Nasir Ganikhodjaev
Farrukh Mukhamedov
Pah Chin Hee

VOLUME 1

$$x' = 2xy$$
$$y' = 2xz$$

INVESTIGATIONS ON PURE MATHEMATICS, FINANCE MATHEMATICS AND OPTICS

Proceedings of the Department of Computational and Theoretical Sciences Kulliyyah of Science, IIUM

$$\varphi_1(x,y,z) = z$$

$$\pi_1 = \begin{pmatrix} x & y & z \\ y & z & x \end{pmatrix}$$

$$z' = x^2 + y^2 + z^2 + 2yz$$

$$\pi_1 V_1 \pi_1 = V_{17}$$

الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيبرسيتي اسلام انتارابغسا مليسيا

Investigations on Pure Mathematics, Finance Mathematics and Optics

Nasir Ganikhodjaev
Farrukh Mukhamedov
Pah Chin Hee

IIUM Press

Published by.
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia   Cataloguing-in-Publication Data

Nasir Ganikhodjaev, Farrukh Mukhamedov & Pah Chin Hee Investigations on Pure Mathematics, Finance Mathematics and Optics

ISBN: 978-967-418-198-7

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by
IIUM PRINTING SDN.BHD.
No 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

Contents

Part II Finance Mathematics Concentration

Part III Optics Concentration

MARKOV CHAINS AND ITS APPLICATION: THE INVENTORY MODEL

Nurul Aishah Ramli
Prof. Dr. Nasir Ganikhodjaev

Abstract. *This project paper examines the application of Markov chains in real life, thus the inventory model is selected. This model is constructed based on the information obtained from Carrefour East Coast Mall, Kuantan throughout the period of 90 days for only one item. Then, this model is further examined by defining the transition probability matrix based on the demand of the item chosen. Some simulation using Maple 12 is done to determine the regular Markov chains for the demand throughout 90 days. Finally, the obtained limiting probability distribution resulted from the simulation will be used to investigate the behavior of demand for the item selected.*

1 Introduction

Most of the classical study of probability has dealt with independent trial process, which is the basis of classic theory of probability. This process is a study of stochastic that the possible outcomes for each experiment are the same and occur with the same probability. In other words, the classical probability assumes that all outcomes in the experiment are equally likely to occur. It may be explained here that the outcomes of the previous experiment does not influence the outcomes of the next experiment. So, the distribution for the outcomes of a single experiment is sufficient to construct a tree diagram, and a tree measure for a sequence *n* experiment can give answer for any probability question about these experiments.

Nowadays, study of chance processes for which the knowledge of previous outcomes influence predictions for future experiments are being conducted in modern probability theory. In principle, when we observe a sequence of chance experiments, all of the past outcomes could influence our predictions for the next experiment. This type of process is called a Markov Chain.

1.1 Specifying the Markov Chains

Definition 1.1: A Markov process $\{X_t\}$ is a stochastic process with the property that, given the value of X_t, the value for X_s for s > t are not influenced by the values of X_u for u < t. In simpler words, the probability of any particular future behavior of the process, when its current state is known exactly, is not altered by additional knowledge concerning its past behavior.

A discrete-time Markov chain is a Markov process whose state space is a finite or countable set, and whose time index set is T = (0,1,2,..). In formal terms, the Markov property is that

$$\Pr\{X_{n+1}=\mathrm{j} \mid X_0 = i_0, \dots, X_{n-1} = i_{n-1}, X_n = i\} = \Pr\{X_{n+1}=\mathrm{j} \mid X_n = i\}$$

for all time points *n* and all states $i_0, \dots, i_{n-1}, i, j$

Let S be the state space of the Markov chain by the nonnegative integers {0, 1, 2,...}, and it is customary to speak X_n as being in state i if $X_n = i$.
The probabilities $P_{ij}^{n,n+1}$ are called one-step transition probability i.e. the probability of X_{n+1} being in state j given that X_n in state i is called the one-step transition probability as followed,