

Multiple Random Variables

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Based on
Probability, Random Variables and Random Signal Principles,
P.Z. Peebles, Jr. and B. Shi

Outline

- 1 A vector random variable (a random vector)

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A Vector Random Variable

a random vector

Definition

X and Y : two random variables

x and y : specific values of X and Y

(x,y) : the ordered pair of numbers

a **random point vector** in the xy plane

Range Sample Space

two dimensional product space, a joint sample space S_J

Definition

an event $A = \{X \leq x\}$ refers to
the sample space $S : \{X(s) \leq x\}$

an event $B = \{Y \leq y\}$ refers to
the sample space $S : \{Y(s) \leq y\}$

a **joint event** $A \cap B = \{X \leq x, Y \leq y\}$ refers to
the sample space $S_J : \{X(s) \leq x, Y(s) \leq y\}$

General Range Sample Space

multi-dimensional product space, a joint sample space S_J

Definition

X_1, X_2, \dots, X_N : N random variables
defined on a sample space S

(x_1, x_2, \dots, x_N) : an N -dimensional random vector (random variable)
defined on an N -dimensional joint sample space