CONCLUDING REMARKS

The study provided the path loss prediction variation of two empirical and semi-empirical path loss models over an urban environment. The path loss ined from measurement result was compared against predictions made by the T-231 Hata, Lee and COST-231 Walfisch-Ikegami respectively.

It shows that the COST-231 Hata and Lee path loss models generally under-ict the environment, while the COST-231 Walfisch-Ikegami path loss model -predicts the environment. However, on the average, the propagation models ide a close prediction of the path loss for the environment.

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ON THE IDEMPOTENT ELEMENTS OF SEMIGROUPS OF INJECTIVE CONTRACTION MAPPINGS

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ABSTRACT

This paper studies the idempotent elements of the semigroups of injective contraction mappings (E(ICONTη) where η 1, 2, 3, 4. All the idempotent elements of partial 1 - 1 transformation semigroups are contraction mappings. Hence $|(E(ICONT\eta)| = 2^n = |E(T_n)|$

INTRODUCTION

Let $X_n = \{1,2,\ldots,n\}$Then a (partial) transformation α: $Dom\ \alpha \subseteq X_n \to Im\ \alpha$ is said to be full or total if $Dom\ \alpha = X_n$; otherwise it is called strictly partial.

The set of all partial transformations on n –objects forms a semigroup under the usual composition of transformations. It is denoted by P_n when it is strictly partial, T_n when it is full or total and I_n when it is partial $1-1$.

A transformation α in$T_n$for which $(\forall\ x, y \in X_n)$, $|x\alpha - y\alpha| \leq |x - y|$is said to be a contraction (Umar, 2008).

The height ofα is $h(\alpha) = |Im\ \alpha|$, the width or breadth of is$b(\alpha) = |Dom\ \alpha|$ the right(left) waist of α is $w^+(\alpha) = \max(Im\ \alpha)$ $[w^-(\alpha) = \min(Im\ \alpha)]$, the collapse and fix of are denoted by$c(\alpha)$ and$f(\alpha)$and defined by

$$c(\alpha) = |C(\alpha)| = \left|\bigcup_{t\in Im\alpha}\{t\alpha^{-1}: |t\alpha^{-1}| \geq 2\right|, f(\alpha) = |F(\alpha)| = |\{x \in X_n: x\alpha = x\}|$$

respectively. It is also well-known that an element$\varepsilon \in P_n$ *is idempotent*$(\varepsilon^2 = \varepsilon)$ if and only if $Im\ \varepsilon = F(\varepsilon)$.The idempotent elements of the semigroup of partial 1 - 1 contractions X_n of will be denoted by *(E(ICONTη).*

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RESULTS AND DISCUSSION

Recall that, a contraction mapping is one in which the difference between any two elements(in the base set X) is greater than or equal to the difference between their images.

The general idea is to study the idempotent elements of the mappings. Here, some tables were formed for $ICONT_n$ for $n = 1,2,3,4$ for (at least). Then we arrange the elements by heights and within each height class by their images, sets and kernel classes and from these tables we form sequence and then study the pattern of the arrangement of numbers as follows:

For n=1, $ICONT_1$ has 2 elements.

$|Im\ \alpha| = 1$.

$ker\alpha \mid Im\alpha$	{1}	
1	$\binom{1}{1}$	+ Ø

For n=2, $ICONT_2$ has 7 elements.

$|Im\ \alpha| = 2$.

$ker\alpha \mid Im\alpha$	{1,2}
1,2	$\binom{1\ 2}{1\ 2}, \binom{1\ 2}{2\ 1}$

$|Im\ \alpha| = 1$.

$ker\alpha \mid Im\alpha$	{1}	{2}	
1,2	$\binom{1}{1}, \binom{2}{1}$	$\binom{1}{2}, \binom{2}{2}$	+ Ø

For n=3, $ICONT_3$ has 26 elements.

$|Im\ \alpha| = 3$.

$ker\alpha \mid Im\alpha$	{1,2,3}
1,2/3	$\binom{1\ 2\ 3}{1\ 2\ 3}, \binom{1\ 2\ 3}{3\ 2\ 1}$

$|Im\ \alpha| = 2$.

	{1,2}
	$\binom{1\ 2}{1\ 2}, \binom{1\ 2}{2\ 1}, \binom{1\ 3}{1\ 2}, \binom{1\ 3}{2\ 1}, \binom{2\ 3}{1\ 2}, \binom{2\ 3}{2\ 1}$
	{1,3}
	$\binom{1\ 3}{1\ 3}, \binom{1\ 3}{3\ 1}$
	{1,3}
	$\binom{1\ 2}{2\ 3}, \binom{1\ 2}{3\ 2}, \binom{1\ 3}{2\ 3}, \binom{1\ 3}{3\ 2}, \binom{2\ 3}{2\ 3}, \binom{2\ 3}{3\ 2}$

$ker\alpha \mid Im\alpha$	{1}	{2}	{3}	
1,2,3	$\binom{1}{1}, \binom{2}{1}, \binom{3}{1}$	$\binom{1}{2}, \binom{2}{2}, \binom{3}{2}$	$\binom{1}{3}, \binom{2}{3}, \binom{3}{3}$	+ Ø

For n=4, $ICONT_4$ has 97 elements.

