$_{d}iffusion, aprerequisiteintroductiontotheLangevindiffusionanditsassociatedPoisson'sequationisgiven.Theintention$
$_{t}d_{l}angevin, thatinthespecialcaseofLangevindiffusion, the-Lalgorithmprovidesasimpleandelegantsolution.Thisisach$
$adjointpropertyofitsdifferentialgenerator.Thisisthemajorcontributioninthischapter.Amoregeneralversionofthealgo$
$timediffusionprocessesisalsoderivedalongthelinesofthestandardLSTDalgorithm.Thisalgorithmwithitsapplicationto$
$timeanalogofthealgorithmhasbeensuccessfullyappliedtoproblemsinoptimalcontrol.$
$_{l}angevininthecontextofMCMCalgorithms.$

d

$$_{t} = \underbrace{-\nabla(_{t})\,t}_{drift} + \underbrace{\sqrt{2}\,W_t}_{diffusion}\,,$$

(1)

$=$
$\{W_t :$
$t \geq$
$0\}$
$\Re^d$
$U :\to$
$\Re$
$=$
$e^{-+\Lambda}$
Λ
?
$_{t}d_{l}angevin_{c}tscanbethoughtofascomposedofadeterministicdrifttermandastochasticdiffusionterm.Theintuitionisthat$
$Mauryamascheme are used e: diff_{t}d_{l}angevin_{d}iscrete :_{n} =_{n-1}$
$-\nabla U(_{n-1})_{n}+$
$\sqrt{2_{n-1}}W_{n-1},$ (2)
$\{_{n}\}_{n\geq 1}$
$\{W_n\}_{n\geq 1}$
$_{n} \equiv$

$$f := \lim_{t\to 0} \frac{[f(_{t}) - f(x)|_0 = x]}{t} = -\nabla\cdot\nabla f + \Delta f, f \in C^2,$$

(3)

∇
Δ
U
$\{P_t\}_{t\geq 0}$

$$= \lim_{t\to 0} \frac{P_t - I}{t}.$$

(4)

$c :\to$
$\Re$

$$\eta :=_{\sim} [c()] = \int_c (x)(x)x = \langle c, 1\rangle_{L^2}.$$

(5)

$h \in$
C^2
c

$$h := -, = c - \eta.$$

(6)

h

$$h(x) = \int_0^\infty {}_x[(_{t})]t,$$

(7)

$h(x)$
$_0 =$
x
$_x[(_{t})]$
$[(_{t})|_0 =$
$x]$
x
h
h
c
?
?
?
h
h
?
?
$h \in$
C^2
?
c
?
h
h
h

$$h^(x) := \int_0^\infty \exp(-t)_x[c(_{t})]t,$$

(8)

$>$
0
$c(x)$
$x \to$
0
h
$_{t}d_{p}oissonsiscrucialineachoftheapplicationsweconsiderinthisdissertation.Inthefeedbackparticlefilter(FPF), theinno$
$\nabla h(x)\,, x \in$
. (9)
?