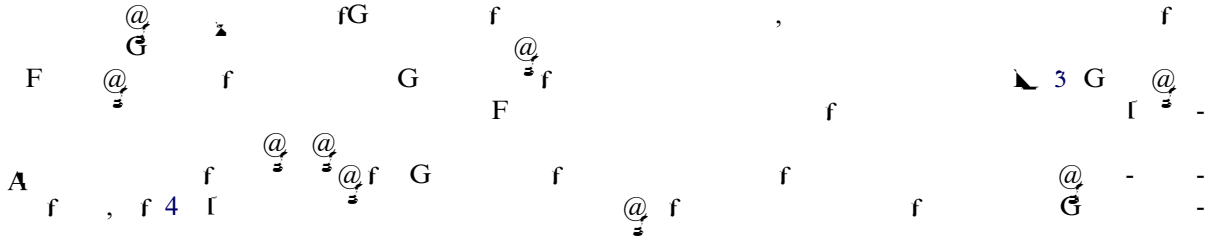
Ɪ ƒ G ƒ ☆



N @ f @ U FF Γ f
A A W (A) A 8) A A 1)

ðv Þ ¼ δðv □ , Þ, ð4Þ

F f

^ðσÞ ¼ □2π σ . ð Þ

U @ F @ ,

□, ² ¼ π 1 □ω²/4, ω ω, ð6Þ

(3)

G ð Þ ¼ , ² π 1 □π²ω² 2π ωð □ , Þ □ 2 , ω. ð Þ

C @ @ f @ @ 2π ωð □ , Þ,

G ð Þ ¼ , ² π 1 □π²ω² Þ2π ω □ ð2 Þ2πωÞ , ω ¼ , ² π 1 □π²ω² Þ2π ω ^ , π Þ ω ω. ð8Þ

Γ f G f □π²ω² @ (8)
F ϵ, @ (8) (-
) jωj < □, ðϵÞ/π j j 6 1/2, f ^ ðξÞ

jξj < , 2π Þ □, ðϵÞ π . ð9Þ

W f A A L G
λ > γλð Þ ¼ □λ ², F f ^γðξÞ, (A 4))

, λðξÞ ¼ j ^γλðξ Þ , Þj². ðl Þ
, 2Z

U @ A @ 3, f j ξ j6 N/2

^ðξÞ □ 1 ^ γλðvξ □ , Þ, ðl1 Þ
, λðξ/vNÞ

g n A 26) N v A A @N
@ - f(9) N 2, (l1) (8)

G ð Þ □ G̃ð Þ ¼ , ² π 1 □π²ω² Þ2π ω ^ γλðvð/π Þ ω Þ □ , Þ . ðl 2Þ
, λðπ/vN Þ

C @ @ @ (l 2)

G̃ð Þ ¼ , ² π ^ 1 □π²ω² Þ2π ω γλðvð/π Þ ω Þ □ , Þ ω. ðl 3Þ
, λðπ/vN Þ

@ 1 (A A), , λðξÞ f jξj < ¼ G A ,
@ (l 3) ; fG @ f
N ,

$$\frac{\pi}{} \quad {}^{1} \quad \frac{\square\pi^2\omega^2}{} \text{ þ } 2\pi\omega \square \lambda \quad v^2 \quad \frac{}{\pi} \text{ þ } \omega \quad \square \quad {}^{2} \text{ þ } \frac{\eth \text{ þ } \pi\omega\text{þ}^2}{\eth vN\text{þ}^2\lambda} \quad \omega$$

$$\text{¼} \frac{vN\sqrt{\text{þ}\lambda\pi}}{\kappa} \square \quad \frac{\square\lambda^2v^2N^2\eth\ \pi \square w \text{ þ}^2 \text{ þ } \lambda \ {}^2\pi^2, \square \ {}^2\pi^2\eth, \lambda v^2N^2 \square \ {}^2\text{þ}}{\kappa}$$

$$\square \quad 2 \frac{\ {}^2\eth\pi^2 \square \lambda^2v^4N^2\text{þ} \text{ þ } \pi, \ \lambda^2v^3N^2}{\kappa} ,$$

$$\kappa \text{¼} \eth\pi^2\lambda v^2N^2 \square \pi^2, \text{ þ } \lambda^2v^4, N^2\text{þ}. \qquad \text{ðl 4þ}$$

