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Mechanics Ch. 1:

Linear operators

Linear Operators

In Quantum

Mechanics With

Page 5/66

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Linear

Examples What is
a Linear
Operator?
Quantum

mechanics; (Part
1) Linear vector
space, Basis

\u0026

dimensions,

Hilbert space

Linear Operators
in Quantum

Mechanics Linear
Operators

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*Introduction to
Operators in
Quantum
Mechanics*

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mechanics Linear

operators

~~Introduction to
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The Hamiltonian

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in quantum For

mechanics What

are

eigenfunctions

and eigenvalues?

— Real Chemistry

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Bra-Ket

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| Quantum

Mechanics L9.1

Expectation

value of

Hermitian

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operators. For

**Ladder Operators
of Angular
Momentum |**

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Mechanics:

*Examples of
Operators |*

Hermitian,

Unitary etc.

Quantum

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Lecture #028:

Linear \u0026amp;

Non-Linear

Operators |

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Eigenvalues and
eigenstates in

quantum

mechanics

4. LINEAR

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// LINEAR

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HINDI Quantum

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Chemistry 3.2 -

Operators Q3?

Operator in

Quantum | Types

of operators |

Miss chemistry

Linear Operators

For Quantum

Mechanics

Classical-

Mechanical

quantities are

represented by

linear operators

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Linear

in Quantum For
Mechanics

Understand that
"algebra" of

scalars and
functions do not
always to
operators

(specifically
the commutative
property) The
bracketed object
in the time-
independent

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Schrödinger For
Equation (in 1D)

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Mechanics
3.2: *Linear*

Operators in

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*Linear Operators
for Quantum*

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Linear Operators

Almost all

operators

encountered in

quantum

mechanics are

linear operators

. A linear

operator is an

operator which

satisfies the

following two

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Linear

Conditions: For

Quantum

Linear Operators

– Georgia

Institute of

Technology

1.3 Linear

operators. An

operator A^{\wedge} is

said to be

linear if

$$A^{\wedge}(cf(x)) = cAf^{\wedge}$$

(x) and

$$A^{\wedge}(f(x)+g(x)) =$$

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Linear

$$A\hat{f}(x) + A\hat{g}(x)$$

where $f(x)$ and $g(x)$ are any two appropriate functions and

c is a complex constant.

Examples: the operators \hat{x} , \hat{p} and \hat{H} are all linear operators. This can be checked by explicit

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Linear

Operators For

(Exercise!) . 1.4

Hermitian

operators.

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1 Lecture 3:

Operators in

Quantum

Mechanics

Classical

dynamical

variables, such

as x and p , are

represented in

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Linear

quantum Operators For

mechanics by
linear operators
which act on the
wavefunction.

The operator for
position of a
particle in
three dimensions
is just the set
of coordinates
 x , y , and z ,
which is written
as a vector, r :

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$$\mathbf{r} = (x, y, z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$$

4.2: Quantum

Operators

Represent

Classical

Variables ...

We have observed
that most
operators in
quantum
mechanics are
linear

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Linear

operators. This is fortunate because it allows us to represent quantum mechanical operators as matrices and wavefunctions as vectors in some linear vector space. Since computers are

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Linear

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good at
performing
operations

common in linear
algebra

(multiplication
of a matrix
times a vector,
etc.) this is
quite

advantageous
from a practical
standpoint.

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Linear

Operators For

*Why do we use
linear operator
in quantum
mechanics? -*

Quora

Next: Linear

Operators Up:

Operators

Previous:

Operators and

Quantum

Mechanics

Contents Basic

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Linear

Operators For

Operators Most
of the

properties of
operators are

obvious, but
they are

summarized below
for

completeness.

The sum and
difference of
two operators

and are given by

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Operators For

*Basic Properties
of Operators*

In quantum

mechanics, the

momentum

operator is the

operator

associated with

the linear

momentum. The

momentum

operator is, in

the position

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Linear

representation,
an example of a
differential
operator. For
the case of one
particle in one
spatial
dimension, the
definition is: \hat{p}
 $= \hbar \nabla$

*Momentum
operator -*

Wikipedia

Page 28/66

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Linear

Linear operators
in wave

mechanics Main
articles: Wave

function and Bra-
ket notation Let
 ψ be the

wavefunction for
a quantum

system, and \hat{A}
{\displaystyle
{\hat {A}}} be

any linear
operator for

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Linear

some observable

A (such as
position,
momentum,

energy, angular
momentum etc.).

