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Chebyshev definite analysis of velocity field computations for shape optimal design

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Abstract

A knowledge of the shape of optimizing process is significantly relevant in producing objects models especially when effort is being geared towards achieving special technological break through. This paper proposes a further analysis of previous work on the velocity field computations, as relates to producing shapes of optimal designs. With a case consideration, we establish results for handling the flow intensity of the process of varying the shape of a resource object. With presentation of some energy, we have obtained results for Lyquist stable designs.

Keywords: Dynamic shape changing process, assignment programming domain, flow frequency profile, zero – root control hypothesis.

1.0 Introduction

In [3], an applied structural domain as a continuous medium in which the process of changing the shape of domain Ω to Ω_1 conformed to a dynamic process that deforms the continuous medium with respect to *t* was considered. The process operation defined in accordance with [2] and [3] was represented by a mapping.

$$T : x \longrightarrow x_t^{(x)}; x \in \Omega$$

with

$$\begin{aligned} X_t &\equiv T(x_t t) \\ \Omega &\equiv T(\Omega, t) \\ \Gamma_t &\equiv T(\Gamma, t) \end{aligned} \tag{1.1}$$

This paper is interested in approximating the dynamic programming problem

$$\begin{aligned} &AT(x,t) + \frac{\partial T}{\partial t}(x,t) \neq 0 \\ &T(x,0) = T(x) \end{aligned}$$

where:

$$\begin{aligned} v(x,t) &= \frac{\partial T}{\partial t}(x,t) \\ v(x,0) &= v(x) \end{aligned} \tag{1.2}$$

and *A* is an operator to accomplish the design hypothesis proposed by [1].

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Now, consider the figure below:

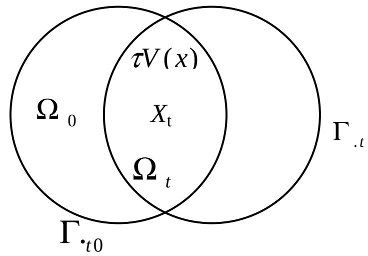


Figure 1.1: Illustrating the flow of the resource point

In the above figure 1.1, a material point x∈ Ω, in the initial domain at $t = 0$, was supposed moving to a new location $x_t \in \Omega_t$ in the perturbed domain. Unlike in [1], the sensitivity variable τ(t) is introduced by incorporating an Eigen assignment [4].
Thus:

$$\tau(t)\left|\,\left|(A-\lambda I)T(x,t)+\tau(t)\frac{\partial T}{\partial t}(x,t)\right|\,\right| = C_T(t)\delta_{ij,};\lambda \in \lambda' \tag{1.3}$$

where, λ is the eigen value set of A, such that λ I λ′ = ϕ; and δ_{ij} is the Dirac-delta, $C_T(t)$ is a variable constant. In [5], there exists a function relation

$$f(\tau,\lambda) = \frac{1}{C_T(t)t_T}\int_{-t_T}^{t} P_i \; P_i^{\;1} dt; P_i = P\left(x^2(t)\right)$$

$$= \delta_{ij} \tag{1.4}$$

$$C_T(t) = \frac{1}{t_T}\int_{-t_T}^{t_T} x(t)P_i dt$$

where,
$P_i(x^2)$ is an orthogonal polynomial with a conjugate P_j^{-1} for the characteristic model

$$\tau(t) \| A_{IJ} - \lambda \| = \delta_{IJ} \tag{1.5}$$

Thus, [4] and [5] are then endowed with a domain τ given by:

$$\frac{\tau \in [-1,1]}{\lambda(t)};\lambda \in \lambda' \tag{1.6}$$

2.0 Resource evaluation and error

The above scheme establishes a general model

$$T_\tau = C_T(t)T_i T_j \delta_{ij};T_j \in \frac{[-1,1]}{\lambda_j(t)};\lambda \in \lambda'$$

$$v_j = \frac{\partial T}{\partial t}(x(t)) \tag{2.1}$$

$$t = t_j$$

Thus, [5] establishes a numerical symmetricity model

$$T = T_0 + \delta_{ij} T_j \left(1 - x^2(t)\right) \sum_{j=1}^{N} C_{T_j}(t) P_j\left(x^2(t)\right)$$

with $$C_T(t) = C_{T_0} e^{\tau_{jt}}; \tau_j \in \frac{[-1,1]}{\lambda_j(t)}; \lambda_j \in \lambda' \qquad (2.2)$$

together with an error criterion

$$ERROR(i) = 0\left(P_i\left(x^2(t)\right)\right) \qquad (2.2a)$$

and, $\left(P_i\left(x^2(t)\right)\right) = 0; (i = n)$ at the N^{th} collocation root point of $\left(P_i\left(x^2(t)\right)\right)$.