Γ ,

$$\tilde{G}\eth \text{ þ } \text{¼} \frac{vN\sqrt{\text{þ}\lambda\pi}}{\kappa} \quad \frac{\square\pi^2\eth, \lambda v^2N^2 \square \ {}^2\text{þ } 2 \ {}^2\eth\pi^2 \square \lambda^2v^4N^2\text{þ}}{\kappa} \square \ {}^2$$

$$\square \quad \tilde{} \quad \square \frac{\lambda^2v^2N^2\eth\ \pi \square w \text{ þ}^2}{\kappa} \quad \frac{2 \ \pi, \ \lambda^2v^3N^2}{\kappa} , \qquad \text{ðl þ}$$

$$\tilde{} \text{¼} \tilde{} \quad \square \frac{\lambda, \pi^2 \ {}^2}{\kappa} . \qquad \text{ðl 6þ}$$

Γ f (3) (l)
@ 4 1 99 84 6l l Γ 9 9626 9 9626 81 2283491 1 6 Γ () Γ Fl 4 4( )-2 31 (433)-3331 (@ Fl 38 96443 l 3 -E

5. Conclusions

A f ' f A 9) @

$$\mathscr{P}^{v} \;=\; \int_{-1}^{1} e^{2\pi i \xi \hat{}} \, \delta v N \xi \, \hat{\gamma}_{\lambda}(\delta \xi) \, d\xi, \qquad \text{A } 1 \text{-} \text{þ}$$

,

$$\mathscr{P}^{v} \;=\; \int_{-\frac{1}{2}}^{\frac{1}{2}} e^{2\pi i \xi} \, \hat{} \, \delta v N(\delta \xi \text{ þ } , \text{ þ} \hat{\gamma}_{\lambda}(\delta \xi \text{ þ } , \text{ þ } \xi. \qquad \text{A } 11 \text{ þ}$$

W @ ℝ A 1) A 11), f fλ,
jξj , $\hat{\gamma}_{\lambda}(\delta \xi$ þ , 1 ,

@ @
, @ A 11) f F , f f

$$F(\delta \xi \text{ þ } = \mathscr{P}^{v} \;) \; \int_{2\mathbb{Z}} e^{2\pi i \xi}, \qquad \text{A } 1\,2\text{þ}$$

$$F(\delta \xi \text{ þ } = \int_{2\mathbb{Z}} \delta v N(\delta \xi \text{ þ } , \text{ þ} \hat{\gamma}_{\lambda}(\delta \xi \text{ þ } , \text{ þ}. \qquad \text{A } 1\,3\text{þ}$$

@ f A 1 3) , $_{\lambda}(\delta \xi$ þ @

Then

$$E_1\ 61\ \square\ \hat{\varphi}\eth\alpha\flat\ \mathrm{b}\ \frac{1}{C^{\wedge}\eth,\ \alpha\flat}\ _{,\ 2\mathbb{Z}n\mathrm{f}_{\blacktriangledown}g}\ C^{\wedge}\eth,\ ,\ \alpha\flat\hat{\varphi}\eth\mathrm{j}\ ,\ \mathrm{j}\ \square\alpha\flat.$$

$\mathrm{f}\hat{\varphi}\quad \mathrm{f}\quad @_{\blacktriangledown}\ ,\quad 1\ \square\ \hat{\varphi}\eth\alpha\flat$
$@_{\blacktriangledown}\ 1_{=}\ 1$

$@_{\blacktriangledown}\hat{}\ \eth\xi\flat\ \mathrm{f}\ \ \mathrm{j}\ \xi\ \mathrm{j}6\ \frac{N}{2},\quad \alpha\quad \alpha\ ¼\frac{1}{2v}$

