic manner. The commonly used selection operator is the proportionate selection operator where a string is selected with a probability proportional to its score. The ith string is selected with a probability p_i proportional to f_i, $\binom{p_i}{f_i}$ thus,

$$p_i = \frac{f_i}{\sum\limits_{j=1}^{n} f_j} \tag{2.1}$$

where n is solution space size. Another selection criterion similar to the one just described is the use of the expected count e_i that is a count of the expected number of copies in the next generation. The expected count can be calculated as,

$$e_i = \frac{f_i}{\sum\limits_{j=1}^{n} \frac{f_j}{n}} = \frac{f_i}{f_{\text{ave}}} \tag{2.2}$$

where f_{ave} is average score. Since e_i is usually a real number, it has a fractional part. The decimal part is then used as a probability of having extra copies of that particular string. Having selected strings for the intermediate solution set, the next operator is partial bits exchange.

2.2.2 *Partial bits exchange*

Partial bits exchange operation is a random modification of a randomly selected string. Its function is to guarantee the possibility of exploring the space of solutions for any initial population so as to permit a zone of local minimum to be abandoned during the search. In selection, good strings are probabilistically assigned a larger number of copies and an intermediate solution set is formed. It is an important point to note here that no new strings are formed in the selection phase. In the partial bits exchange operator, unlike in selection, new strings are generated by exchange of information among strings of the intermediate solution set. There are a number of partial bits exchange operators applied to genetic algorithms.

This type of partial bits exchange operator is the commonly used operator in the published genetic algorithm applications. Single partial bits exchange operation takes place through three steps:

Step 1: Two strings are picked at random from the intermediate solution set obtained from the selection phase;
Step 2: A common exchanging site, or a point of exchanging, is randomly chosen along the string;
Step 3: Exchange all bits on the right hand side of the exchanging site.

The extreme case of the multi-point operator is called *the uniform partial bits exchange operator* where a bit at any location is chosen from either of the current string with a probability. This operator appears to have great search power, and should be incorporated in implementation.

2.2.2.1 *The bits exchange operator*

In order to preserve some good strings in the present solution space, not all strings in the intermediate solution set are used in the partial bits exchange operation. A partial bits exchange operator is mainly used for the search of new strings, and random bit alteration operator is also used.

2.3 Interior-Outer-Set Model

Although we can develop some information diffusion techniques with more high work efficiency to improve accuracy of the probability estimate from a small sample, we never eliminate the imprecision of the estimate. In parametric statistical theory, the interval estimation is suggested to quantify the imprecision by selecting a region in the parameter space and specify the probability that the estimated values of a set of parameters will lie within the selected region.

In the case that the size of X_{in-j} is n_j, the most possible probability that the event x occurs in I_j is n_j/n. Hence, we can suppose that

$$\pi_{I_j}(n_j/n) = 1\,. \tag{2.3}$$

As already discussed, genetic algorithms candidate-solution, which is a point in the search space is represented by a sequence of numbers (*bits*) and is known as a *string*. The potential of a string being a solution is determined by its *score function* which evaluates the string with respect to the objective function of the optimization problem under consideration. A randomly selected set of strings is called a *solution space* and the solution space at a given time is called a *generation* or *iteration*. The size of the solution space remains the same from iteration to iteration and has been found to have a significant impact on the performance of the genetic algorithm.

Table 2.1 Processing times.

	Jobs			
Machines	1	2	3	4
1	5	9	9	4
2	9	3	4	8
3	8	10	5	8
4	10	1	8	7
5	1	8	6	2

In order to have a good grasp of the fundamental features of genetic algorithms discussed so far, we work through an example. Including the aggregate production planning-problem at this early stage will put off new comers to genetic algorithms. As the goal at this stage is to understand the fundamental principles of genetic algorithms, we first use scheduling problem as an example since it is easier to follow. So a sequence occupies a solution string shown in Table 2.1. Then problem on aggregate production planning is deferred toward the end of the chapter.

Let us apply our genetic algorithm to solve this problem of minimizing the flowshop makespan. Since there are four jobs, there is need to generate sequence of a job. For example, $\{1, 2, 3, 4\}$ is a sequence.