The model in (2.1) enables the construction of figure 2.1 below for a design symmetricity.

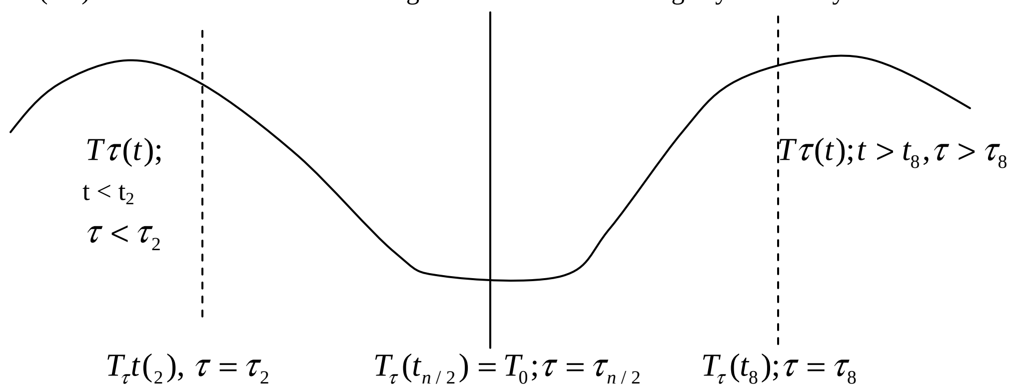


Figure 2.1: Illustrating approximate resource flow intensity

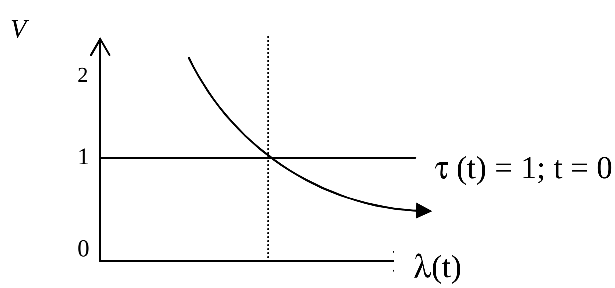
The C-component of the system process operations velocity of propagation is given by

$$\begin{aligned}\partial T_\tau &= \frac{\partial T}{\partial C_T \tau(t)} \tau \frac{dC_T^{(t)}}{dt} \\ &= \frac{\partial T}{\partial C_T \tau(t)} \tau C_T \tau\, e^{\pi} \\ &= v(x,t).\end{aligned}$$

That is,

$$v(x,t) = \left\lfloor C_{T0} \frac{\partial T}{\partial C_T(t)} \tau \right\rfloor \tau e^{\pi}; |t| \in [0,1] / \lambda(t) \qquad (2.4)$$

Thus the velocity flow streamline can be represented as in figure 2.2 below. This figure is a representation of the band side of configuration symmetry.



$$\frac{\nabla(t)\lambda}{2}$$

Figure.2.2: Illustrating the flow frequency profile of the shape changing process.

3.0 Finite model

For the system state variable $x(t)$, select the difference scheme

$x_i = x(t_i) \equiv i\Delta x;\ \Delta x = 0{,}2;\ i = 1{,}2\Lambda\ N.$

$$x_i = \frac{\Delta t}{2} \equiv i\Delta t;\quad \Delta t = 0.1 \tag{3.1}$$

$$p(x^2) = p(x_i^{\,2});\ \ i = 1,2,\ldots N$$

Then the scheme in (1.1) motivates a modified symmetric scheme of chebyshev polynomials;

$$x^2 \le 1;\ w(^2) = (1 - x^4)^{1/2};\ x \in R^2$$
$$p_0(x^2) = 1$$
$$p_1(x^2) = x^2$$
$$p_{i+1}(x^2) = 2x^2 p_i(x^2) - p_{i-1}(x^2)$$

for planar geometry.