$|Im\ \alpha| = 4$.

$ker\alpha \mid Im\alpha$	{1,2,3,4}
1,4/2,3	$\binom{1\ 2\ 3\ 4}{1\ 2\ 3\ 4}, \binom{1\ 2\ 3\ 4}{4\ 3\ 2\ 1}$

$|Im\ \alpha| = 3$.

	{1,2,3}
{1,2,3,4}	$\binom{1\ 2\ 3}{1\ 2\ 3}, \binom{1\ 2\ 3}{3\ 2\ 1}, \binom{1\ 2\ 4}{1\ 2\ 3}, \binom{1\ 2\ 4}{3\ 2\ 1}, \binom{1\ 2\ 4}{2\ 1\ 3}, \binom{1\ 2\ 4}{2\ 3\ 1}$ $\binom{1\ 3\ 4}{1\ 2\ 3}, \binom{1\ 3\ 4}{1\ 3\ 2}, \binom{1\ 3\ 4}{3\ 1\ 2}, \binom{1\ 3\ 4}{3\ 2\ 1}, \binom{2\ 3\ 4}{1\ 2\ 3}, \binom{2\ 3\ 4}{3\ 2\ 1}$
	{1,2,3}
1,4/2,3	$\binom{1\ 2\ 4}{1\ 2\ 4}, \binom{1\ 3\ 4}{4\ 2\ 1}$
	{1,3,4}
1,4/2,3	$\binom{1\ 3\ 4}{1\ 3\ 4}, \binom{1\ 2\ 4}{4\ 3\ 1}$
	{2,3,4}
1,2,3,4	$\binom{1\ 3\ 4}{2\ 3\ 4}, \binom{1\ 3\ 4}{2\ 4\ 3}, \binom{1\ 3\ 4}{4\ 2\ 3}, \binom{1\ 3\ 4}{4\ 3\ 2}, \binom{2\ 3\ 4}{2\ 3\ 4}, \binom{2\ 3\ 4}{4\ 3\ 2}$ $\binom{1\ 2\ 3}{2\ 3\ 4}, \binom{1\ 2\ 3}{4\ 3\ 2}, \binom{1\ 2\ 4}{2\ 3\ 4}, \binom{1\ 2\ 4}{3\ 2\ 4}, \binom{1\ 2\ 4}{4\ 3\ 2}, \binom{1\ 2\ 4}{3\ 4\ 2}$

$|Im\ \alpha| = 2.$

$ker\alpha \mid Im\alpha$	{1,2}
	$\binom{1}{1}\ \binom{2}{2}, \binom{1}{2}\ \binom{2}{1}, \binom{1}{1}\ \binom{3}{2}, \binom{1}{2}\ \binom{3}{1}, \binom{1}{1}\ \binom{4}{2}, \binom{1}{2}\ \binom{4}{1}$ $\binom{2}{1}\ \binom{3}{2}, \binom{2}{2}\ \binom{3}{1}, \binom{2}{1}\ \binom{4}{2}, \binom{2}{2}\ \binom{4}{1}, \binom{3}{1}\ \binom{4}{2}, \binom{3}{2}\ \binom{4}{1}$
	{1,3}
	$\binom{1}{1}\ \binom{3}{3}, \binom{1}{3}\ \binom{3}{1}, \binom{1}{1}\ \binom{4}{3}, \binom{1}{3}\ \binom{4}{1}, \binom{2}{1}\ \binom{4}{3}, \binom{2}{3}\ \binom{4}{1}$
	{1,4}
	$\binom{1}{1}\ \binom{4}{4}, \binom{1}{4}\ \binom{4}{1}$
1,2,3,4	{2,3}
1,4	$\binom{1}{2}\ \binom{2}{3}, \binom{1}{3}\ \binom{2}{2}, \binom{1}{2}\ \binom{3}{3}, \binom{1}{3}\ \binom{3}{2}, \binom{1}{2}\ \binom{4}{3}, \binom{1}{3}\ \binom{4}{2}$ $\binom{2}{2}\ \binom{3}{3}, \binom{2}{3}\ \binom{3}{2}, \binom{2}{2}\ \binom{4}{3}, \binom{2}{3}\ \binom{4}{2}, \binom{3}{2}\ \binom{4}{3}, \binom{3}{3}\ \binom{4}{2}$
	{2,4}
1,2,3,4	$\binom{1}{2}\ \binom{3}{4}, \binom{1}{4}\ \binom{3}{2}, \binom{1}{2}\ \binom{4}{4}, \binom{1}{4}\ \binom{4}{2}, \binom{2}{2}\ \binom{4}{4}, \binom{2}{4}\ \binom{4}{2}$
	{3,4}
1,2,3,4	$\binom{1}{3}\ \binom{2}{4}, \binom{1}{4}\ \binom{2}{3}, \binom{1}{3}\ \binom{4}{4}, \binom{1}{4}\ \binom{4}{3}, \binom{1}{3}\ \binom{4}{4}, \binom{1}{4}\ \binom{4}{3}$ $\binom{2}{3}\ \binom{3}{4}, \binom{2}{4}\ \binom{3}{3}, \binom{2}{3}\ \binom{4}{4}, \binom{2}{4}\ \binom{4}{3}, \binom{3}{3}\ \binom{4}{4}, \binom{3}{4}\ \binom{4}{3}$