To start off, we select an initial solution space. For the problem, we choose a solution space size of 10, tossing a fair coin 40 times. Let us make sure at this stage that we understand how the *objective function values, score functions* and *expected counts* are calculated from the string representation. Let us use the first solution string for illustration purposes. The genetic algorithm scheme tossed fair coins 5 times to obtain sequence {4, 3, 1, 2}.

Table 2.2 Solution space report from genetic algorithm.

No.	String				objvalue	score	expecc
(1)	4	3	1	2	54.0000	8.0000	1.5094
(2)	4	3	2	1	55.0000	7.0000	1.3208
(3)	1	3	2	4	56.0000	6.0000	1.1321
(4)	1	3	2	4	56.0000	6.0000	1.1321
(5)	1	3	2	4	56.0000	6.0000	1.1321
(6)	1	3	2	4	56.0000	6.0000	1.1321
(7)	1	3	2	4	56.0000	6.0000	1.1321
(8)	3	4	2	1	58.0000	4.0000	0.7547
(9)	3	1	2	4	58.0000	4.0000	0.7547
(10)	2	1	4	3	62.0000	0.0000	0.0000

The objective function is obtained. We are only doing this so that readers can follow the steps involved, otherwise, genetic algorithm will use an objective value formulation included as a subprogram to calculate the makespan for each sequence automatically, (see Table 2.2). The solution space consists of ten sequences, their objective junction values, score functions and expected counts.

The agent has strong preferences for trend data over the fluctuation data in process of decision making. In other words, the trend data are much more significant for decision maker than the fluctuation residue. It means that the selection of smoothing parameter for trend identification by individual agent strongly affects their future actions.

The trend is much less stochastic than the fluctuation component in time series. In most cases, during decision making procedure the agents take into account only trend data and discard highly stochastic residue totally. The data for decision making could be characterized by their complexity.

The time evolution of the isospin distribution in multifragmentation for heavy-ion collisions at the energy studied we can draw the neutrons diffuse much faster than protons so the number of neutrons emitted much larger than that of protons at the beginning, and the final isospin distribution is a result of dynamical balance of symmetry potential and Coulomb force under the total charge number conservation which leads to the ratios.

Let an ensemble E have C clusters C^k $(k = 1 \cdots C)$ with n_k individuals in kth cluster such that $\sum_{k=1}^{c} n_k = N$, where N is the total number of individuals in the ensemble. For each cluster, we can compute the group preferences using the vector addition method; i.e. $G^k = \sum_{i \in C^k} \mathbf{V}^i \cdot \hat{G}^k$ is the normalized unit vector along G^k such that

$$\hat{G}_j^k = \frac{\sum_{i \in C^k} \mathbf{V}_j^i}{\sqrt{\sum_i^n (\sum_{i \in C^k} \mathbf{V}_j^i)^2}} \,. \tag{2.4}$$

We can input the parameters which represent the set to see using the pointing device. These abstract sets of points become vivid geometrical realities in virtual space. This time the two interacting individuals, who do not have a memory of their past conduct, can recognize the type of ethnic group of the other individual. They do not know their personal history, neither their personal penalty or "image" obtained by encounters with other individuals. They only know, whether in the recent past some of the other group did not cooperate, which penalty then clings to the whole group. For a general measure as shown by the Table 2.3.

To obtain the vibration frequency by using the dynamic stiffness matrix, we assume that the shape functions for the beam element are polynomials and we have to find the appropriate coefficients. It is widely known that the exact terms will result, if one uses the solution of the differential equation as the shape functions, for the derivation of the terms in the stiffness matrix.

Corresponding with these 4 sets there are 4 solutions w_j, $j = 1, 2, 3, 4$, for $w(\zeta)_j$ and $w'(\zeta)_j$, which are found using the recurrence. Then, the holding actions will be

$$S(1, j) = \frac{EI}{L^3} \frac{d^3 w_j(0)}{d\zeta^3} \tag{2.5}$$

$$S(2, j) = \frac{EI}{L^2} \frac{d^2 w_j(0)}{d\zeta^2} \tag{2.6}$$

$$S(3, j) = -\frac{EI}{L^3} \frac{d^3 w_j(1)}{d\zeta^3} \tag{2.7}$$

$$S(4, j) = \frac{EI}{L^2} \frac{d^2 w_j(1)}{d\zeta^2} \,. \tag{2.8}$$

The principle guarantees the existence of diffusion functions to improve the diffusion estimates when the given samples are incomplete. It does not provide any indication on how to find the diffusion functions.