Operator

(physics) -

Wikipedia

The physics of
quantum

mechanics was

thereby reduced

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Operators For

mathematics of
Hilbert spaces
and linear

operators acting

on them. For
example, the

uncertainty
principle ,

according to
which the

determination of
the position of
a particle

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prevents the determination of its momentum and vice versa, is translated into the non-commutativity of the two corresponding operators.

John von Neumann
- *Wikipedia*

Every operator
Page 32/66

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Corresponding to an observable is both linear and Hermitian: That is, for any two wavefunctions $|\psi\rangle$ and $|\phi\rangle$, and any two complex numbers α and β , linearity implies that $A^{\wedge}(\alpha|\psi\rangle + \beta|\phi\rangle) = \alpha(A^{\wedge}|\psi\rangle) + \beta(A^{\wedge}|\phi\rangle)$.

Moreover, for

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any linear operator \hat{A} , the Hermitian conjugate operator (also known as the adjoint) is defined by the relation

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in quantum
mechanics - TCM
Group*

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Linear

In your case, V is the space of kets, and $|\Phi\rangle$ is a linear operator on it. A linear map

$f: V \rightarrow \mathbb{C}$ is a bra.

(Let's stay in the finite dimensional case to not have to worry about

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Linear

continuity and so.) Since Φ is linear, it is not hard to see that if f is linear, then so is $\Phi^{\ast} f$.

*quantum
mechanics - How
does a linear
operator act on*

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related to the
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2 Lecture 2.

Elements of the
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35 2.1 Birth of
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35 2.2 Birth of
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Heisenberg and
the algebra

Quantum

Mechanics
Lectures on the
Mathematics of

Quantum
Mechanics

And it is here
that the reader
begins to
appreciate the
elegance of the
operator
formalism: it

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handles quantum mechanics and quantum statistical mechanics simultaneously. This is because in the operator formalism all states are represented as density operators. And pure states are

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Operators For

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operators.

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for Quantum

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Books on ...

Linear operators

in a Hilbert

space form a

special

structure that

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Linear

mathematicians
call algebra.

This means two
things. First,

the linear

operators act in
a linear vector
space, also form
a vector space.

Second, the
operators can be
multiplied. The
result of this
multiplication

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Linear

is a linear operator in the same space.

Let's consider this in more detail.

*Linear Operators
- The Language
of Quantum
Mechanics ...*

$A (\psi + \phi) = A\psi + A\phi$.

Most operators

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in quantum mechanics are linear. For instance, the Hamiltonian, momentum and angular momentum as well as the position operator are linear. In fact, any observable has to be a linear operator.

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and nonlinear
operators in*

Quantum . . .

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diagonalizing

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algebras; and
Mechanics
equations of
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Operator quantum

mechanics

becomes

accessible to

undergraduates

with no

background in

mathematics

beyond algebra.

Includes more

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textbook in the
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operators in
Banach and
Hilbert spaces.
It is a
thoroughly
worthwhile

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students in

functional

analysis as well

as for

researchers in

perturbation,

spectral, and

scattering

theory. [...] I

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mathematician or
physicist
interested in
this field."

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This concise
text for

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intricate

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often a simple

fact or idea. So

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mechanics; the

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mathematical For

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quantum F

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mechanics stems
essentially from

the fact that
quantum

probabilities
interfere (i.e.,

from the
superposition

principle). This

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substantiating

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achieves. The

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reverse

engineers the

postulates of

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schematic

outline of the

empirical

content of

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mechanics from
which the
postulates are
then

reconstructed
step by step.

This strategy is
adopted to avoid
the

disconcerting
details of
actual

experiments
(however

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simplified) to spare the beginner of issues that lurk in the fragile foundations of the subject. In the Copenhagen interpretation of quantum mechanics, the key idea is measurement. But "measurement"

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carries an For

entirely

different

meaning from the

connotation that

the term carries

elsewhere in

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mechanics. For

Builds the
vocabulary of
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mechanics by
showing how the
entire body of
its conceptual
ingredients can
be constructed
from the single
notion of
quantum
measurement.

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