F $@_{\blacktriangledown}\mathrm{f}\quad v_{=}2,\quad \mathrm{j}\ \xi\ \mathrm{j}<\frac{1}{4},\ \hat{\varphi}\eth\xi\flat\quad$ -

, $\hat{\varphi}\eth\xi\ \square 1\ \flat\quad$, $\lambda <_{\blacktriangledown}1\ 4\ \ F\ \ \lambda =_{\blacktriangledown}1\ 4$

$\mathrm{f}\gamma_{\lambda}\quad \square 1\ 6,1\ 6\quad ,\quad$ A 9) $@_{\blacktriangledown}\quad \mathrm{f}33\quad ,$

$23\ \ \mathrm{f}\quad -\quad ,\ \ \mathrm{f}$

(2) C

$$F(\xi_\nu) = \sum_{n=-\frac{N}{2}}^{\frac{N}{2}-1} \mathscr{P}^{n} \cdot e^{-2\pi i \xi_\nu n}$$

FF Γ

(3) $F(\xi_j)$, $\chi(\xi_\nu)$

A.2.2. Fast evaluation of the Fourier series at unequally spaced points

W f , f

L T

$$(\xi_\nu) = \frac{F(\xi_\nu)}{\chi(\xi_\nu)},$$

F(ξ) A 1 2) $a_\chi(\xi)$ A 4) C f

$$f(\xi_\nu) = \sum_{n=-\frac{N}{2}}^{\frac{N}{2}-1}$$

[illegible]

$$\langle r, \quad i = \int_{-1}^{1} \hat{G}\left(\frac{\xi}{v}\right) \tilde{\mathscr{P}}^{v}(\xi) \quad \xi, \qquad (A.20)$$

$$\hat{G}(\xi) = \sum_{l=-\frac{N}{2}+1}^{\frac{N}{2}} \frac{r_l}{\left(1 - \lambda\left(\frac{1}{vN}\right)\right)} e^{-2\pi i l \frac{\xi}{N}}. \qquad (A.21)$$

(A.19)–(A.21),

$$\langle r, \quad i = \int_{-1}^{1} \hat{G}\left(\frac{-}{v}\right) \gamma_l(vN) \quad (\xi) \quad = \langle r \quad (N\xi), \quad i, \qquad (A.22)$$

$$r \quad (\xi) = \sum_{l \in \mathbb{Z}} \hat{G}\left(\frac{-}{v}\right) \gamma_l(v\xi -). \qquad (A.23)$$

N $\hat{G}$ $\frac{-}{v}$ ( ) ,

$$r_l = \frac{r_l}{\left(1 - \lambda(\frac{l}{vN})\right)}, \quad -\frac{N}{2} \le l \le \frac{N}{2} - 1; \qquad (A.24)$$

A FFT $\{r_l\}_{l=-\frac{vN}{2}+1}^{\frac{vN}{2}}$ $\{\hat{G}(\frac{l}{v})\}$ F

Algorithm 2.

(1) C $\{r_l\}$ (A.24)
(2) A FFT $\hat{G}(\frac{l}{v})$
(3) C $r(\xi)$ (A.23)

A.2.3. Evaluation of unequally spaced FFT at unequally spaced points

W $\xi \in [-\frac{1}{2}, \frac{1}{2}]$ $\xi \in [-\frac{N}{2}, \frac{N}{2}]$ (A.14),

Algorithm 3.

(1) C

$$\mathscr{P}^{v} = \gamma_l(vN), \quad l = -\frac{v^2N}{2}, \ldots, \frac{v^2N}{2} - 1 \qquad (A.25)$$

$[-\frac{v}{2}, \frac{v}{2}]$

(2)
$$r_l = \frac{\mathscr{P}^{v}}{\left(1 - \lambda\left(\frac{l}{v^2N}\right)\right)}$$