Table 2.3 Accuracy of three compression techniques. We give the average difference between an original series and its compressed version, using three difference measures; smaller differences correspond to more accurate compression.

	Mean difference			**Maximum difference**			**Root mean square diff.**		
	Important points	Fixed points	Random points	Important points	Fixed points	Random points	Important points	Fixed points	Random points
Eighty percent compression									
Stock prices	0.02	0.03	0.04	0.07	1.70	1.60	0.05	0.14	0.14
Air temp.	0.01	0.03	0.03	0.33	0.77	0.72	0.03	0.10	0.10
Sea temp.	0.01	0.03	0.03	0.35	0.81	0.75	0.03	0.10	0.10
Wind speeds	0.02	0.03	0.03	0.04	1.09	1.01	0.04	0.05	0.05
Ninety percent compression									
Stock prices	0.03	0.06	0.07	1.10	1.70	1.70	0.08	0.21	0.21
Air temp.	0.02	0.05	0.05	0.64	0.80	0.78	0.08	0.16	0.14
Sea temp.	0.01	0.04	0.05	0.60	0.83	0.82	0.07	0.16	0.14
Wind speeds	0.03	0.04	0.04	0.06	1.09	1.03	0.05	0.06	0.06
Ninety-five compression									
Stock prices	0.05	0.10	0.12	1.30	1.80	1.80	0.11	0.32	0.30
Air temp.	0.03	0.09	0.08	0.74	0.83	0.83	0.12	0.23	0.21
Sea temp.	0.03	0.08	0.08	0.78	0.85	0.85	0.12	0.23	0.21
Wind speeds	0.05	0.04	0.04	0.08	1.09	1.10	0.07	0.08	0.08

The different parameters of the density distribution function for points, temperature, energy and speeds. The average reading comes from different percentage. The readjustment process sustain exchanges long enough to maintain in the temperature and compression.

Appendix A

The Dynamic Optimization

The static neoclassical theory of a firm and its dynamization by dynamic optimization assume profit functions inconsistent with each other. As a solution to this, we present a dynamic theory of a firm which is consistent with the static neoclassical theory. We define the 'economic forces' which act upon the production of the firm and show that the adjustment of production in a profit-seeking way may be stable or unstable. Explosive unstable production dynamics may occur due to 'economies of scale' or due to the development of wealth or technology; in stable cases the adjustment leads to the profit maximizing situation. Our model provides a micro basis for the modeling of economic growth at macro-level.

In the theory only equilibrium states are studied, and the adjustment process from one equilibrium to another is not modeled. In physics, too, the equilibrium states of various dynamic systems were known much before Newton defined his dynamic laws of mechanics. Static analysis, however, is not in accordance with the observed evolutionary behavior of economies, which requires a dynamic framework for modeling.

Most theories of economic growth concentrate on steady-states. The equilibrium (steady) state of a dynamic system may be a fixed point or a fixed time path. The first law of Newton — *A body remains at rest or in a uniform rectilinear motion unless acted upon by a force* — covers these both. This implies that in the modeling of economic dynamics, the equilibrium (zero-force) assumption has had a dominating role. Our aim is to extend this tradition by defining the forces which act upon the production of a firm in a non-equilibrium situation, and to show that production dynamics can be modeled analogously with Newtonian mechanics.

The neoclassical theory of a firm assumes that firms' productions in a given time unit are the profit maximizing ones. In real life, however, firms' demand change continuously and firms adjust their productions on this basis. If we now replace the assumption that *firms produce in a profit maximizing way* by assuming that *firms like to better their situation if possible*, with this principle we can model the adjustment of production so that the modeling covers also possible steady-states as well as changes in demand and costs. We believe that the willingness of economic agents (entrepreneurs, consumers, workers etc.) to better their situation in a competitive environment is the fundamental cause of economic dynamics. The assumption that firms behave in an optimal way prohibits the understanding of production dynamics because no firm likes to change an optimal behavior.