$Im\alpha| = 1.$

$ker\alpha \mid Im\alpha$	{1}	{2}	
	$\binom{1}{1}, \binom{2}{1}, \binom{3}{1}, \binom{4}{1}$	$\binom{1}{2}, \binom{2}{2}, \binom{3}{2}, \binom{4}{2}$	
	{3}	{4}	
	$\binom{1}{3}, \binom{2}{3}, \binom{3}{3}, \binom{4}{3}$	$\binom{1}{4}, \binom{2}{4}, \binom{3}{4}, \binom{4}{4}$	$+\ \emptyset$

From the preliminary results, we have the following:

3.1: $ICONT_1$: $\binom{1}{1}$ and $\emptyset$ are idempotents.

3.2: $ICONT_2$: $\binom{1}{1}\ \binom{2}{2}, \binom{1}{1}, \binom{2}{2}$ and $\emptyset$ are idempotents.

$ICONT_3$ $\binom{1}{1}\ \binom{2}{2}\ \binom{3}{3}, \binom{1}{1}\ \binom{2}{2}, \binom{1}{1}\ \binom{3}{3}, \binom{2}{2}\ \binom{3}{3}, \binom{1}{1}, \binom{2}{2}, \binom{3}{3}$ $\emptyset$

3.4: $ICONT_3$: $\binom{1}{1}\ \binom{2}{2}\ \binom{3}{3}\ \binom{4}{4}, \binom{1}{1}\ \binom{2}{2}\ \binom{3}{3}, \binom{1}{1}\ \binom{2}{2}\ \binom{4}{4}, \binom{1}{1}\ \binom{3}{3}\ \binom{4}{4}, \binom{2}{2}\ \binom{3}{3}\ \binom{4}{4}, \binom{1}{1}\ \binom{2}{2}$

$\binom{1}{1}\ \binom{4}{4}, \binom{2}{2}\ \binom{3}{3}, \binom{2}{2}\ \binom{4}{4}, \binom{3}{3}\ \binom{4}{4}, \binom{1}{1}, \binom{2}{2}, \binom{3}{3}, \binom{4}{4}$ $\emptyset$

ϕ is an empty mapping and all empty mappings are contraction mapping

CONCLUDING REMARKS

From the main results, the idempotent elements of the $ICONT_n(n$ are also the idempotent elements of the T_n and these go by the sequence 2, And from the sequence, we can deduce that $|E(ICONT_n)| = 2^n$ where $n =$ which is the formular for finding $|E(T_n)|$. Therefore, the idempotent ele the partial 1 - 1 transformation semigroups are contraction mappings $|E(ICONT_n)| = 2^n = |E(T_n)|$. The result can be used in coding system and a theory and languages.

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APPLICATION OF DYNAMIC PROGRAMMING TO SOLVI RESERVOIR OPERATION PROBLEMS

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ABSTRACT

The course of dimensionality gives rise to prohibitive computational requirements that render infeasible the exact solution of large-scale reservoir control problems. We study an efficient method based on linear programming for approximating solutions to such problems. The approach of dynamic programming helps resolve long time operational, water allocation and expansion problems in reservoir dynamics, operations and maintenance.

Keyword: *Dynamic Programming, Optima Solution, Reservoir Operation Modeling, Overlapping*

INTRODUCTION

In terms of mathematical optimization, dynamic programming usually re to a simplification of a decision by breaking it down into a sequence of deci steps over time. This is done by defining a sequence of value functions V_1, V_2 with an argument y representing the state of the system at times i from 1 to n. definition of $V_n(y)$ is the value obtained in state y at the last time n. The value at earlier times I = n-1, n-2, 2, 1 can be found by working backwards, usir recursive relationship called the Bellman equation. For i=2,...n, V_{i-1} at any sta is calculated from V_i by maximizing a simple function (usually the sum) of gain from decision i-1 and the function V_i at the new state of the system if decision is made. Since V_i has already been calculated, for the needed states, above operation yields V_{i-1} for all the needed states. Finally, V_1 at the initial st of the system is the value of the optimal solution. The optimal values of the decis variables can be recovered, one by one, by tracking back the calculations alre performed.

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