By our previous results in (1.4), noting (1.1) and (1.2), then

$$C_{T,j} = \frac{1}{t_\tau}\int_{t_T}^{\tau_T} x^2 p_i(x^2)dx$$

Thus, the values obtained are:

$$C_{T,0} = \frac{1}{3}, C_{T,1} = \frac{1}{5}, .C_{T,2} = -\frac{1}{2}$$

$$C_{T,3} = -\frac{7}{45}, C_{T,4} = \frac{13}{45}, C_{T,5} = \frac{61}{231} \tag{3.3}$$

Then by (1.6), we can write

$$\tau = C_{T,i}\delta_{ij} = 1; i = j \tag{3.4}$$

This paper selects the scheme

$$\Delta\lambda = \frac{(\lambda_{\max} - \lambda_{\min})}{\lambda_{\max}} = 0 \cdot 2$$

to obtain a domain of values of Γ.

Now,

$$A_{TJ} = C_{TJ}\lambda^{Tt} \tag{3.5}$$

$$\text{Sum} = \sum A_{TJ} P_I(x^2)$$

and,

$$Z_I = (1 - x^2(t))\sum A_{TJ} P_I(x^2)$$

The values displaced in table 3.1 below are the values of the unknown variables in our model. These values are obtained at different rows and columns. Thus, the values are then made use in obtaining our approximate solution which are in agreement with some known results. This shows that our chosen error criterion is okay in our model.

4.0 Discussion of result

The profile of the data sample values calculated (see table 3.1) agreed with the resource flow intensity earlier illustrated (see figure 2.1), with T and P directly related.

Our rule for evaluating *V* in (2.4) and the anticipated limiting values are achieved as earlier illustrated {see figure 3} as confirmed with values of P in the table. The zero root hypothesis is adhered and is confirmed with values of P and Error in the table.

5.0 Recommendations

The difference scheme provided with (3.2) and (3.5) has enabled us to obtain a model of Choi-Chang velocity field. The assignment introduced with (1.3) has provided us with t-related means of controlling the flow intensity of the x-resource changing shape.

Table 3.1: Sample Calculated Data Values.

Row	I	TI	ATI	p(I)	SUM I	ZI(ROW)	ERROR
1	1	0.1	1.64872127	0.04	6.5989E-02	1.06594885	4.34925E-03
2	1	0.1	1.64872127	0.04	6.5989E-02	1.06594885	4.34925E-03
1	2	0.2	1.64872127	-0.9968	-1.64344536	-643445363	2.70091266
2	2	0.2	1.64872127	-0.9968	-1.64344536	-643445363	2.70091266
1	3	0.3	1.64872127	0	0	1	0
2	3	0.3	1.64872127	0	0	1	0
1	4	0.4	1.64872127	0	0	1	0
2	4	0.4	1.64872127	0	0	1	0
1	5	0.5	1.64872127	0	0	1	0
2	5	0.5	1.64872127	0	0	1	0
1	6	0.6	1.64872127	0	0	1	0
2	6	0.6	1.64872127	0	0	1	0
1	7	0.7	1.64872127	0	0	1	0
2	7	0.7	1.64872127	0	0	1	0
1	8	0.8	1.64872127	0.9968	1.64344536	2.64344536	2.70091266
2	8	0.8	1.64872127	0.9968	1.64344536	2.64344536	2.70091266
1	9	0.9	1.64872127	-0.119744	-0.19742448	0.80257552	3.89764E-02
2	9	0.9	1.64872127	-0.119744	-0.19742448	0.80257552	3.89764E-02
1	10	1	1.64872127	-1	-1.64872127	-0. 64872127	2.71828183
2	10	1	1.64872127	-1	-1.64872127	-0. 64872127	2.71828183

A communicating shape varying design is made available if we assume that energy E = δij… been provided, fulfilling the Lyquist. Change velocity field. the assignment introduced with [3] has stability Test Criterion based technology as stated in [5].The formulation of *V* in [9] leads to obtaining models of figure 2.2 with these model, we may meanwhile expect our x-resource material is liable to decaying effect.

The result established enabled a Choi-Chang Velocity field based technology, in view of figures 2.1 and 2.2. The domain established for the shape design sensitivity variable can be generalized to the form:

$$\frac{[-a,a]}{\lambda};a\ \pi\ \infty$$

Figure 2.2 is consistent with the current technologically based system designs analysis, notably Hewitt [6].

6.0 Conclusion

The model established in this paper is very closely in agreement with the Lyquist stability Test Criterion based technology in [7]. A number of orthogonal collocation schemes is available in [8] for specific accomplishments of the numerical implementation.

The results in [9] afford an optimum trajectory based programming of the technological designs.

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