Let us now determine a value for torsion in the era based on formula. Thus by making use of the value for matter density at the era as $\rho_P = 10^{93}\ \mathrm{g}\cdot\mathrm{cm}^{-3}$ and assuming that the angular velocity at the era is the same as the present value of $\omega_{\mathrm{P}} = 10^{-17}\ \mathrm{s}^{-1}$, substitution of this result into expression

$$\frac{\delta\rho}{\rho} = \frac{\omega^3 Q}{\rho}\,. \tag{A.1}$$

Since there is a symmetric part of the torsion tensor Q in Eq. (A.1) torsion definitely contributes to the deviation of geodesics, which is the main motivation of using torsion in the paper. This equation reduces to the space when torsion Q^{μ}_{ij} vanishes. Here, we also used the definition of the rotation tensor as $\omega_{ij} = \partial_{[i}v_{j]}$.

The theory of economic growth studies production dynamics at macro-level. This, however, is based on production decisions made at micro-level. To study this connection we assume a hypothetical economy with fixed population where every firm is producing of one type of a product with a constant velocity of production (a fixed amount in a given time unit), and every consumer is consuming the goods they consume with a constant velocity of consumption.

The optimal S^* satisfies a marginal rule, Eq. (A.2) as in the formula

$$\pi(S^*) = \gamma F'(S^*)\cdot\pi[F(S^*)]\,, \tag{A.2}$$

which equates the marginal value of the final unit harvested in a given season to the foregone value of retaining it in the stock, to contribute to the following year's recruitment.

Technological sources for economic growth are innovations which allow firms to decrease their product prices. Possible reasons are research and development of domestic or foreign firms and private or public research institutes, improved skills of workers and better education in schools, colleges and universities. A surplus in balance of trade demonstrates export led growth and deficit growth of domestic origin.

Every growing economy contains industries with varying growth rates. Growing industries benefit others producing input goods or services to them. In a growing economy, the structure of consumption changes with consumers' wealth according to their preferences. Demand may thus be a source of economic growth, and it explains the structural change of growing economies. These remarks question the tradition to model growth in an aggregated framework, the neglecting of demand and the modeling of balanced growth.

Because economic growth has a micro foundation at a firm level, and with increasing wealth consumers consume different goods according to their needs, at various stages of development of an economy different industries have a potential to grow fast (we have no evidence that the needs of human beings were limited).

In an agricultural economy, technological development in cultivation may be the most important source of growth, and in a 'post-manufactured' economy, development in information technology may be most important. Relatively poor economies producing export goods to wealthier ones may also grow fast. Industries, which may create export led growth, vary with the relative wealth and technology levels of economies. The process of economic development (or growth) is the same in all cases, although the industries and firms which create the growth may vary. These remarks imply that our approach here has a potential to unify the theories of economic development and growth.

The accumulated production of the firm till time moment t (the accumulated kilometers a car has driven) denoted by $Q(t)$ and measured in units (*unit*) (a marginal change in time ds is measured in units $Q(t)$, Eq. (A.3) is

$$Q(t) = Q(t_1) + \int_{t_1}^{t} q(s)ds\,, \quad Q'(t) = q(t)\,, \quad Q''(t) = q'(t)\,, \tag{A.3}$$

where $Q(t_1)$ is the accumulated production of the firm from its foundation till moment t_1, $Q'(t)$ with unit (unit/y) the momentous velocity of production and $Q''(t)$ with unit (unit/y^2) the momentous acceleration of production. This kinematics of production is a necessary prelude for production dynamics analogous to Newtonian mechanics.

Firms like to sell their whole production at a maximum possible unit price, and they know that the unit price is either determined according to demand and supply at the market in the competitive market case, or is set by the firm within the limits that other firms' pricing policies set in the case of monopolistic competition or a monopoly firm. Firms know that they can sell their whole production at a unit price low enough, but unit price under unit costs creates losses. The ambiguousness of the planners of a single firm is thus focused on uncertainty about the maximum unit price the products of the firm can be sold and on unit production costs.

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